CRITICAL AND CREATIVE THINKING TEST ITEMS

CLASS X SUB: SCIENCE

CHAPTER-1 CHEMICAL REACTIONS AND EQUATIONS

INDEX

TEST ITEM -1

Domain: Scientific Literacy

Theme: Chemical reactions and equations

Topic: Types of Chemical Reactions-Combination Reaction

Class: X

Expected Time: 12 min

Total Credit: 10

Description of Item:

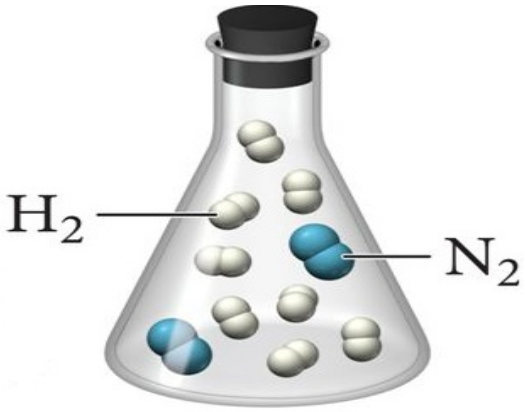
YES	Text
Yes	Image
No	Table
No	Graph
No	Map

Learning Outcomes:

- Analyse and differentiate between various types of chemical reactions.
- Express chemical reaction through a chemical equation.
- Provide examples for different types of chemical reactions.
- Predict the products of a chemical reactions.
- Apply concepts learnt in everyday problems.

Description of item: (Item-1) TYPES OF CHEMICAL REACTIONS

A chemical reaction is said to occour when any one or two elements or compounds come close to each other so that some bonds break or some bonds are formed or both. The general principle is the 'Law of conservation of mass' wherein the number of participating units on one side of the arrow is equal to the units mentioned on the other side of the arrow. The units / molecules mentioned on the left side of the arrow are called reactants while those written on the right side are called products. In some cases, the reactants just break to form the products, in others the reactants combine to form new compounds with the exchange of energy. In some other cases the reactants just combine with each other as they have merged into each other. In his laboratory, Rohan mixes nitrogen and hydrogen gases so that they undergo a combination reaction.



Q1.1) What is the product obtained during this combination reaction?

A. $N_2 + 3H_2 \rightarrow 2NH_3$
B. $N_2 + 2H_2 \rightarrow 2NH_2$
C. $N_2 + H_2 \rightarrow 2NH$
D. $N_2 + 4H_2 \rightarrow 2NH_4$

FRAMEWORK	**CHARACTERISTICS**
Competency	Explain Phenomena Scientifically
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Simple Multiple Choice
Proficiency level	3

Q1.2) Which of the combination reactions contains at least one compound in its reactants?

A. $CaO + H_2O \rightarrow Ca(OH)_2$
B. $4Fe + 3O_2 \rightarrow 2Fe_2O_3$
C. $4K + O_2 \rightarrow 2K_2O$
D. $2Fe + O_2 \rightarrow 2FeO$

FRAMEWORK	**CHARACTERISTICS**
Competency	Explain Phenomena Scientifically
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Simple Multiple Choice
Proficiency level	3

Q1.3) Wonder Women wears silver coloured boots made of pure magnesium for a special mission. In a fight, she burns her boots. She realizes that her boots has undergone a reaction as she could spot some sort of layer on her boots.

What is the product obtained in this reaction?

FRAMEWORK	**CHARACTERISTICS**
Competency	Explain Phenomena Scientifically
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Short Response Item
Proficiency level	3

Q1.4) Barium metal and fluorine gas react to form Barium fluoride. Which of the following reactions describes the correct reaction for this combination reaction?

a. $\mathrm{Ba} + \mathrm{F} \rightarrow \mathrm{BaF}$
b. $\mathrm{Ba} + \mathrm{F} \rightarrow \mathrm{BaF_2}$
c. $\mathrm{Ba} + \mathrm{F_2} \rightarrow \mathrm{BaF_2}$
d. $\mathrm{Ba} + \mathrm{F_2} \rightarrow \mathrm{BaF}$

FRAMEWORK	**CHARACTERISTICS**
Competency	Explain Phenomena Scientifically
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Simple Multiple Choice
Proficiency level	3

Q1.5) Shyam adds water to quicklime to white wash his house walls. Remember quick lime is also called calcium oxide. Identify and write the chemical reaction.

FRAMEWORK	CHARACTERISTICS
Competency	Explain Phenomena Scientifically
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Closed Constructed Response
Proficiency level	4

Credit Pattern:

Full Credit: 02

Partial Credit : 01

Nil Credit: 0

Answer key:

Q1.1) Full Credit: A

Nil Credit: Other responses or missing

Q 1.2) Full Credit: A

Nil Credit: Other responses or missing

Q 1.3) Full Credit MgO

Nil Credit: Other responses or missing

Q 1.4) Full Credit: C

Nil Credit: Other responses or missing

Q 1.5)Full Credit: Combination reaction

$$CaO + H_2O \rightarrow Ca(OH)_2 + \text{Heat}$$

Nil Credit: Other responses or missing

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TEST ITEM -2

Domain: Scientific Literacy

Theme: Chemical reactions and equations

Topic: Types of Chemical Reactions-Decomposition Reaction

Class: X

Expected Time: 12 min

Total Credit: 10

Description of Item:

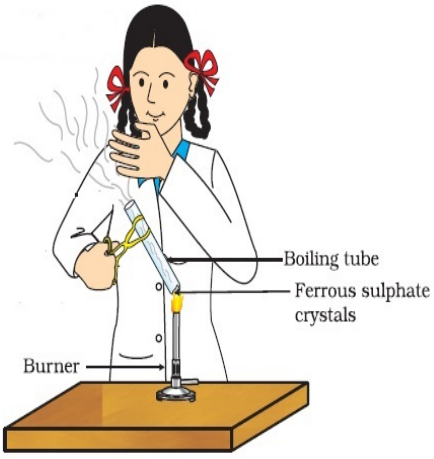
YES	Text
Yes	Image
No	Table
No	Graph
No	Map

Learning Outcomes:

- Analyse and differentiate between various types of chemical reactions.
- Express chemical reaction through a chemical equation.
- Provide examples for different types of chemical reactions.
- Predict the products of a chemical reactions.
- Apply concepts learnt in everyday problems.

Description of item: (Item – 2) DECOMPOSITION REACTIONS

A reaction in which one reactant breaks into two or more products with or without the energy involvement is considered to be decomposition of the reactant. Here again the basic principle of 'Law of conservation of masses' apply. If one writes the chemical composition of the reactants correctly, then it is generally easy to follow the reaction to the product stage. Seema heats green Ferrous sulphate crystals in a boiling tube and observes that the colour of the crystals changes to brown and gases are released.



Q2.1) What are the products obtained during this reaction?

FRAMEWORK	CHARACTERISTICS
Competency	Explain Phenomena Scientifically
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Close Constructed Response
Proficiency level	3

Q2.2) Consider the following thermal decomposition reaction where lead nitrate is heated over a flame.

$\mathrm{Pb(NO_3)_2} \xrightarrow{\text{Heat}} ?$

The white powder turns yellow and brown fumes are released.

Write the balanced chemical equation.

FRAMEWORK	CHARACTERISTICS
Competency	Explain Phenomena Scientifically
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Close Constructed Response
Proficiency level	4

Q2.3) Hydrogen peroxide undergoes a decomposition reaction inside rocket boosters to provide necessary conditions for burning of rocket fuel.

Choose the correct chemical equation for this reaction?

A. $\mathrm{H_2O_2 \rightarrow H_2O + H_2 + Heat}$
B. $\mathrm{H_2O_2 \rightarrow H_2O + O_2 + Heat}$
C. $\mathrm{H_2O_2 \rightarrow H_2O + Heat}$
D. $\mathrm{H_2O_2 \rightarrow H_2O + H_2 + O_2 + Heat}$

FRAMEWORK	CHARACTERISTICS
Competency	Explain Phenomena Scientifically
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cogni ive demand	Medium
Item format	Simple Multiple Choice
Proficiency level	3

Q2.4) Can these be used to breakdown compound in decomposition reactions?

S.NO.	CONDITIONS	YES/NO
1.	Force	YES/NO
2.	Energy	YES/NO
3.	Air	YES/NO
4.	Water	YES/NO

FRAMEWORK	CHARACTERISTICS
Competency	Evaluate and Design Scientific Enquiry
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Simple Multiple Choice
Proficiency level	3

Q 2.5) Aryan has a passion for photography. He makes thin films out of silver chloride which decomposes when exposed to light. Write the balanced chemical equation for the reaction.

FRAMEWORK	CHARACTERISTICS
Competency	Explain Phenomena Scientifically
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Closed Constructed Response
Proficiency level	4

Credit Pattern:

Full Credit: 02
Partial Credit : 01
Nil Credit: 0
Answer key:

Q 2.1) Full Credit: $2FeSO_4.\ 7H_2O\ (s) \xrightarrow{Heat} Fe_2O_3(s) + SO_2(g) + SO_3(g)$

Nil Credit: Other responses or missing

Q 2.2) Full Credit: $Pb(NO_3)_2 \xrightarrow{Heat} 2PbO + 4NO_2 + O_2$

Nil Credit: Other responses or missing

Q2.3) Full Credit: B

Nil Credit: Other responses or missing

Q 2.4) Full Credit: 1. NO

2. YES

3. NO

4. NO

Nil Credit: Other responses or missing

Q 2.5) Full Credit: $2AgCl \xrightarrow{sunlight} 2Ag + Cl_2$

Nil Credit: Other responses or missing

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TEST ITEM-3

Domain: Scientific Literacy

Theme: Chemical reactions and equations

Topic: Types of Chemical Reactions-Displacement Reaction

Class: X

Expected Time: 12 min

Total Credit: 10

Description of Item:

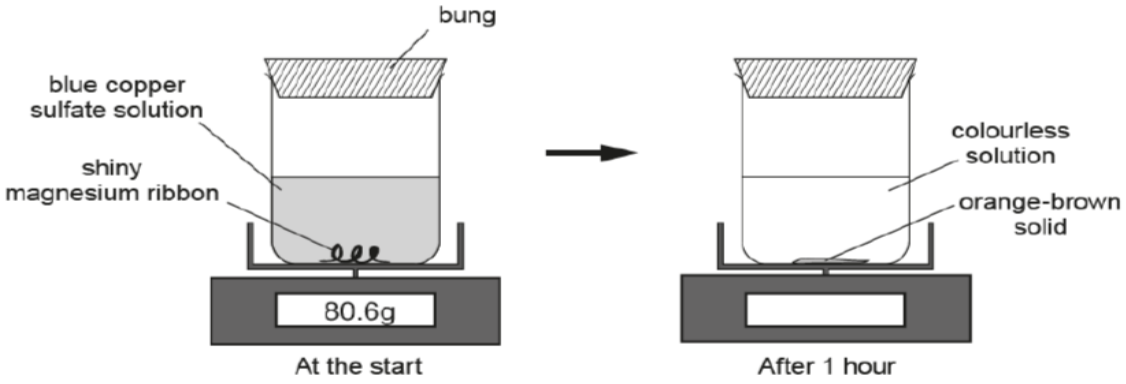
YES	Text
Yes	Image
No	Table
No	Graph
No	Map

Learning Outcomes:

- Analyse and differentiate between various types of chemical reactions.
- Express chemical reaction through a chemical equation.
- Provide examples for different types of chemical reactions.
- Predict the products of a chemical reactions.
- Apply concepts learnt in everyday problems.

Description of item: (Item – 3) DISPLACEMENT REACTIONS

A student was asked to investigate what happens when a piece of shiny magnesium ribbon is added to copper sulphate solution. The apparatus was set up as shown below. The mass was recorded at the start and again after one hour.



Q3.1) Complete the equation:

$Mg + CuSO_4 \rightarrow$ ____ + ____

FRAMEWORK	CHARACTERISTICS
Competency	Explain Phenomena Scientifically
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Short Response Item
Proficiency level	3

Q3.2) Choose from below the name given to this type of reaction:

a. Combustion
b. Displacement
c. Corrosion
d. Electrolysis

FRAMEWORK	CHARACTERISTICS
Competency	Explain Phenomena Scientifically
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Simple Multiple Choice
Proficiency level	3

Q3.3) What will be the mass of the beaker and content after 1 hour?

a. More than 80.6 g
b. Equal to 80.6 g
c. Less than 80.6 g

Give the reason for your choice.

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting Data and Evidence Scientifically
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Close Constructed Response
Proficiency level	4

Q3.4) The experiment was repeated using sodium sulphate solution instead of copper sulphate solution. No reaction took place. Put the metals copper, magnesium and sodium in order of reactivity.

Most reactive I. _____

II. _____

Least reactive III. _____

FRAMEWORK	CHARACTERISTICS
Competency	Evaluating and Designing Scientific Enquiry
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Short Response Item
Proficiency level	5

Q3.5) Balance the following symbol equation that represents the displacement reaction that takes place between zinc and silver nitrate solution.

$Zn + \bigcirc AgNO_3 \rightarrow Zn(NO_3)_2 + \bigcirc Ag$

FRAMEWORK	CHARACTERISTICS
Competency	Explain Phenomena Scientifically
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Short Response Item
Proficiency level	3

Credit Pattern:

Full Credit: 02
Partial Credit : 01
Nil Credit: 0
Answer key:

Q3.1) Full Credit: $MgSO_4$ + Cu

Nil Credit: Other responses or missing

Q3.2) Full Credit: Displacement

Nil Credit: Other responses or missing

Q3.3) Full Credit: equal to 80.6 g

Nil Credit: Other responses or missing

Q3.4) Full Credit: I. Sodium

II. Magnesium

III. Copper

Nil Credit: Other responses or missing

Q3.5) Full Credit: $Zn + 2AgNO_3 \rightarrow Zn(NO_3)_2 + 2Ag$

Nil Credit: Other responses or missing

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TEST ITEM -4

Domain: Scientific Literacy

Theme: Chemical reactions and equations

Topic: Types of Chemical Reactions-Double Displacement Reaction

Class: X

Expected Time: 12 min

Total Credit: 10

Description of Item:

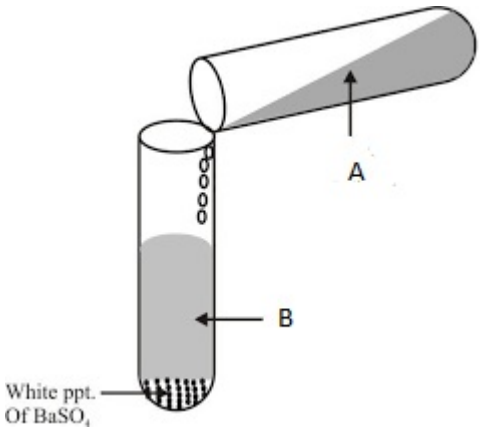
YES	Text
Yes	Image
No	Table
No	Graph
No	Map

Learning Outcomes:

- Analyse and differentiate between various types of chemical reactions.
- Express chemical reaction through a chemical equation.
- Provide examples for different types of chemical reactions.
- Predict the products of a chemical reactions.
- Apply concepts learnt in everyday problems.

Description of item: (Item-4) DOUBLE DISPLACEMENT REACTION

Smitha demonstrates a double displacement reaction in her class by mixing two aqueous solution. On mixing the two solution, insoluble Barium sulphate is formed.



Q4.1) Name two solutions which you could mix to give a precipitate of Barium sulphate from the mixture.

FRAMEWORK	CHARACTERISTICS
Competency	Explain Phenomena Scientifically
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Short Response Item
Proficiency level	3

Q4.2) Describe what you do to obtain Barium sulphate from the mixture?

FRAMEWORK	CHARACTERISTICS
Competency	Explain Phenomena Scientifically
Knowledge-System	Physical System
Context	Global
Cognitive demand	Medium
Item format	Closed constructed Response
Proficiency level	3

Q4.3) Choose the correct equation for the reaction:

A. $BaSO_4 + NaSO_4 \rightarrow BaSO_4 + NaCl$
B. $BaCl_2 + NaSO_4 \rightarrow BaSO_4 + NaCl$
C. $Ba + NaSO_4 \rightarrow BaSO_4 + Na$
D. $BaCl_2 + Na \rightarrow Ba + NaCl$

FRAMEWORK	CHARACTERISTICS
Competency	Explain Phenomena Scientifically
Knowledge-System	Physical System
Context	Globa
Cognitive demand	Medium
Item format	Simple Multiple Choice
Proficiency level	3

Q4.4) Name and write the formula of the insoluble solid or precipitate that will form when

the Lead nitrate is mixed with Sodium sulphate.

Name of Precipitate _____

Formula_____

FRAMEWORK	CHARACTERISTICS
Competency	Explain Phenomena Scientifically
Knowledge-System	Physical System
Context	Global
Cognitive demand	Medium
Item format	Short Response Item
Proficiency level	5

Q4.5) Which of the following reactants when mixed together will form precipitates?

S.No.	Reaction	Yes/No
i.	Copper sulphate and sodium hydroxide	Yes/No
ii.	Copper sulphate and iron	Yes/No

FRAMEWORK	CHARACTERISTICS
Competency	Evaluate and Design Scientific Enquiry
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Complex Multiple Choice
Proficiency level	3

Credit Pattern:

Full Credit: 02
Partial Credit : 01
Nil Credit: 0
Answer key:

Q4.1) Full Credit: Barium chloride and Sodium sulphate

Nil Credit: Other responses or missing

Q4.2) Full Credit: Filtration method

Nil Credit: Other responses or missing

Q4.3) Full Credit: B

Nil Credit: Other responses or missing

Q4.4) Full Credit: Lead sulphate

$PbSO_4$

Nil Credit: Other responses or missing

Q4.5) Full Credit: i. Yes

ii. No

Nil Credit: Other responses or missing

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TEST ITEM -5

Domain: Scientific Literacy

Theme: Chemical reactions and equations

Topic: Exothermic and Endothermic Reaction

Class: X

Expected Time: 12 min

Total Credit: 10

Description of Item:

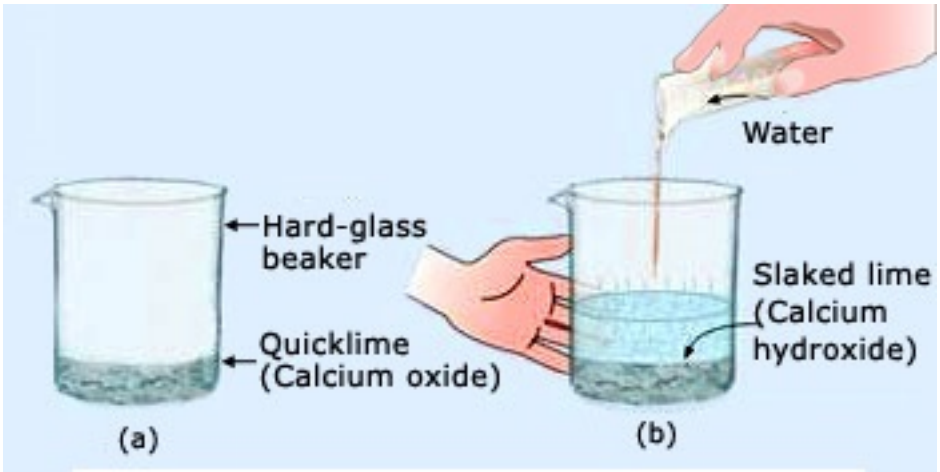
YES	Text
Yes	Image
No	Table
No	Graph
No	Map

Learning Outcomes:

- Analyse and differentiate between various types of chemical reactions.
- Express chemical reaction through a chemical equation.
- Provide examples for different types of chemical reactions.
- Predict the products of a chemical reactions.
- Apply concepts learnt in everyday problems.

Description of item: (Item- 5) ENDOTHERMIC & EXOTHERMIC REACTIONS

Alen learns about combination reactions and spends a day long in the lab figuring out if they absorb or release heat. He performs an experiment in which he adds water to quicklime in a beaker.



Q5.1) How will he confirm that heat is absorbed or released in this experiment?

FRAMEWORK	CHARACTERISTICS
Competency	Explain Phenomena Scientifically
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Short Response Item
Proficiency level	3

Q5.2) Which of the following reactions is endothermic reaction?

A. Photosynthesis
B. Respiration
C. Corrosion
D. Digestion

FRAMEWORK	CHARACTERISTICS
Competency	Explain Phenomena Scientifically
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Simple Multiple Choice
Proficiency level	3

Q5.3) Consider the following reactions:

Reaction 1: $2H_2O \xrightarrow{electricity} H_2 + O_2$

Reaction 2 : $2AgCl \xrightarrow{sunlight} 2Ag + Cl_2$

Categorize these reactions as exothermic or endothermic reactions.

Reaction 1: _____
Reaction 2 : _____

FRAMEWORK	CHARACTERISTICS
Competency	Explain Phenomena Scientifically
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Short Response Item
Proficiency level	3

Q5.4) Angel performed following experiments:

Reaction 1: $2AgBr \xrightarrow{sunlight} Ag + Br_2$

Reaction 2 : $2Mg + O_2 \rightarrow 2MgO + Light$

Choose the correct observation:

A. Reaction 1 and Reaction 2 are both endothermic reactions.
B. Reaction 1 and Reaction 2 are both exothermic reactions.
C. Reaction 1 is endothermic reaction and Reaction 2 is exothermic reaction.
D. Reaction 1 is exothermic reaction and Reaction 2 is endothermic reaction.

FRAMEWORK	CHARACTERISTICS
Competency	Explain Phenomena Scientifically
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Simple Multiple Choice
Proficiency level	3

Q5.5) In which of the following reactions heat is absorbed?

S.No.	Reaction	YES/NO
1)	The combination of nitrogen and oxygen gases to form nitric oxide	YES/NO
2)	The decomposition of vegetable matter into compost	YES/NO

FRAMEWORK	CHARACTERISTICS
Competency	Evaluate and Design Scientific Enquiry
Knowledge-System	Knowledge of science-Physical System
Context	Global
Cognitive demand	Medium
Item format	Simple Multiple Choice
Proficiency level	2

Credit Pattern:

Full Credit: 02
Partial Credit : 01
Nil Credit: 0
Answer key:

Q 5.1) Full Credit: By touching the beaker. Beaker is hot as this reaction is exothermic.

Nil Credit: Other responses or missing

Q 5.2) Full Credit: A

Nil Credit: Other responses or missing

Q 5.3) Full Credit: Reaction 1: Endothermic reaction

Reaction 2 : Endothermic reaction

Nil Credit: Other responses or missing

Q 5.4) Full Credit: C

Nil Credit: Other responses or missing

Q 5.5) Full Credit: 1) YES

2) NO

Nil Credit: Other responses or missing

S.NO.	NAME OF THE TEACHERS	TOPICS ALLOTED
1	Ms. ADITI YADAV ,	- Types of Chemical Reaction
	PGT (BIO)	- Combination Reaction
	TEST ITEM 1-5	- Decomposition Reaction
		- Displacement Reaction
		- Double Displacement reaction

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TEST ITEM -6

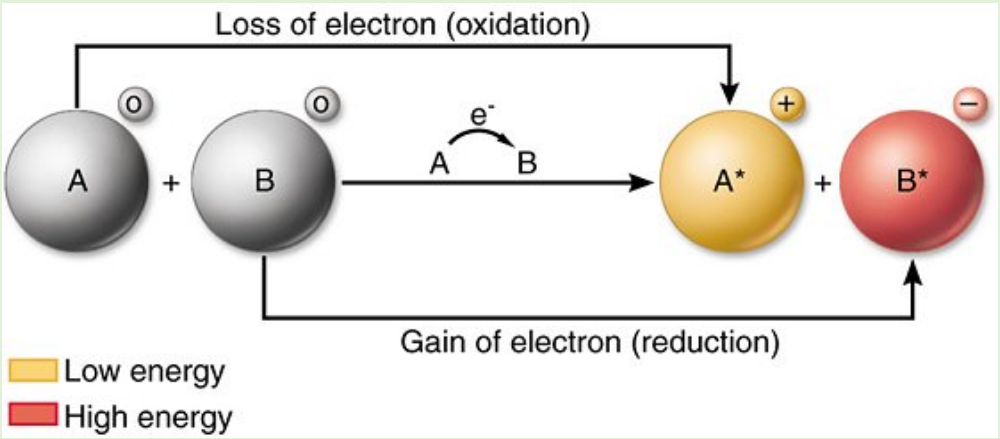
Template for preparation Items for Scientific Literacy

Domain: Scientific Literacy	**Theme: Redox reaction**	**Class(es):X**
		Expected time:10 min
		Total Credit: 08

Description of Item:		**Learning Outcome: (As per NCERT)**
YES	Text	(i) Applies learning of scientific concepts in day-to-day life (ii) Interprets and study data (iii) Conducts simple investigations to seek answers to queries
Yes	Image	
No	Table	
No	Graph	
No	Map	

WHAT IS A REDOX REACTION?

The redox reaction is basically the contract~~ion~~ of reduction oxidation reaction. This type of reaction consists of a reduction and an oxidation that is coupled so that the oxidation part releases the electrons to be used in the reduction part. Therefore, all reactions that change the oxidation numbers are therefore redox reactions.



The two species that exchange electrons in a redox reaction are given special names. The ion or molecule that accepts electrons is called the oxidizing agent; by accepting electrons it causes the oxidation of another species. Conversely, the species that donates electrons is called the reducing agent; when the reaction occurs, it reduces the other species. In other words, what is oxidized is the reducing agent and what is reduced is the oxidizing agent.

A good example of a redox reaction is the thermite reaction, in which iron atoms in ferric oxide lose (or give up) O atoms to Al atoms, producing Al_2O_3.

$Fe_2O_3(s) + 2Al(s) \rightarrow Al_2O_3(s) + 2Fe(l)$

Redox reactions can occur relatively slowly, as in the formation of rust, or much more rapidly, as in the case of burning fuel. There are simple redox processes, such as the oxidation of carbon to yield carbon dioxide (CO_2) or the reduction of carbon by hydrogen to yield methane (CH_4), and more complex processes such as the oxidation of glucose ($C_6H_{12}O_6$) in the human body.

1.1 FRAMEWORK	**CHARACTERISTICS**
Competency	Evaluating and designing Scientific Enquiry
Knowledge System	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	Medium
Item format	Simple multiple choice
Proficiency level	½

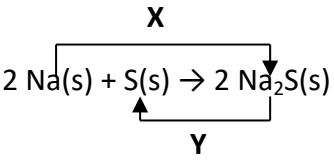
Q6.1 A substance which oxidizes itself and reduces other is known as

a) Oxidizing agent
b) Reducing agent
c) Both of these
d) None of these

FRAMEWORK	**CHARACTERISTICS**
Competency	Explain phenomenon Scientifically
Knowledge System	Knowledge of science-physical Systems
Context	Global
Cognitive demand	high
Item format	Complex multiple choice
Proficiency level	5

Q 6.2

Which of the following is correct code for X and Y in the following reaction



(i) x = oxidation reaction, y = reduction reaction
(ii) x = gain of two electrons, y = loss of two electrons,
(iii) x = reduction reaction, y = oxidation reaction
(iv) x = loss of two electrons, y = gain of two electrons

a. (i)and(ii)
b. (i)and(iv)
c. (ii) and (iii)
d. (iii) and (iv)

FRAMEWORK	CHARACTERISTICS
Competency	Explain phenomenon Scientifically
Knowledge System	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	high
Item format	Open constructed response
Proficiency level	5

Q 6.3

'Thermite is a pyrotechnic composition of metal powder, which serves as fuel, and metal oxide. When ignited by heat, thermite undergoes an exothermic reduction-oxidation reaction. Most varieties are not explosive, but can create brief bursts of heat and high temperature in a small area'

Using the information given above, state why thermite reaction is used for welding of railway tracks?

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence Scientifically
Knowledge System	physical Systems
Context	Global
Cognitive demand	medium
Item format	Open constructed response
Proficiency level	4

Q 6.4

"**Redox reactions can occur relatively slowly, as in the formation of rust, or much more rapidly, as in the case of burning fuel"**

Describe possible difference in the two areas(rusting and combustion) that would make you think that the given statement is correct or not.

ANSWERS

SCIENCE PASSAGE –REDOX REACTION

SCORING Q6.1

Full credit: Reducing agent

No credit: Other responses and missing

SCORING Q 6.2

Full credit: option B) (i)and(iv)

No credit: Other responses and missing

SCORING Q6.3

Full credit: A strongly exothermic (heat-generating) reaction occurs that via reduction and oxidation produces a white hot mass of molten iron and a slag of refractory aluminium oxide. That is the reason why thermite welding is widely used to weld railway tracks.

Partial credit: answer without explanation

No credit: Other responses and missing

SCORING Q 6.4

Full credit: Iron does not react vigourously under the impact of air, but an orange coating of iron(III) hydroxide slowly forms on its surface (when the hydroxide is dehydrated, on the surface only iron oxide Fe_2O_3 remains, also as a product of slow oxidation). Any similar reaction which does not take place instantaneously, without strong heating or ignition, is classified as slow oxidation.

Partial credit: answer without explanation

No credit: Other responses and missing

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TEST ITEM -7

Template for preparation Items for Scientific Literacy

Domain: Scientific Literacy (Item -2)	**Theme: Redox reactions**	**Class(es):X**
		Expected time:10 min
		Total Credit: 08

Description of Item:		**Learning Outcome: (As per NCERT)**
YES	Text	(i) Applies learning of scientific concepts in day-to-day life (ii) Interprets and study data (iii) Conducts simple investigations to seek answers to queries
Yes	Image	
No	Table	
No	Graph	
No	Map	

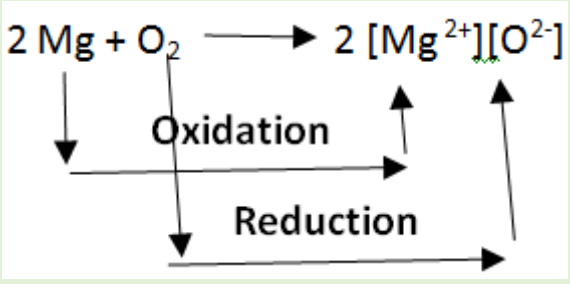
OXIDATION_ REDUCTION REACTIONS

A redox (or oxidation-reduction) reaction is a type of chemical reaction that involves a transfer of electrons between two species.

Oxidation meant gaining oxygen and Reduction meant losing oxygen.

Oxidation and Reduction reactions are always interlinked. Because electrons are neither created nor destroyed in a chemical reaction, oxidation and reduction always occur in pairs, it is impossible to have one without the other.

In the below reaction Magnesium gets oxidized by losing two electrons to oxygen which gets reduced by accepting two electrons from magnesium.



Since oxidation and reduction cannot occur individually, they as a whole are called 'Redox Reactions'. The reactant that oxidizes the other reactants is called as the Oxidizing agent and reactant that reduces is called Reducing agent..

FRAMEWORK	CHARACTERISTICS
Competency	Interpret Data and Evidence Scientifically
Knowledge System	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	Easy
Item format	Simple Multiple choice
Proficiency level	1

Q7.1

A reducing agent is a substance which can

(i) Accept electrons
(ii) Donate electrons
(iii) Accept protons
(iv) Donate protons

FRAMEWORK	CHARACTERISTICS
Competency	Interpret Data and Evidence Scientifically
Knowledge System	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	medium
Item format	Short response type
Proficiency level	3

Q 7.2

$2Fe_2O_3(s) + 3C(s) \rightarrow 4Fe(s) + 3CO_2(g)$

Is this reaction a redox reaction, and how do we know?

FRAMEWORK	CHARACTERISTICS
Competency	Explain phenomenon Scientifically
Knowledge System	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	medium
Item format	Simple Multiple choice
Proficiency level	3

Q7.3 Identify the correct statement (s) in relation to the following reaction:

$Zn + 2HCl \rightarrow ZnCl_2 + H_2$

(i) Zinc is acting as an oxidant
(ii) Chlorine is acting as a reductant
(iii) Hydrogen ion is acting as an reductant
(iv)Zinc is acting as a reductant

FRAMEWORK	CHARACTERISTICS
Competency	Evaluating and designing scientific ~~enuiry~~ enquiry
Knowledge System	Physical Systems
Context	Global
Cognitive demand	High
Item format	Binary choice type
Proficiency level	4

Q7.4 Combustion of octane, a hydrocarbon which is a component of gasoline, occurs in the engine of most cars.
The above statement is an example of Redox Reaction.Do you agree/ disagree with it ? Justify

ANSWERS

SCIENCE PASSAGE –OXIDATION-REDUCTION REACTIONS

SCORING Q7.1

Full credit: (ii) A substance which is capable of reducing other substances and is capable of **donating electrons** during reduction is called a reducing agent or reductant

No credit: Other responses and missing

SCORING Q 7.2

Full credit: Yes, this is probably a redox reaction, the oxidation numbers for carbon and iron are changing during the reaction from a transfer of electrons

Partial credit: answer (yes) without explanation

No credit: Other responses and missing

SCORING Q7.3

Full credit: (iv) Zinc is acting as a reductant

No credit: Other responses and missing

SCORING Q7.4

Full credit: combustion reaction is a redox reaction between a compound and molecular oxygen to form oxygen-containing products. When one of the reactants is a hydrocarbon, the products include carbon dioxide and water.

$2C_8H_{18} + 25\ O_2 \rightarrow 16\ CO_2 + 18\ H_2O$.

No credit: Other responses and missing

……

TEST ITEM -8

Template for preparation Items for Scientific Literacy

Domain: Scientific Literacy (Item -3)	**Theme: Corrosion**	**Class(es):X** **Expected time:10 min** **Total Credit:**

Description of Item:		**Learning Outcome: (As per NCERT)**
YES	Text	(i) Applies learning of scientific concepts in day-to-day life (ii) Interprets and study data (iii) Conducts simple investigations to seek answers to queries
Yes	Image	
No	Table	
No	Graph	
No	Map	

CORROSION

Following is a piece of information taken from an article written by K.L.V.S. Viswanadham .

RAIL: is the fundamental component of Rail Transit System

Expectation: to function reliably and continuously over decades.

What is the problem?

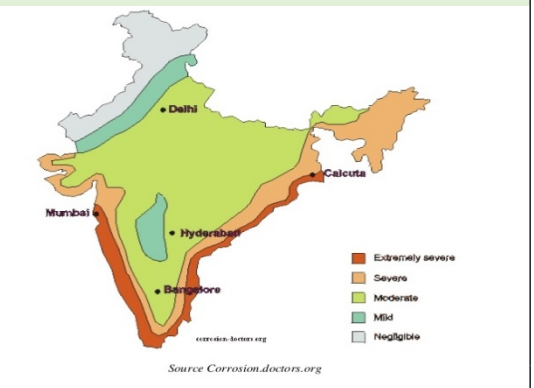
1. Saline atmosphere in salt laden coastal areas deteriorating the life of the rail due to corrosion.

2. Corrosion of rails causes huge economic loss because of frequent replacements.

3. As per analysis of IIT Kanpur, average annual loss due to premature rail replacements is about Rs. 440 cr.

4. Rail failures due to corrosion effects safety of trains and disturb normal traffic.

5. Rails laid near coastal regions are more prone for atmospheric corrosion and warranting more frequent replacement than rails in dry climate.



The following map describes corrosion patterns in India showing macroscopic differences between areas, with coastal regions being the most severe.

This map is prepared by Corrosion Advisory Bureau, Metals Research Committee (Council of Scientific and Industrial Research) Jamshedpur.

FRAMEWORK	CHARACTERISTICS
Competency	Interpret Data and Evidence Scientifically
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	Medium
Item format	Open constructed response
Proficiency level	4

Q8.1 Corrosion of rails has been recognized as one of the serious cause of damage railway track. It is observed that corrosion in rail tracks is more compared to coach and engine. What do you think is the probable reason?

_____

_____

FRAMEWORK	CHARACTERISTICS
Competency	Interpret Data and Evidence Scientifically
Knowledge System	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	Easy
Item format	Simple Multiple choice
Proficiency level	2

Q8.2

More frequent preventive measures are taken in humid areas by railways to reduce the damage. Which one of these do you think as the most effective action to prevent corrosion of tracks? Justify your preference.

a. By applying a paint of durable acrylic
b. By applying a protective zinc coating
c. By keeping the area around the metal surface dry

FRAMEWORK	CHARACTERISTICS
Competency	Explain phenomenon Scientifically
Knowledge System	Knowledge of science-Living Systems
Context	Global
Cognitive demand	Medium
Item format	Open constructed response
Proficiency level	4

Q8.3

There is an assumption that if a person gets a cut from rusted iron object, there is more chance of Tetanus, and therefore we should get a Tetanus injection although rust itself does not cause tetanus. Tetanus is a disease caused by a bacterium called Clostridium Tetanic.

Do you agree with the statement "if a person gets a cut from rusted iron object, there is more chance of Tetanus". Give justification for your agreement

_____

_____

FRAMEWORK	CHARACTERISTICS
Competency	Interpret Data and Evidence Scientifically
Knowledge System	Knowledge of science-Living Systems
Context	Global
Cognitive demand	Medium
Item format	Closed constructed response
Proficiency level	3

Q8.4

In attempt to replace a missing tooth, many materials have been tried as an implant. No metal or alloy is entirely inert in terms of corrosion. Material used for making implants is in direct exposure to fluid media or air.

Following are some of the material used for making dental implants.

Titanium alloys, Titanium, and ceramic .Arrange them in increasing order of their resistance power against corroding to be used as an implant

_____.

ANSWERS

SCIENCE PASSAGE -CORROSION

SCORING Q8.1

Full credit: More exposure to the atmosphere, Rails are thousands of km long

Partial credit: React with air , React with water

No credit: Other responses and missing

SCORING Q8.2

Full credit: option B . It is because coating Iron with Zinc is done once and it stays forever.

No credit: Other responses and missing

SCORING Q8.3
Full credit: favourable conditions for growth of bacteria
Partial credit: answer without explanation
No credit: Other responses and missing

SCORING Q8.4
Full credit: Titanium < Ti alloy < Ceramics
No credit: Other responses and missing

…….

TEST ITEM-9

Template for preparation Items for Scientific Literacy

Domain: Scientific Literacy (Item – 4)	**Theme: Corrosion**	**Class(es):X** **Expected time:10 min** **Total Credit: 08**

Description of Item:		**Learning Outcome: (As per NCERT)**
YES	Text	(i) Applies learning of scientific concepts in day-to-day life (ii) Interprets and study data (iii) Conducts simple investigations to seek answers to queries
Yes	Image	
No	Table	
No	Graph	
No	Map	

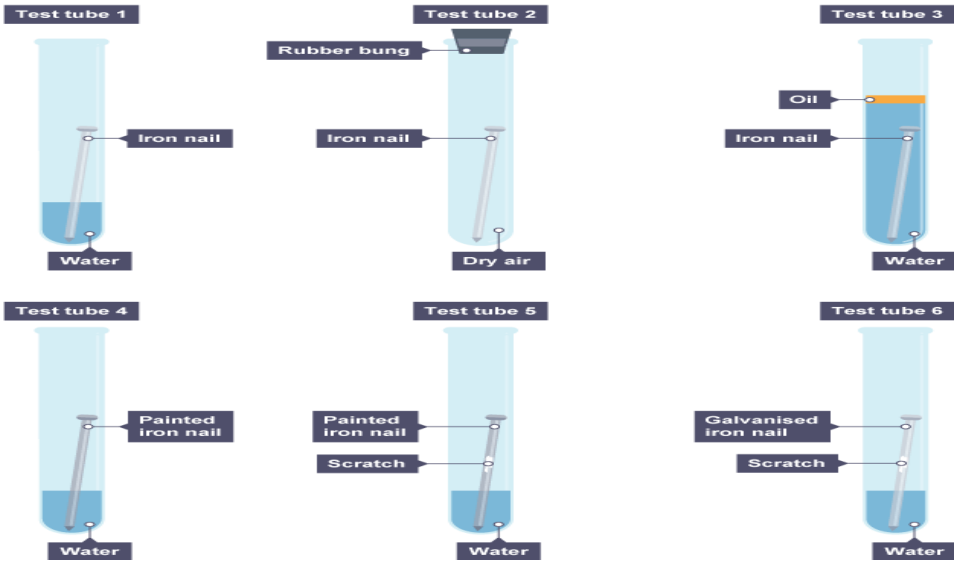
CORROSION

Corrosion is a spontaneous/ irreversible process wherein the metals turn into a much stable chemical compound like oxides, sulphides, hydroxides, etc. It is one of the most common phenomena that we observe in our daily lives. Besides, it has been noticed that metal objects covered with some orange-red-brown color pigment at some point in time. This is nothing but a chemical process known as rusting which is a part of corrosion.

The exposure of iron (or an alloy of iron) to oxygen in the presence of moisture leads to the formation of rust. This reaction is not instantaneous, it generally proceeds over a considerably large time frame. The oxygen atoms bond with iron atoms, resulting in the formation of iron oxides. This weakens the bonds between the iron atoms in the object/structure.

Shreya sets up six test tubes to investigate the rusting of iron. This is the method used for each test tube.

- Measure the mass of the nail using a balance.
- Leave the nail in the test tube for 6 days.
- Measure the mass of the nail after six days



FRAMEWORK	CHARACTERISTICS
Competency	Explaining phenomenon Scientifically
Knowledge System	Knowledge about science-Physical Systems
Context	Global
Cognitive demand	Medium
Item format	Short response type
Proficiency level	3

Q9.1 Six test tubes with the effects of rust on a nail

She observed that the nail in test tube 1 had a mass of 8.45 g at the beginning of the experiment and 8.91 g at the end of the experiment. What do you think is the possible reason behind it? **Justify.**

FRAMEWORK	CHARACTERISTICS
Competency	Interpret Data and Evidence Scientifically
Knowledge System	Knowledge about science-Physical Systems
Context	Global
Cognitive demand	Easy
Item format	Simple Multiple choice
Proficiency level	2

Q9.2

In which one of the test tube rusting is not observed?

(a) Test tube 4 and Test tube 6
(b) Test tube 2 and Test tube 3
(c) Test tube 1 and Test tube 4
(d) Test tube 5 and Test tube 2

FRAMEWORK	CHARACTERISTICS
Competency	Interpret Data and Evidence Scientifically
Knowledge System	Physical Systems
Context	Global
Cognitive demand	medium
Item format	Closed constructed response
Proficiency level	4

Q9.3

Ravi investigates the corrosion of two metals. He places strips of metals in some damp gases. Look at his results:

	Copper	Iron	Lead
Appearance at **start**	Shiny brown	Shiny silver	Shiny silver
Appearance after two weeks in damp **oxygen**	Green patches on surface	Orange-brown patches on surface	Dull and silvery
Appearance after two weeks in damp **acidic air**	Thick layer of green on surface	Lots of orange-brown flakes on surface	Black layer on surface
Appearance after two weeks in damp **nitrogen**	Shiny brown	Shiny silver	Shiny Silver

The student makes two conclusions:

- oxygen is needed for corrosion
- more corrosion happens in acidic air than in any other conditions

Explain whether the student is correct or not. Use evidence from the table in your answer

---

FRAMEWORK	CHARACTERISTICS
Competency	Explaining phenomenon Scientifically
Knowledge System	Knowledge about science-Physical Systems
Context	Global
Cognitive demand	Medium
Item format	Open constructed response
Proficiency level	4

Q9.4

Why do you think that cuts from rusted iron objects that pierce the skin can be dangerous? Is tetanus shot required in such case?

ANSWERS

SCIENCE PASSAGE -CORROSION AND RUSTING

SCORING Q9.1

Full credit: Rust is nothing but an oxidised form of iron. Thus, when the rust forms above the iron object, the mass of oxygen is added on with the mass of iron, and that is, the weight of the object is increased.

Partial credit: When iron rusts, the weight increases

No credit: Other responses and missing

SCORING Q9.2

Full credit: (b) Test tube 2 and Test tube 3

No credit: Other responses and missing

SCORING Q9.3

Full credit: Yes, because:

- none of the metals corrode in nitrogen or in the absence of oxygen or air
- all of the metals show more change in acidic air

Partial credit: answer without explanation

No credit: Other responses and missing

SCORING Q9.4

Full credit: Puncture wounds from objects like rusted nails and bites are most susceptible to infection with tetanus as it ~~is~~ may be infected with Clostridium tetani or the cut portion if remains exposed may come in contact with bacteria, Once the tetanus bacteria get into your tissues, it starts multiplying and the by products act as toxins. These toxins interfere with nerves, which leads to spasms, contractions, and respiratory failure.

Yes, tetanus shot is required

Partial credit : tetanus shot is required/ without explanation

No credit: Other responses and missing

…….

TEST ITEM -10

Template for preparation Items for Scientific Literacy

Domain: Scientific Literacy	**Theme: Rancidity in potato chips**	**Class(es):X** **Expected time:10 min** **Total Credit: 08**

Description of Item:		**Learning Outcome: (As per NCERT)**
YES	Text	(i) Applies learning of scientific concepts in day-to-day life (ii) Interprets and study data (iii) Conducts simple investigations to seek answers to queries
Yes	Image	
No	Table	
No	Graph	
No	Map	

OXIDATIVE RANCIDITY IN POTATO CHIPS

Like all food components, fats undergo deteriorative changes, which result in undesirable flavors and odors with time. These changes in fats are given the term "rancidity". Rancidity can be of two types, hydrolytic and oxidative. Hydrolytic rancidity is caused by a breakdown of the fat into glycerol and fatty acids. This is the type of rancidity that gives "rancid" butter its bad flavor.

Oxidative rancidity results from oxidation of unsaturated and polyunsaturated fatty acids. The products of these reactions produce undesirable flavors and odors. These flavors sometimes develop in foods such as peanut better, potato chips, and crackers. Manufacturers are permitted to add antioxidants to some foods to slow down this oxidative deterioration. The antioxidants normally used are butylated hydroxyanisole (BHA), butylated hydroxytoluene (BHT), tertiary butyl hydroquinone (TBHQ), and propyl gallate (propyl 3,4,5-trihydroxybenzoate). You may see these terms on the labels of some foods. The antioxidant slowly diffuses into the packaged food product during storage, thus protecting the snack. Another means of slowing down oxidation is to package the food so that it is protected from light, moisture, and oxygen, three things that accelerate oxidation.

(source: IFT Experiments in Food Science Series)

Q10.1

Nida wraps a canning jar with aluminium foil so that no light can enter the container. Fresh potato chips were placed in the foil-wrapped jar and in a similar clear jar without foil around it. After 2 days, she taste the potato chips from both jars and found difference in taste.

What do you think is the purpose behind performing this activity?

_____.

FRAMEWORK	**CHARACTERISTICS**
Competency	Evaluating and designing scientific enquiry
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	Medium
Item format	Open constructed response
Proficiency level	4

Q10.2

Now she keeps the two jars on a window sill where they will be exposed to sunlight and turn each jar one-quarter turn each day (every 24 hours).
She taste potato chips from each jar at intervals of 1-2 days for 1-2 weeks.

Why did wrapping the jar in aluminum foil affect the flavor of the stored potato chips?

_____
_____

FRAMEWORK	**CHARACTERISTICS**
Competency	Explaining phenomenon Scientifically
Knowledge system	Knowledge about science-Physical Systems
Context	Global
Cognitive demand	Medium
Item format	closed constructed response
Proficiency level	4

Q10.3

-Which one of the following factors does not affect oxidative rancidity?

a. enzymes,
b. oxygen,
c. temperature,
d. ultra-violet light.

FRAMEWORK	CHARACTERISTICS
Competency	Interpret Data and Evidence Scientifically
Knowledge system	Knowledge about science-Physical Systems
Context	Global
Cognitive demand	Medium
Item format	Simple multiple choice
Proficiency level	½

Q10.4

All the methods mentioned below can be used to prevent the food from getting rancid except:

i. Storing the food in the air-tight containers
ii. Storing the food in refrigerator
iii. Keeping the food in clean and covered containers
iv. Always touching the food with clean hands

a. (i) and (ii)
b. (i) and (iii)
c. (i), (iii) and (iv)
d. (iii) and (iv)

FRAMEWORK	CHARACTERISTICS
Competency	Interpret Data and Evidence Scientifically
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	High
Item format	Complex multiple Choice
Proficiency level	5

Q10.5

Observe the figure carefully and draw inference from it. What scientific phenomenon is shown through this picture?

_____
_____
_____
_____

FRAMEWORK	CHARACTERISTICS
Competency	Explaining phenomenon Scientifically
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	Medium
Item format	Open constructed response
Proficiency level	4

ANSWERS

SCIENCE PASSAGE – OXIDATIVE RANCIDITY

SCORING Q10.1

Full credit: 1. The purpose of this experiment is to demonstrate typical off-flavours in fat caused by oxidative rancidity and to study one of the factors that causes lipid oxidation

Partial credit: to check off flavour of chips

No credit: Other responses and missing

SCORING Q10.2

Full credit: Wrapping the jar in aluminum protects the potato chips from ultraviolet (UV) light and thus allows them to retain their desirable flavor and not oxidize. In the clear jar, the UV light causes lipid oxidation, which caused the off-flavors.

Partial credit: incomplete answer without explanation

No credit: Other responses and missing

SCORING Q10.3

Full credit: **A**- Enzymes

No credit: Other responses and missing

SCORING Q10.4

Full credit: **d**. (iii) and (iv)
No credit: Other responses and missing

SCORING Q10.5
Full credit: To inflate non reactive gas in the packet, to prevent rancidity
No credit: Other responses and missing

S.NO.	NAME OF THE TEACHERS	TOPICS ALLOTED
1	Ms. TRIPTI SHARMA ,	- Type of Chemical Reaction Oxidation and Reduction
	TGT (SCIENCE)	- Effect of Oxidation and Reduction
	TEST ITEM 6-10	- Corrosion and Rancidity

…….

TEST ITEM-11

Template for preparation Items for Scientific Literacy

Domain: Scientific Literacy	**Theme: Chemical reactions**	**Class(es):X** **Expected time:10 min** **Total Credit: 08**
Description of Item: YES – Text No – Image No – Table No – Graph No – Map	**Learning Outcome: (As per NCERT)** (i) Applies learning of scientific concepts in day-to-day life (ii) Interprets and study data (iii) Conducts simple investigations to seek answers to queries	

THE BOUNCING EGG

Q11.1

While preparing a bouncy egg Rohit found some bubbles sticking to the surface of the egg. Which of the following statements can explain the appearance of bubbles on the surface of the egg.

a) The bubbles can appear due to the evolution of carbon dioxide gas
b) The bubbles may appear due to ~~to~~ the release of hydrogen gas
c) The bubbles may appear due to evaporation of water
d) None of these can be a possible explanation.

FRAMEWORK	CHARACTERISTIC
Competency	Explain phenomenon scientifically
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	LOW
Item format	Simple Multiple choice
Proficiency level	2

Q11.2

Write any one observation that Rohit might have made other than Bubbles while conducting the experiment.

_____

_____

FRAMEWORK	CHARACTERISTIC
Competency	Evaluate and design scientific inquiry
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	High
Item format	Open constructive response
Proficiency level	~~5~~ 4

Q11.3

The experiment can be explained by the following chemical reaction

Calcium carbonate react with **acetic acid** to produce **calcium** acetate, water and carbon dioxide.Represent it with a balanced chemical equation

_____

FRAMEWORK	CHARACTERISTIC
Competency	Interpret data and evidence scientifically
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	Medium
Item format	Closed constructive response
Proficiency level	4

Q11.4

In the experiment there are two reactants, acetic acid and calcium carbonate. From where do these two ingredients might have come from? Are these statements give possible explanations for the same. Circle yes / no

Explanations	Yes / no
a) acetic acid came from highlighter while calcium carbonate from egg shell	Yes/ No
b) calcium carbonate came from egg shell while acetic acid from vinegar	Yes/ No

FRAMEWORK	CHARACTERISTIC
Competency	Design scientific inquiry
Knowledge system	Physical Systems
Context	Global
Cognitive demand	Medium
Item format	Complex multiple Choice
Proficiency level	4

ANSWERS

SCIENCE PASSAGE – THE bouncing egg

SCORING Q11.1

Full credit: A option

No credit: Other responses and missing

SCORINGQ1 1.2

Full credit: ONE OF THE FOLLOWING-

a) egg become larger

b) egg starts to float

c) egg gains color

or any other possible observation

No credit: Other responses and missing

SCORING Q11.3

Full credit: - $CaCO_3 + 2CH_3COOH \rightarrow Ca(CH_3COO)_2 + H_2O + CO_2$

Partial credit : Correct unbalanced equation

No credit: Other responses and missing

SCORING Q11.4

Full credit: a) no b) yes

No credit: Other responses and missing

…….

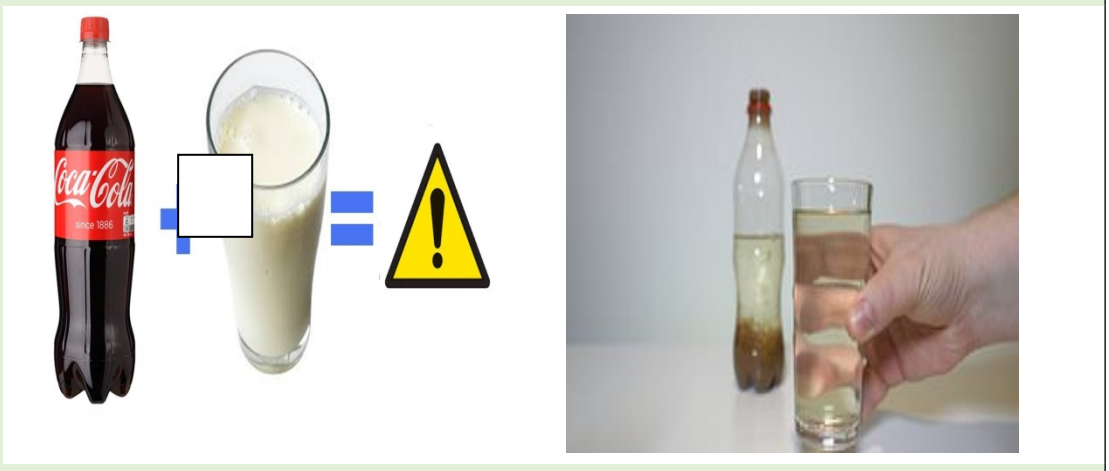
TEST ITEM 12

Template for preparation Items for Scientific Literacy (ITEM-2)

<table>
<tr><td>Domain: Scientific Literacy</td><td>Theme: Chemical reactions-
Cola milkshake</td><td>Class(es): X
Expected time:10 min
Total Credit: 08</td></tr>
<tr><td colspan="2">Description of Item:
<table><tr><td>YES</td><td>Text</td></tr><tr><td>No</td><td>Image</td></tr><tr><td>No</td><td>Table</td></tr><tr><td>No</td><td>Graph</td></tr><tr><td>No</td><td>Map</td></tr></table></td><td>Learning Outcome: (As per NCERT)
(i) Applies learning of scientific concepts in day-to-day life
(ii) Interprets and study data
(iii) Conducts simple investigations to seek answers to queries</td></tr>
</table>

COLA MILKSHAKE

Most soft drinks contain high content of phosphoric acid. Studies suggest that because of high amount of phosphoric acid in most soft drinks, they increase the likelihood that a person will develop osteoporosis if they are not getting enough calcium in their diet. That is why one should not drink such soft drinks.



The figure shows an experiment how fizzy drink is turned completely clear when milk is added. The effect is created by a chemical reaction between phosphoric acid in coke and calcium in milk. Calcium reacts with phosphoric acid to form molecular hydrogen and tricalcium phosphate. The drink loses its phosphoric acid to form tricalcium phosphate, a solid form of calcium which is taken as a supplement for bone development. Tricalcium phosphate attach to the milk proteins giving them more density and separate out while the remaining liquid that makes up milk and cola being lighter floats on the top.

(source: daily mail.co.uk)

Q12.1

Preeti was fascinated after studying this experiment and want to test the effect of concentration of cola and milk on the results. She added increasing amounts of cola to milk in three different glasses. Which of the following is most likely to happen if large amount of cola is mixed with small amounts of milk?

a) more milk proteins will settle down due to high amount of phosphoric acid.
b) proteins will not settle down as the amount of milk is less.
c) more milk proteins will settle down due to high amount of calcium
d) nothing will happen.

_____

FRAMEWORK	CHARACTERISTIC
Competency	Explain phenomenon scientifically
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	Medium
Item format	Simple Multiple choice
Proficiency level	2

Q12.2

In the text the effect is described as " by a chemical reaction between phosphoric acid in coke and calcium in milk". The reaction can be represented in the following way

Phosphoric acid + calcium → [a] + [b]

write the name of the substances a and b.

_____

_____

FRAMEWORK	CHARACTERISTIC
Competency	Explaining phenomenon Scientifically
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	Low
Item format	Short response
Proficiency level	2

Q12.3

Represent the reaction which took place during the experiment in the form of a balanced equation.

_____

FRAMEWORK	CHARACTERISTIC
Competency	Interpret data and evidence scientifically
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	Medium
Item format	Closed constructive response
Proficiency level	4

Q12.4 Two students studied this experiment and drew a conclusion based on the results of the experiment. Are their conclusions correct according to the information given in the text. Circle Yes/ No for each conclusion.

Are these conclusions correct? Circle yes or no for each	
a)Calcium in milk decreased the p H of the drink	Yes/ No
b) Cola milkshake is less harmful to our bones than cola	Yes/ No

FRAMEWORK	CHARACTERISTIC
Competency	Interpret Data and Evidence Scientifically
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	Medium
Item format	~~Complex~~ Simple multiple Choice
Proficiency level	3

ANSWERS

SCIENCE PASSAGE – COLA MILKSHAKE

SCORING Q12.1

Full credit: A Option

No credit: Other responses and missing

SCORING Q12.2

Full credit: a and b are tricalcium phosphate and hydrogen

Partial credit: either tricalcium phosphate and hydrogen

No credit: Other responses and missing

SCORING Q12.3

Full credit: - $3Ca + 2H_3PO_4 \rightarrow 3H_2 + Ca_3(PO_4)_2$

No credit: Other responses and missing

SCORING Q12.4

Full credit: a) no b) yes

No credit: Other responses and missing

……..

TEST ITEM 13

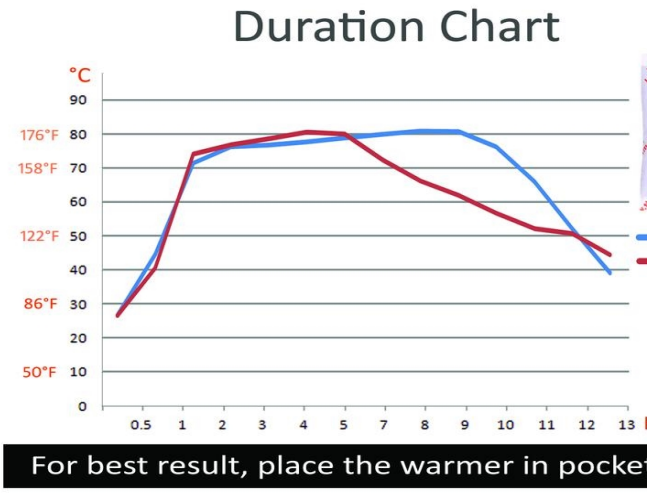
Template for preparation Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific Literacy</td><td>Theme: Chemical reactions-
Instant hot packs</td><td>Class(es): X
Expected time:10 min
Total Credit: 08</td></tr>
<tr><td colspan="2">Description of Item:
<table><tr><td>YES</td><td>Text</td></tr><tr><td>Yes</td><td>Image</td></tr><tr><td>No</td><td>Table</td></tr><tr><td>Yes</td><td>Graph</td></tr><tr><td>No</td><td>Map</td></tr></table></td><td>Learning Outcome: (As per NCERT)
(i) Applies learning of scientific concepts in day-to-day life
(ii) Interprets and study data
(iii) Conducts simple investigations to seek answers to queries</td></tr>
</table>

INSTANT HOT PACKS

Hot packs take advantage of chemical reactions that produce heat it as they progress. One of the simplest forms that comes in a pouch which typically contains iron powder, salt, water, an absorbent material and activated carbon. When the pouch is removed from its outer packaging oxygen drifts across the pouch's permeable covering. With salt and water present the oxygen reacts with iron powder located inside to form iron oxide and release heat. To lengthen the time a hand warmer lasts some companies opt different strategies. If you vary the raw materials in the warmer you can change how quickly the reaction happens or how much of the warmer (material) is reacted at one time. Example: the greater the surface area of iron the more it can react with oxygen to produce heat.

Q13.1



The graph shows the temperature maintenance of hot packs of 2 different companies A (BLUE) and B (RED) with time.
Which of the following statements cannot be concluded from the graph

A) Hot packs of company B releases more heat initially.
B) The reaction in B is exothermic for first six hours and then endothermic.
C) Hot pack of company A releases heat for a longer duration.

FRAMEWORK	CHARACTERISTIC
Competency	Interpret data scientifically
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	Medium
Item format	Simple Multiple choice
Proficiency level	4

Q13.2

In the hot pack iron and oxygen reacts to form iron oxide along with the release of heat. Can this reaction be used in a cold pack? Give one reason in support of your answer.

_____

_____

FRAMEWORK	CHARACTERISTIC
Competency	Evaluate and design scientific inquiry
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	High
Item format	Open constructive response
Proficiency level	4

Q13.3

Rohita tried to prepare a hot pack at home by following instructions from a site but she forgot to prepare fine powder of iron. Instead she used iron fillings. Will this effect the heat released from the hot pack? Explain with reason.

_____

_____

FRAMEWORK	CHARACTERISTIC
Competency	Interpret data and evidence scientifically
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	High
Item format	Closed constructive response
Proficiency level	5

Q13.4.

Whether the following reactions happen in the hot pack explained in the text. Circle yes or no for each reaction

Reactions	Yes / no
a) 4 Fe (s) + 3 O_2 → 2 Fe_2O_3 (s)	Yes/ No
b) Fe + H_2O → FeO + H_2	Yes/ No

FRAMEWORK	CHARACTERISTIC
Competency	Explain phenomenon scientifically
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	Medium
Item format	Simple multiple Choice
Proficiency level	3

ANSWERS

SCIENCE PASSAGE – instant hot packs

SCORING Q13.1

Full credit: B option

No credit: Other responses and missing

SCORING Q13.2

Full credit: no, because a cold pack uses an endothermic reaction

No credit: Other responses and missing

SCORING Q13.3

Full credit: - yes it will effect the heat released due to less surface area

Partial credit : yes without explanation

No credit: Other responses and missing

SCORING Q13.4

Full credit: a) yes b) no

No credit: Other responses and missing

…….

TEST ITEM -14

Template for preparation Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific Literacy</td><td>Theme: Chemical reactions-
Home made bread</td><td>Class(es): X
Expected time:10 min
Total Credit: 08</td></tr>
<tr><td colspan="2">Description of Item:
<table><tr><td>YES</td><td>Text</td></tr><tr><td>Yes</td><td>Image</td></tr><tr><td>No</td><td>Table</td></tr><tr><td>No</td><td>Graph</td></tr><tr><td>No</td><td>Map</td></tr></table></td><td>Learning Outcome: (As per NCERT)
(i) Applies learning of scientific concepts in day-to-day life
(ii) Interprets and study data
(iii) Conducts simple investigations to seek answers to queries</td></tr>
</table>

THE SECRET TO HOME MADE BREAD WITHOUT KNEADING

Yeast needs three things to thrive: food, warmth and moisture. In the presence of warmth and moisture, yeast converts its food sugar and starch into carbon dioxide and alcohol through fermentation. It is carbon dioxide that makes the bread rise.

In this recipe, dry yeast is actively stirred together with flour, milk, sugar and melted butter- the combination of three things yeast love most. After adding salt, we cover it and put in the fridge for 8 hours or overnight. Put the dough in a pan and let the dough rest in a warm place until it has risen.

Kneading is an essential part of bread making. It develops gluten in the dough which is necessary for elastic texture of bread. But this recipe is special. The proteins are broken down so much that even small actions can develop gluten

Q14.1

During the process of bread making heat energy is released. Such reactions are called exothermic reactions. During an exothermic reaction

a) More energy is required to make the chemical bonds than to break them.
b) More energy is required to break the chemical bond then to make them
c) No energy is required
d) None of the above

FRAMEWORK	CHARACTERISTIC
Competency	Explain phenomenon scientifically
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	Medium
Item format	Simple Multiple choice
Proficiency level	3

Q14.2

Refer to the lines from the text “let the dough rest in a warm place”. A cook forgot to keep the dough in a warm place. Explain the possible result/ results he would have obtained.

_____

_____

FRAMEWORK	CHARACTERISTIC
Competency	Evaluate and design scientific inquiry
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	high
Item format	Open constructive response
Proficiency level	5

Q14.3

Represent the conversion of sugar that is glucose into alcohol and carbon dioxide with the help of a balanced chemical equation

_____

FRAMEWORK	CHARACTERISTIC
Competency	Interpret data and evidence scientifically
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	high
Item format	Closed constructive response
Proficiency level	5

Q14.4

In the dough yeast help to transform starch and sugar in the flour. A chemical reaction occurs during which carbon dioxide and alcohol form. Where do the carbon atoms that are present in carbon dioxide and alcohol come from? Circle yes or no for each of the possible explanations.

Explanations	Yes / no
a) some carbon atoms come from sugars	Yes/ No
b) some carbon atoms come from the water	Yes/ No

FRAMEWORK	CHARACTERISTIC
Competency	Design scientific inquiry
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	Medium
Item format	Complex multiple Choice
Proficiency level	4

ANSWERS

SCIENCE PASSAGE – THE SECRET TO HOME MADE BREAD WITHOUT KNEADING

SCORING Q14.1

Full credit: (a) option

No credit: Other responses and missing

SCORING Q14.2

Full credit: the cook might get unrisen dough/ no proper dough formation due to incomplete fermentation

No credit: Other responses and missing

SCORING Q14.3

Full credit: - $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$

No credit: Other responses and missing

SCORING Q14.4

Full credit: a) yes b) no

No credit: Other responses and missing

…….

TEST ITEM-15

Template for preparation Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific Literacy</td><td>Theme: Chemical reactions-
Writing a chemical reaction</td><td>Class(es): X
Expected time:10 min
Total Credit: 08</td></tr>
<tr><td colspan="2">Description of Item:
<table><tr><td>YES</td><td>Text</td></tr><tr><td>Yes</td><td>Image</td></tr><tr><td>No</td><td>Table</td></tr><tr><td>No</td><td>Graph</td></tr><tr><td>No</td><td>Map</td></tr></table></td><td>Learning Outcome: (As per NCERT)
(i) Applies learning of scientific concepts in day-to-day life
(ii) Interprets and study data
(iii) Conducts simple investigations to seek answers to queries</td></tr>
</table>

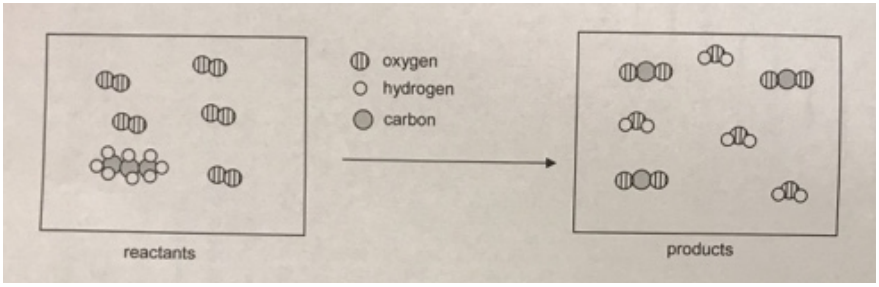
WRITING CHEMICAL EQUATION

A **chemical equation** is the symbolic representation of a chemical reaction in the form of symbols and formulae, wherein the reactant entities are given on the left-hand side and the product entities on the right-hand side. The coefficients next to the symbols and formulae of entities are the absolute values of the stoichiometric numbers. The first chemical equation was diagrammed by Jean Beguin in 1615

A chemical equation consists of the chemical formulas of the reactants (the starting substances) and the chemical formula of the products (substances formed in the chemical reaction). The two are separated by an arrow symbol and each individual substance's chemical formula is separated from others by a plus sign.

Q15.1

For writing chemical equation, understanding molecular interactions is important. Write a balanced chemical equation represented in the figure



FRAMEWORK	CHARACTERISTIC
Competency	Evaluate and design scientific enquiry
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	high
Item format	Closed constructive response
Proficiency level	5

Q15.2

It is important to balance a chemical equation. Which of the following statements can be a strong evidence for it.

a) the reactants and products are always equal
b) to follow law of conservation of mass
c) to follow law of definite proportions
d) both b and c

FRAMEWORK	CHARACTERISTIC
Competency	Explaining phenomenon Scientifically
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	low
Item format	Simple multiple choice
Proficiency level	2

Q15.3

Priya has formulated a balanced chemical equation for the following reaction.
Hydrogen gas reacts with nitrogen gas to form ammonia gas.

$$3H_2 + N_2 \rightarrow 2\ NH_3$$

She has missed out an important aspect of a balanced chemical equation. Correct and write the equation including that aspect.

_____

FRAMEWORK	CHARACTERISTIC
Competency	Design scientific inquiry
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	Medium
Item format	Closed constructive response
Proficiency level	3

Q15.4

Can there be an equation with only one reactant and more than one products? Support your answer with example. If not possible, give reason for it.

_____

_____

FRAMEWORK	CHARACTERISTIC
Competency	Interpret Data and Evidence Scientifically
Knowledge system	Knowledge of science-Physical Systems
Context	Global
Cognitive demand	Medium
Item format	Open constructed response
Proficiency level	4

ANSWERS

SCIENCE PASSAGE – writing chemical equation

SCORING Q15.1

Full credit: $C_3H_8 + 5\ O_2 \rightarrow 3\ CO_2 + 4\ H_2O$

No credit: Other responses and missing

SCORING Q15.2

Full credit: Option b

No credit: Other responses and missing

SCORING Q15.3

Full credit: - Writing physical states

$3H_{2\,(g)} + N_{2(g)} \rightarrow 2\ NH_{3(g)}$

No credit: Other responses and missing

SCORING Q15.4

Full credit: Yes , these are called decomposition reactions . Any one example

No credit: Other responses and missing

……..

S.NO.	NAME OF THE TEACHERS	TOPICS ALLOTED
1	Mrs. RICHA GILL , TGT (SCIENCE) TEST ITEM 11-15	- Chemical Reaction - Writing a chemical Reaction - Balanced Chemical reaction

CRITICAL AND CREATIVE THINKING TEST ITEMS

CLASS X SUB: SCIENCE

CH-2 ACIDS BASES AND SALTS

INDEX

TEST ITEM -1
SOIL pH- IS IT WHAT MAKES A HEALTHY SOIL?

What it is: Soil pH generally refers to the degree of soil acidity or alkalinity. Chemically, it is defined as the log10 hydrogen ions (H+) in the soil solution. The pH scale ranges from 0 to 14; a pH of 7 is considered neutral. If pH values are greater than 7, the solution is considered basic or alkaline; if they are below 7, the solution is acidic. It is important to recognize that because the pH scale is in logarithmic units, a change of just a few pH units can induce significant changes in the chemical environment and sensitive biological processes. For example, a soil with pH 5 is 10 or 100 times more acidic than a soil with pH 6 or 7, respectively. Sources of H+ ions in soil solution include carbonic acid produced when carbon dioxide (CO_2) from decomposing organic matter, root respiration, and the soil atmosphere is dissolved in the soil water. Other sources of H+ ions are root release, reaction of aluminum ions (Al+3) with water, nitrification of ammonium from fertilizers and organic matter mineralization, reaction of sulfur compounds, rainwater, and acid rain. Certain soils are more resistant to a drop or rise in pH (buffering capacity). Therefore, the lime requirement, which is the quantity of limestone ($CaCO_3$) required to raise the pH of an acid soil to a desired pH, must be determined specifically for each field before amending the soil.

Why it is important: Soil pH affects the soil's physical, chemical, and biological properties and processes, as well as plant growth. The nutrition, growth, and yields of most crops decrease where pH is low and increase as pH rises to an optimum level (see table 1).

Table 1. Relative yield of selected crops grown in a corn, small grain, legumes or timothy rotation at different pH levels. (adapted from Smith and Doran 1996)

	pH				
	4.7	5.0	5.7	6.8	7.5
Crop	Relative Average Yield				
Corn	34	73	83	100	85
Wheat	68	78	89	100	99
Oats	77	93	99	98	100
Barley	0	23	80	95	100
Alfalfa	2	9	42	100	100

Soybean	65	79	80	100	93
Timothy	31	47	66	100	95

Many crops grow best if pH is close to neutral (pH 6 to 7.5) although a few crops prefer acid or alkaline soils. In acid soils, calcium and magnesium, nitrate-nitrogen, phosphorus, boron, and molybdenum are deficient, whereas aluminum and manganese are abundant, sometimes at levels toxic to some plants. Phosphorus, iron, copper, zinc, and boron are frequently deficient in very alkaline soils. Bacterial populations and activity decline at low pH levels, whereas fungi adapt to a large range of pH (acidic and alkaline). Most microorganisms have an optimum pH range for survival and function .

Q1.1

A substance which is neither acidic nor basic will have a pH value-
(a) 1 to 7
(b) 7 to 14
(c) 7
(d) None of these.

Template for preparation of Practice Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific Literacy</td><td>Topic/Chapter: soil pH. (Acids,Bases,Salts)</td><td>Class(es): X
Expected time:1 MIN
Total Credit:2</td></tr>
<tr><td>Description of Item:
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Can understand and evaluate the importance of pH for soil.
Understand and differentiate between acids, Bases and salts on the basis of pH</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Evaluate and design scientific enquiry
Knowledge-system	Procedural
Context	Local
Cognitive demand	low
Item format	Simple Multiple Choice
Proficiency level	2

Credit Pattern:

Full Credit:2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q1.1 Option c - Full credit. **Any other response- no credit** pH 7 is for neutral substance.

Question 1,2

Referring to the table, mention the crops which grow best in a slightly acidic soil.

……..

Template for preparation of Practice Items for Scientific Literacy

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(Acids,Bases,Salts)</td><td>Class(es): X
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Can understand and evaluate the importance of pH for soil.
Understand and differentiate between acids, Bases and salts on the basis of pH.
Understand the type of crop to be grown in different types of soil to get maximum yield.</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically.
Knowledge-system	Procedural, Epistemic
Context	Local
Cognitive demand	Medium
Item format	Open response
Proficiency level	3

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q1.2 Oats, Barley, Alfalfa- full credit **Any one or two of the above – partial credit** **Any other response- no credit**

Q1.3

What according to you, would be the ideal pH range for a soil to get the maximum yield with the largest variety of crop yield?

……..

Template for preparation of Practice Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific</td><td>Topic/Chapter: soil pH.
(Acids,Bases,Salts)</td><td>Class(es): X
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Can understand and evaluate the importance of pH for soil.
Understand and differentiate between acids, Bases and salts on the basis of pH.
Understand the type of crop to be grown in different types of soil to get maximum yield.
Understand the ideal pH for any soil for particular crop.</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically
Knowledge-system	Procedural
Context	Local
Cognitive demand	Medium
Item format	Open response
Proficiency level	4

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q1.3 pH of 6.8 is ideal.- full credit Slightly basic- partial credit Neutral soil- partial credit **Any other response- no credit**

Q1.4

Referring to the article, which minerals according to you would make the soil more Basic?

…….

Template for preparation of Practice Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific</td><td>Topic/Chapter: soil pH.
(Acids,Bases,Salts)</td><td>Class(es): X
Expected time:1 MIN
Total Credit:2</td></tr>
<tr><td>Description of Item:
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Can understand and evaluate the importance of pH for soil.
Understand and differentiate between acids, Bases and salts on the basis of pH.
Understand the factors which affect the soil pH</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically
Knowledge-system	Procedural, Epistemic
Context	Global
Cognitive demand	Medium
Item format	Open Response
Proficiency level	3

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q 1.4 calcium and magnesium, nitrate-nitrogen, phosphorus, boron, and molybdenum
- Full credit
Any one or two of the above – partial credit
Any other response – no credit

Q1.5 Suggest any one method to maintain the alkalinity of the soil.

……

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific	Topic/Chapter: soil pH. (Acids,Bases,Salts)	Class(es): X Expected time:1 MIN Total Credit:2
Description of Item: yes Text Image Yes Table Graph Map Poem	Learning Outcomes: Can understand and evaluate the importance of pH for soil. Understand and differentiate between acids, Bases and salts on the basis of pH. Understand the factors which affect the soil pH	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge-system	Procedural, Epistemic
Context	Global
Cognitive demand	High
Item format	open response
Proficiency level	5

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q1.5 the lime requirement, which is the quantity of limestone ($CaCO_3$) required to raise the pH of an acid soil to a desired pH – full credit Any other basic mineral mentioned- partial credit **Any other response- No credit**

Name of the Teacher/Item Writer: Arpan Soni

Designation: PGT (physics)

Email: arpanpioneer@gmail.com

Phone No.: 9993820924

Name of the Vidyalaya: KV OF Khamaria Jabalpur

KVS Region: Jabalpur

……..

TEST ITEM -2

DO MICROBIALS DEPEND ON ACIDS AND BASES?

The following data shows the study of the pH environment for the different microbial groups present in the soil.

Table 1: Maximum, minimum, and optimum pH values for microbial groups. (adapted from Smith and Doran 1996)

Microorganisms	Range	Optimum
Bacteria	5 – 9	7
Actinomycetes	6.5 - 9.5	8
Fungi	2 – 7	5
Blue green bacteria	6 – 9	> 7
Protozoa	5 – 8	> 7

At very acid or alkaline pH levels, organic matter mineralization is slowed down or stopped because of poor microbial activity linked to bacteria. Nitrification and nitrogen fixation are also inhibited by low pH. The mobility and degradation of herbicides and insecticides, and the solubility of heavy metals are pH dependent. The effects of soil pH on cation availability influence aggregate stability since multivalent cations, such as calcium ions, act as bridges between organic colloids and clays. Some diseases thrive when the soil is alkaline or acidic. Take-all, which is caused by the fungus Gaeumannomyces graminis, is favored by alkaline pH and infects wheat, barley, rye, and several grasses.

Specific problems that might be caused by poor function: Deficiencies of many nutrients, decline of microbial activity and crop yield, and deterioration of environmental conditions are associated with pH levels as discussed in the previous section.

Photo: Phosphorus deficiency in corn. Source: R.L. Croissant, Bugwood.org

What you can do: Liming, addition of organic residues rich in basic cations, and crop rotation to interrupt the acidifying effect of leguminous crops increase soil pH. Applying ammonium based fertilizers, urea, sulfur/ferrous sulfate, irrigating with acidifying fertilizers, or using acidifying residues (acid moss, pine needles, sawdust) decrease soil pH. Increasing organic matter increases buffering capacity.

Are plants and animals pH sensitive?

Our body works within the pH range of 7.0 to 7.8. Living organisms can survive only in a narrow range of pH change. When pH of rain water is less than 5.6, it is called acid rain. When acid rain flows into the rivers, it lowers the pH of the river water. The survival of aquatic life in such rivers becomes difficult.

Q2.1 Nitrogen fixation is worst affected if the soil is-

(a) Having low pH

(b) Having high pH

(c) Having zero pH

(d) Having pH equal to 7

Template for preparation of Practice Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific</td><td>Topic/Chapter: Do microbials depend on Acids and bases?

(Acids,Bases,Salts)</td><td>Class(es): X
Expected time:1 MIN
Total Credit:2</td></tr>
<tr><td>Description of Item:
<table><tr><td>yes</td><td>Text</td></tr><tr><td>yes</td><td>Image</td></tr><tr><td>Yes</td><td>Table</td></tr><tr><td></td><td>Graph</td></tr><tr><td></td><td>Map</td></tr><tr><td></td><td>Poem</td></tr></table></td><td colspan="2">Learning Outcomes:
Can understand and evaluate the importance of pH for microbials.</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Evaluate and design scientific enquiry
Knowledge-system	Procedural
Context	Local
Cognitive demand	low
Item format	Simple Multiple Choice
Proficiency level	2

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q2.1 Option (a) - Full credit. **Any other response- no credit**

Q2.2 When does rain water become acidic ?

Template for preparation of Practice Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific</td><td>Topic/Chapter: Do microbials depend on Acids and bases?

(Acids,Bases,Salts)</td><td>Class(es): X
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</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically.
Knowledge-system	Procedural, Epistemic
Context	Global
Cognitive demand	Medium
Item format	Open response
Proficiency level	3

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q2.2 When pH of rain water is less than 5.6, it is called acid rain. – full credit Rain having low pH – partial credit When quantity of oxides of Sulphur increases in rain water- partial credit. Any other response – no credit

Question 2.3

Which of the microorganism mentioned in table 1 works best in a basic medium?

Template for preparation of Practice Items for Scientific Literacy (2.3)

<table>
<tr><td>Domain: Scientific</td><td>Topic/Chapter: Do microbials depend on Acids and bases?

.(Acids,Bases,Salts)</td><td>Class(es): X
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Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically
Knowledge-system	Procedural, Epistemic
Context	Global
Cognitive demand	Medium
Item format	Open response
Proficiency level	4

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q2.3 Actinomycetes, Blue green bacteria, protozoa- full credit Any one or two names out of Actinomycetes, Blue green bacteria, protozoa - partial credit **Any other response- no credit**

Q2.4

What according to you would be the two consequences if the soil pH is lowered?

……

Template for preparation of Practice Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific</td><td>Topic/Chapter: Do microbials depend on Acids and bases?

(Acids,Bases,Salts)</td><td>Class(es): X
Expected time: 1.5 MIN
Total Credit:2</td></tr>
<tr><td>Description of Item:

<table><tr><td>yes</td><td>Text</td></tr><tr><td>yes</td><td>Image</td></tr><tr><td>Yes</td><td>Table</td></tr><tr><td></td><td>Graph</td></tr><tr><td></td><td>Map</td></tr><tr><td></td><td>Poem</td></tr></table></td><td colspan="2">Learning Outcomes:
Can understand and evaluate the importance of pH for microbials.</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically
Knowledge-system	Procedural, Epistemic
Context	Global
Cognitive demand	High
Item format	Open Response
Proficiency level	5

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q2.4 (i) deterioration of environmental conditions (ii) soil mineralization is hampered (iii) microbial growth is hampered (iv) Crop growth is affected adversely. Any two of the above responses including other relevant response **- Full credit** **Partial credit-1 correct response** **Any other response – no credit**

Q2.5

How is aquatic life in rivers affected if the pH of river water is lowered?

Template for preparation of Practice Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific</td><td>Topic/Chapter: Do microbials depend on Acids and bases?

(Acids,Bases,Salts)</td><td>Class(es): X
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Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge-system	Procedural, Epistemic
Context	Global
Cognitive demand	high
Item format	open response
Proficiency level	5

Credit Pattern: Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q 2.5 If pH of river water is lowered, it becomes a threat to aquatic life because the aquatic life can survive only in marginal range of pH. Most of aquatic plants and animals are adapted to survive only in neutral or slightly basic or acidic water. Moreover the oxygen dissolving capacity (solubility of gases) of water is also hampered when pH changes which directly affects aquatic life - Full credit Other similar answers – full credit **Any other response- No credit**

Name of the Teacher/Item Writer: Arpan Soni

Designation: PGT (physics)

Email: arpanpioneer@gmail.com

Phone No.: 9993820924

Name of the Vidyalaya: KV OF Khamaria Jabalpur

KVS Region: Jabalpur

……

TEST ITEM -3

pH IN OUR DIGESTIVE SYSTEM

It is very interesting to note that our stomach produces hydrochloric acid. It helps in the digestion of food without harming the stomach. During indigestion the stomach produces too much acid and this causes pain and irritation. To get rid of this pain, people use bases called antacids. These antacids neutralise the excess acid. Magnesium hydroxide (Milk of magnesia), a mild base, is often used for this purpose.

Digestion in the Stomach

by Howard F. Loomis Jr., D.C.

Digestion begins in the mouth. When you chew your food it is mixed with saliva, which not only supplies moisture but also the carbohydrate-digesting enzyme, amylase. When you eat raw food, its enzymes work with the salivary amylase to begin digestion.

Swallowing prevents food from remaining in the mouth long enough for any significant amount of digestion to occur. However, the food and salivary enzymes continue the digestion process until the secretion of stomach acid causes the pH to drop below 3.0, which is the activity range of plant enzymes. Before food arrives, the stomach normally has a pH between 5.0 and 6.0. In young and healthy adults it takes about 45 minutes before enough acid is generated to drop the pH to 3.0. This is because stomach acid is secreted into the stomach in response to the expansion of the stomach wall. During this time a considerable amount of digestive work can be accomplished if plant enzymes, either indigenous to the raw food ingested or from a supplemental source, are present. Unfortunately, the amount of time necessary to make stomach acid increases with age. Studies have proven that older adults often suffer from inadequate stomach acid levels.

There is a common misconception that enzymes are destroyed by stomach acid. Nothing could be further from the truth. Stomach acid does not digest protein. Rather, it activates an enzyme called pepsinogen which then becomes pepsin that is secreted by the stomach wall. This enzyme is only active within the pH range of 3.0 to 5.0 and requires the acid to maintain that pH. Pepsin is very specific in its action and is simply incapable of digesting food enzymes, which are very large molecules and are more than just protein.

More than seventy years ago, Olaf Bergeim conducted a series of experiments on salivary digestion at the Laboratory of Physiological Chemistry in the University of Illinois, College of Medicine in Chicago. He found that an average of 59-76% of ingested carbohydrates is digested within 15-30 minutes after a meal. He concluded that a very considerable degree of starch digestion may be brought about by saliva if food is chewed properly.

The pH within the stomach rarely, if ever, drops below 3.0. Pure stomach acid has a pH of 1.8 when it first enters the stomach, but is quickly diluted in the presence of food. Regardless, plant enzymes are not destroyed by the highly acidic environment of the stomach. They simply become dormant until reaching the higher pH levels in the small intestine, where they again become active and continue the digestive process. Once their digestive function in the gastrointestinal tract is completed, a large number of enzymes are absorbed through the gut wall into the bloodstream.

A lot of research remains to be done to determine the exact fate of these enzymes after they pass through the gut wall into blood. However, it is known that plant enzymes will pass from the body into the urine after they have completely lost their usefulness.

Q3.1 Give two examples of antacids consumed by us.

……

Template for preparation of Practice Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific</td><td>Topic/Chapter: pH in our digestive system
(Acids,Bases,Salts)</td><td>Class(es): X
Expected time:1 MIN
Total Credit:2</td></tr>
<tr><td>Description of Item:
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Can understand and evaluate the importance of pH in our digestive system.</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Evaluate and design scientific enquiry
Knowledge-system	Procedural
Context	Global
Cognitive demand	Low
Item format	Short response
Proficiency level	2

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Explain Expected answer and the respective credits **Q3.1** Any two antacids of - baking soda, calcium or magnesium carbonate salts, calcium or magnesium hydroxides, chalk powder, bananas, yogurt, green vegetables, etc - Full credit. Any other response- no credit

Q3.2

The pH of the stomach before having the food is _____, and after some time of having the food, it generally becomes around _____.

Template for preparation of Practice Items for Scientific Literacy (3.2)

<table>
<tr><td>Domain: Scientific</td><td>Topic/Chapter pH in our digestive system
(Acids,Bases,Salts)</td><td>Class(es): X
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Can understand and evaluate the importance of pH in our digestive system.</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically.
Knowledge-system	Procedural, Epistemic
Context	Local
Cognitive demand	Low
Item format	Short response
Proficiency level	2

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q3.2 (i) 5 to 6 (ii) 3 – Full credit **Any other response- no credit**

Q3.3

Which of the following has the lowest pH level?

(a) Saliva

(b) Stomach

(c) Intestine

(d) Blood stream

Template for preparation of Practice Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific</td><td>Topic/Chapter: pH in our digestive system.(Acids,Bases,Salts)</td><td>Class(es): X
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Can understand and evaluate the importance of pH in our digestive system.</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically
Knowledge-system	Procedural, Epistemic
Context	Local
Cognitive demand	Medium
Item format	Simple MCQ
Proficiency level	3

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Explain Expected answer and the respective credits
Q3.3 b - stomach- full credit
Any other response- no credit

Q 3.4

When does the stomach wall expand? What is the consequence of the expansion of the stomach wall?

Template for preparation of Practice Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific</td><td>Topic/Chapter: pH in our digestive system (Acids,Bases,Salts)</td><td>Class(es): X
Expected time: 1.5 MIN
Total Credit:2</td></tr>
<tr><td>Description of Item:
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Can understand and evaluate the importance of pH in our digestive system.</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically
Knowledge-system	Procedural, Epistemic
Context	Global
Cognitive demand	Medium
Item format	Closed constructed
Proficiency level	4

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q.3.4 (i) stomach expands when food arrives into it.
(ii) when stomach expands, it starts secreting acids for digestion of food**- Full credit**
Any other response – no credit

Q3.5

What according to you would happen if our stomach would stop secreting the acid? What would happen if stomach secretes excess acid?

Template for preparation of Practice Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific</td><td>Topic/Chapter: pH in our digestive system (Acids,Bases,Salts)</td><td>Class(es): X
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Can understand and evaluate the importance of pH in our digestive system.</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge-system	Procedural, Epistemic
Context	Global
Cognitive demand	high
Item format	open response
Proficiency level	5

Credit Pattern: Full Credit: o2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q3.5 (i) if stomach stops secreting acid, then the food will not be broken down into simpler molecules which are accepted by the body.
(ii) if stomach secretes excess acid, it will cause acidity in stomach leading to pain, heartburn, indigestion etc. – full credit for similar responses
Any other response- No credit

Name of the Teacher/Item Writer: Arpan Soni

Designation: PGT (physics)

Email: arpanpioneer@gmail.com

Phone No.: 9993820924

Name of the Vidyalaya: KV OF Khamaria Jabalpur

KVS Region: Jabalpur

……..

TEST ITEM -4

pH CHANGE AS THE CAUSE OF TOOTH DECAY

Tooth decay starts when the pH of the mouth is lower than 5.5. Tooth enamel, made up of calcium hydroxyapatite (a crystalline form of calcium phosphate) is the hardest substance in the body. It does not dissolve in water, but is corroded when the pH in the mouth is below 5.5. Bacteria present in the mouth produce acids by degradation of sugar and food particles remaining in the mouth after eating. The best way to prevent this is to clean the mouth after eating food. Using toothpastes, which are generally basic, for cleaning the teeth can neutralise the excess acid and prevent tooth decay.

You might have heard that the pH level in the body affects your health. Studies have shown that lower, or acidic, pH levels are associated with a greater risk of serious health conditions including type 2 diabetes, heart disease, and obesity. Studies have also shown that higher, or alkaline, pH levels are linked to improvements in memory and cognition, reduced pain, and lower risk of hypertension (high blood pressure), and stroke.

Another interesting link is pH levels and bone health. Extensive research has been conducted on the effects of pH on bone health, and studies have discovered that low-acid diets can help improve bone density. According to Dr. Sara Gottfried, the Journal of Nutrition published a study that stated that alkaline mineral waters can decrease bone resorption and even lower parathyroid hormone levels which regulate the release of calcium from bone.

An alkaline diet is one that incorporates foods that can increase the pH levels. Interestingly, an alkaline diet is associated with an increase in growth hormone which can burn fat, improve libido, and retain a general sense of well-being.

Maintaining a good pH balance in the mouth allows a healthy balance of good and bad bacteria. Many of the good bacteria in our mouth are harmless and some bacteria, known as probiotics, aid in the digestion of foods. Other good bacteria actually protect our teeth and gums.

Certain foods, such as sugary beverages, snacks, and some grains, increase the acidity in the mouth. The pH of the mouth can change dramatically with the types of

foods we eat. Foods that are highly acidic, like lemons, lowers the pH, while foods like melons increases the pH.

The saliva can help neutralize the acid, but eating acidic foods can increase the acidity of the saliva. If the pH takes a long time to neutralize in the mouth, it may give bad bacteria enough time to wreak havoc on the teeth and gums. Typically it may take a few minutes or a few hours for the pH to neutralize. An acidic mouth is an optimal environment for bad bacteria to grow, and if given the time and the ability, it can cause tooth decay.

Question 4.1 The pH of mouth is generally-

(a) Less than 7
(b) Greater than 7
(c) Equal to 7
(d) Cannot be determined.
……..

Template for preparation of Practice Items for Scientific Literacy

<table>
<tr>
<td>Domain: Scientific</td>
<td>Topic/Chapter: pH change as the cause of tooth decay
(Acids,Bases,Salts)</td>
<td>Class(es): X
Expected time:1 MIN
Total Credit:2</td>
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<td>Description of Item:
<table><tr><td>yes</td><td>Text</td></tr><tr><td></td><td>Image</td></tr><tr><td></td><td>Table</td></tr><tr><td></td><td>Graph</td></tr><tr><td></td><td>Map</td></tr><tr><td></td><td>Poem</td></tr></table></td>
<td colspan="2">Learning Outcomes:
Can understand and evaluate the importance of pH in our oral cavity and teeth.</td>
</tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Evaluate and design scientific enquiry
Knowledge-system	Procedural
Context	Global
Cognitive demand	Low
Item format	MCQ
Proficiency level	1

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q. 4.1 (a) less than 7- Full credit. Any other response- no credit

Q4.2 The hardest substance in the body has _____ and _____ elements as the major components.

……

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific	Topic/Chapter: **pH change as the cause of tooth decay** (Acids,Bases,Salts)	Class(es): X Expected time:1 MIN Total Credit:2
Description of Item: yes Text Image Table Graph Map Poem	Learning Outcomes: Can understand and evaluate the importance of pH in our oral cavity and teeth. Knowledge about the components of teeth.	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically.
Knowledge-system	Procedural
Context	Global
Cognitive demand	Medium
Item format	Short response
Proficiency level	3

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q4.2 Calcium and Phosphorus– Full credit Calcium, phosphorus and oxygen – Full credit Any one of Calcium, phosphorus and oxygen – partial credit Any other response- no credit

Q4.3 What according to you, could be the reason of not allowing the kids to eat plenty of chocolates?

……

Template for preparation of Practice Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific</td><td>Topic/Chapter: pH change as the cause of tooth decay
(Acids,Bases,Salts)</td><td>Class(es): X
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Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically
Knowledge-system	Epistemic
Context	Global
Cognitive demand	high
Item format	Closed constructed
Proficiency level	5

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q4.3 Sugary substances turn into acidic when reacted with saliva in our mouth. This acid decays the teeth and is the reason of cavity in the teeth. – Similar responses – full credit. **Any other response- no credit**

Q 4.4 Give two benefits of having an alkaline diet.

……

Template for preparation of Practice Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific</td><td>Topic/Chapter: pH change as the cause of tooth decay
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Can understand and evaluate the importance of pH in our oral cavity and teeth.
Benefits of balanced diet.</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically
Knowledge-system	Epistemic
Context	Global
Cognitive demand	High
Item format	Open Response
Proficiency level	5

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q.4.4 Higher, or alkaline, pH levels are linked to improvements in memory and cognition, reduced pain, and lower risk of hypertension (high blood pressure), and stroke. Low-acid diets can help improve bone density. It allows a healthy balance of good and bad bacteria in the mouth and helps prevent tooth decay. – Any two of these responses- **full credit.** Any other response – no credit

Name of the Teacher/Item Writer: Arpan Soni
Designation: PGT (physics)
Email: arpanpioneer@gmail.com
Phone No.: 9993820924
Name of the Vidyalaya: KV OF Khamaria Jabalpur
KVS Region: Jabalpur

…….

TEST ITEM -5

PLANTS AND ANIMALS IN CHEMICAL WARFARE

Plants have an impressive arsenal at their disposal to fend off pests. And scientists have now figured out exactly how it works.

Plants and animals in chemical Warfare

Scientists have discovered how plants fend off insects and fungal attacks using chemical poisons like hydrogen cyanide.

It is not always fun to be a plant. With your roots firmly planted in the earth, there is no way to run away from an insect who wants to lay their eggs on your leaves, or when the larvae hatch and start eating you.

That is why all plants have developed defence systems to protect against insects and fungi that would otherwise devour their fragile leaves, seeds, or fruits.

Until now, scientists did not know how plants shifted between the many different types of defence systems that protect them against various types of attack. But now scientists have solved the mystery.

Have you ever been stung by a honey-bee? Bee-sting leaves an acid which causes pain and irritation. Use of a mild base like baking soda on the stung area gives relief. Stinging hair of nettle leaves inject methanoic acid causing burning pain. Almonds protect themselves with chemical weapons Many plants have an inbuilt defence system that, when activated, releases hydrogen cyanide to ward off insects and fungi. It is directed at the part of the plant under attack. This is what makes bitter almonds, apricots, and apple pips toxic when crushed.

But plants have many different defence systems that can be activated individually, depending on the type of threat they face. Each plant should be able to quickly, flexibly, and precisely, convert its metabolism to produce the new type of defensive agents.

Source- Science Nordic, NCERT.

Q 5.1

The chemical that is used by some plants as a defense system is-

(a) Hydrochloric acid
(b) Potassium hydroxide
(c) Chlorophyll
(d) Hydrogen cyanide

……

Template for preparation of Practice Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific</td><td>Topic/Chapter: Plants and animals in chemical Warfare
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Can understand and evaluate the importance of acids in defense mechanisms of plants and animals.</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Evaluate and design scientific enquiry
Knowledge-system	Procedural
Context	Global
Cognitive demand	Low
Item format	MCQ
Proficiency level	1

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q. 5.1 (d) Hydrogen cyanide- Full credit. Any other response- no credit

Q5.2 Give two ways other than baking soda by which we can cure the bite of a honey bee?

Template for preparation of Practice Items for Scientific Literacy

<table>
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Can understand and evaluate the importance of acids in defense mechanisms of plants and animals.</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically.
Knowledge-system	Epistemic
Context	Global
Cognitive demand	High
Item format	Open response
Proficiency level	5

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q.5.2 (i) washing thoroughly with soap (ii) applying basic materials like toothpaste etc. – similar responses– Full credit One correct response – partial credit Any other response- no credit

Q 5.3 What is the science behind applying baking soda on the area stung by a honey bee?

Template for preparation of Practice Items for Scientific Literacy

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Can understand and evaluate the importance of acids in defense mechanisms of plants and animals.</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically.
Knowledge-system	Procedural
Context	Global
Cognitive demand	High
Item format	Closed constructed
Proficiency level	5

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q.5.3 Baking soda is a base, while honey bee venom is acidic. Therefore baking soda reacts with venom of honey bee and neutralizes it. –similar responses- full credit Acid reacts with base to neutralize it – partial credit Any other response- no credit

Q5.4 Bitter almonds, apricots, and apple pips become toxic when crushed and nontoxic when used normally. Give reason.

Template for preparation of Practice Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific</td><td>Topic/Chapter: Plants and animals in chemical Warfare
(Acids,Bases,Salts)</td><td>Class(es): X
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Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically
Knowledge-system	Epistemic
Context	Global
Cognitive demand	High
Item format	Closed constructed
Proficiency level	5

Credit Pattern:

Full Credit: 2

Partial Credit: 1

Nil Credit: 0

Description of Answer Key and Credits

Q.5.4 When suddenly crushed, the plants release hydrogen cyanide (a poison) on the affected area as a reflex action to defend it. When normally plucked, hydrogen cyanide is not released. - Full credit for similar responses To prevent themselves from being crushed – similar responses – partial credit Any other response – no credit

Name of the Teacher/Item Writer: Arpan Soni

Designation: PGT (physics)

Email: arpanpioneer@gmail.com

Phone No.: 9993820924

Name of the Vidyalaya: KV OF Khamaria Jabalpur

KVS Region: Jabalpur

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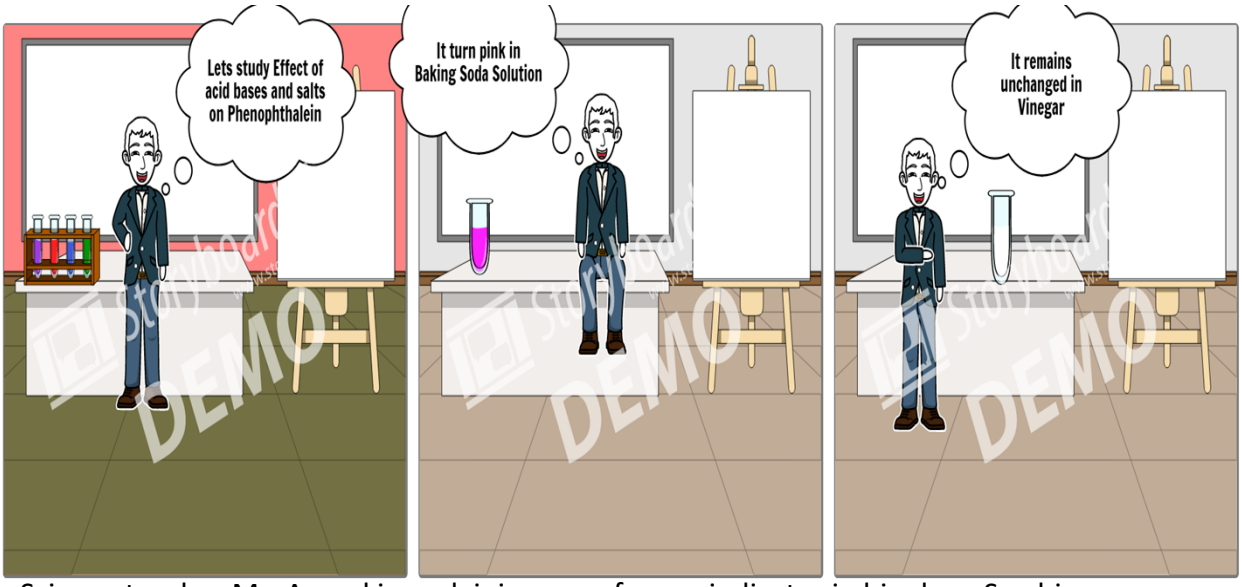
TEST ITEM-6

COLOUR CHANGE STORY



Science teacher Mr. Anand is explaining use of some indicator in his class. See his demonstration and with the help of below table answer the following questions.

S. No.	Test solution	Effect on red litmus paper	Effect on blue litmus paper	Inference
1	Tap Water	No change	No change	Neutral
2	Detergent Solution	Changes to blue	No change	Basic
3	Aerated Drink	No change	Changes to red	Acidic
4	Soap Solution	Changes to blue	No change	Basic
5	Shampoo	No change	Changes to red	Acidic
6	Common Salt Solution	No change	No change	Neutral
7	Sugar Solution	No change	No change	Neutral
8	Vinegar	No change	Changes to red	Acidic
9	Baking Soda Solution	Changes to blue	No change	Basic
10	Milk of Magnesia	Changes to blue	No change	Basic
11	Washing Soda Solution	Changes to blue	No change	Basic
12	Lime Water	Changes to blue	No change	Basic

Q6.1 What would be the change in colour of phenolphthalein if it is added to Lemon Juice?

a. Colourless
b. Pink
c. Blue
d. Red

<table>
<tr><td>Domain: Scientific</td><td>Theme:
Acids/bases/salts</td><td>Class(es): X
Expected time:1 MIN
Total Credit:2</td></tr>
<tr><td>Description of Item:<table><tr><td></td><td>Text</td></tr><tr><td>√</td><td>Image</td></tr><tr><td></td><td>Table</td></tr><tr><td></td><td>Graph</td></tr><tr><td></td><td>Map</td></tr><tr><td></td><td>Poem</td></tr></table></td><td colspan="2">Learning Outcomes:
(As per NCERT)
Can differentiate and identify given substances as acids, bases using indicators.</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Evaluate and design scientific enquiry
Knowledge-system	Procedural
Context	Local
Cognitive demand	Low
Item format	Multiple Choice
Proficiency level	1a

Credit Pattern

Full Credit: 2
Nil Credit: 0

Description of answer key and credits

Q6.1 Option a-Colourless

Is correct alternative and as shown in picture vinegar show no change in color of phenolphthalein so he can relate that lemon juice is acidic and will show same result.

Q6.2 What would you use to find the pH of distilled water?

a. Litmus Solution
b. Methyl orange solution
c. Phenolphthalein
d. Universal indicator

Template for preparation of Practice Items for Scientific Literacy

<table>
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Acids/bases/salts</td><td>Class(es): X
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(As per NCERT)
Can differentiate and identify given substances as acids, bases using indicators.</td></tr>
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Scientific literacy

FRAMEWORK	CHARACTERISTICS
Competency	Evaluate and design scientific enquiry.
Knowledge-system	Procedural
Context	Local
Cognitive demand	Medium
Item format	Multiple Choice
Proficiency level	3

Credit Pattern

Full Credit:2
Nil Credit: 0

Description of answer key and credits

Q6.2 Option d- Universal Indicator

Is correct alternative because it give different colour at different pH and we will be able to find its pH

Q6.3 In question 6.2 Give your reason for selecting the correct indicator.

……
……

Template for preparation of Practice Items for Scientific Literacy

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Can differentiate and identify given substances as acids, bases using indicators.</td></tr>
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Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Evaluate and design scientific enquiry.
Knowledge-system	Epistemic
Context	Local
Cognitive demand	High
Item format	Closed response
Proficiency level	5

Credit Pattern

Full Credit 2
Nil Credit 0

Description of answer key and credits

Q6.3 Universal Indicator is chosen because we have to find the pH and Universal indicator will turn green as the distilled water is neutral.

No other indicator can be used they merely change colour only to show the nature whether the sample is acidic or basic and some indicators remain same in two of the mediums ~~so.~~ To avoid this one should use Universal indicator.(Or any other explanation with same meaning as desired)

Q6.4 Reaction of which acid and base will form Common salt. Why the pH of common salt solution is neutral?

……

……

Template for preparation of Practice Items for Scientific Literacy

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Can differentiate and identify given substances as acids, bases using indicators.</td></tr>
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Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Explain phenomenon scientifically
Knowledge-system	Epistemic
Context	local
Cognitive demand	Medium
Item format	Closed response
Proficiency level	4

Credit Pattern

Full Credit- 2
Partial Credit-1
Nil Credit- 0

Description of answer key and credits

Q6.4 Hydrochloric acid (Acid) and Sodium Hydroxide(Base)

$HCl + NaOH \longrightarrow NaCl + H_2O$

pH is neutral because it is formed by complete displacement of H^+ ion so no H^+ ions are not formed in solution so pH is 7.---------**Full Credit**
If Student give any one of the above response ------**Partial Credit**
Any other response-------**No credit**

Q6.5 How checking pH of food stuffs and other substances may help us?

……

……

Template for preparation of Practice Items for Scientific Literacy

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(As per NCERT)
Can use scientific information to come to a conclusion.</td></tr>
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Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically
Knowledge-system	Epistemic
Context	local
Cognitive demand	Medium
Item format	Open response
Proficiency level	4

Credit Pattern

Full Credit- 2
Nil Credit- 0

Description of answer key and credits

Q6.5 It will help us to find out/ whether food item is suitable for consumption or it is spoiled.

/whether it has preservatives or added agents/It is free from microbes/it will not effect pH of digestive system ------ Full credit

Q6.6 a. How much you agree with the following statements?

Circle only one condition in each row

1.	**Solution of Sugar and Common salt have same pH**	**Strongly agree**	**Agree**	**Disagree**	**Strongly Disagree**
2.	**Washing soda solution harms and cause skin sores while using.**	**Strongly agree**	**Agree**	**Disagree**	**Strongly Disagree**

b. Do you think above statement can be verified by scientific investigations. Yes/No

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific	Theme: Acids/bases/salts	Class(es): X Expected time:1 MIN Total Credit:2
Description of Item: Text: (blank) Image: √ Table: (blank) Graph: (blank) Map: (blank) Poem: (blank)	Learning Outcomes: (As per NCERT) Can differentiate and identify given substances and its application.	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically
Knowledge-system	Epistemic
Context	local
Cognitive demand	High
Item format	Closed response
Proficiency level	5

Credit Pattern

Full Credit- 2
Partial credit-1
Nil Credit- 0

Description of answer key and credits

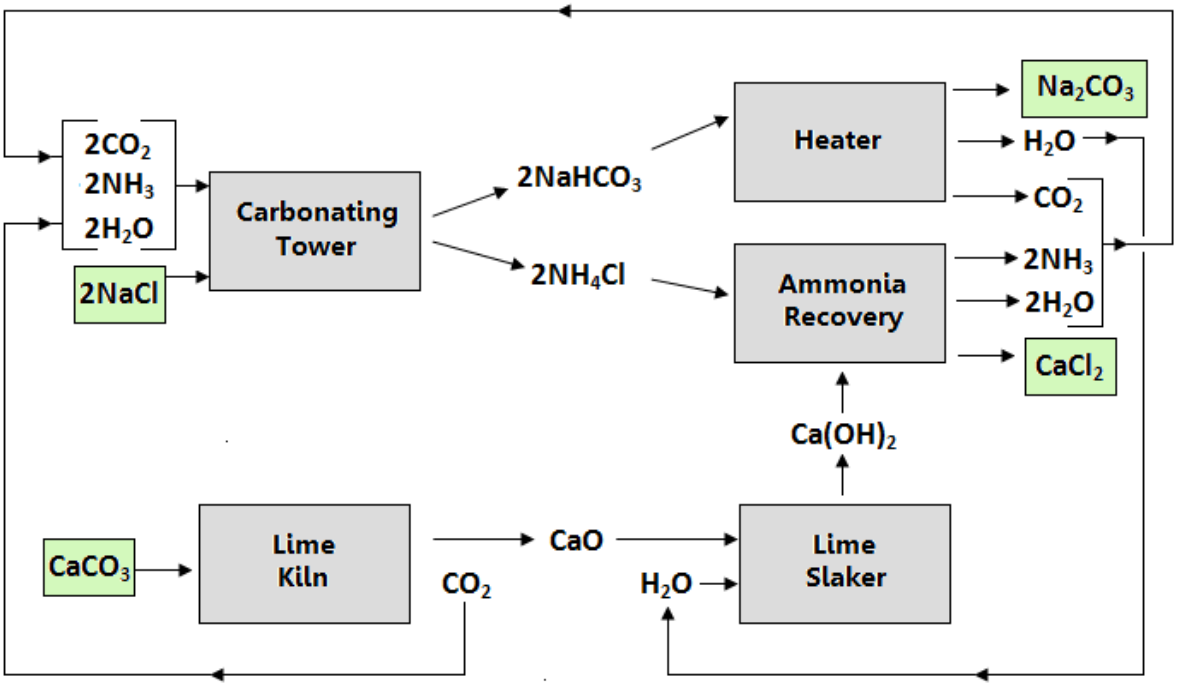
Q6.6 a- i.Strongly agree
ii.Disagree
b. Yes
*If both parts of a and b are correct then **Full credit**.
* If one part of 'a' is correct and 'b' is yes -----**Partial Credit**
Any other response---- **No credit**

Name of the Teacher/Item Writer: **Kapil Mahajan**
Designation: **PGT Biology**
Email: **kapils.2904@gmail.com**
Phone No.**9012218358**
Name of the Vidyalaya: **Kendriya Vidyalaya Panna**
KVS Region: **Jabalpu**r

……

TEST ITEM -7

CHEMISTRY OF SOLVAY'S PROCESS



The **Solvay process** or **ammonia-soda process** is the major industrial process for the production of sodium carbonate (soda ash, Na_2CO_3). The ammonia-soda process was developed into its modern form by Ernest Solvay during the 1860s. The ingredients for this are readily available and inexpensive: salt brine (from inland sources or from the sea) and limestone (from quarries). The worldwide production of soda ash in 2005 has been estimated at 42 million metric tons, which is more than six kilograms per year for each person on Earth. Solvay-based chemical plants now produce roughly three-quarters of this supply, with the remaining being mined from natural deposits. This method superseded the Leblanc process.

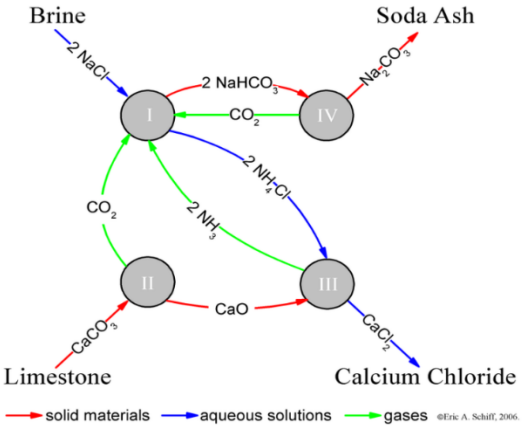


Figure 1b

Q7.1 If one of the product of Solvay's Process is Soda ash(Na_2CO_3) then which of the following is another product of the same process and is considered as waste?

a. Cacium Carbonate($CaCO_3$)

b. Calcium Chloride($CaCl_2$)

c. Ammonium Chloride(NH_4Cl)

d. Sodium Chloride(NaCl)

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific	Theme: Solvay's Process Acids/bases/salts	Class(es): X Expected time:1 MIN Total Credit:2
Description of Item: √ Text √ Image Table Graph Map Poem	Learning Outcomes: (As per NCERT) Can Explain process and phenomenon Scientifically.	

Scientific literacy

FRAMEWORK	CHARACTERISTICS
Competency	Explain phenomenon scientifically
Knowledge-system	Procedural
Context	Local
Cognitive demand	low
Item format	MCQ
Proficiency level	1 b

Credit Pattern

Full Credit: 2
Nil Credit: 0

Description of answer key and credits

Q7.1 (b). Calcium Chloride—Full Credit

Student is expected to observe the flow chart carefully and come to the conclusion

Any other response---No credit

Q7.2 Observe the above figure 1b carefully and find which of the following combinations is correct.

a. $NaHCO_3$, NaCl and NH_4Cl are in aqueous state.

b. Ammonia, Carbon di oxide and soda ash are in gaseous state.

c. Limestone, soda ash and Brine are in solid state.

d. Brine, Calcium chloride and NH_4Cl are in aqueous state.

Template for preparation of Practice Items for Scientific Literacy

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Acids/bases/salts</td><td>Class(es): X
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Can Explain process and phenomenon Scientifically.</td></tr>
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Scientific literacy

FRAMEWORK	CHARACTERISTICS
Competency	Evaluate and design scientific enquiry.
Knowledge-system	Procedural
Context	Local
Cognitive demand	Medium
Item format	MCQ
Proficiency level	3

Credit Pattern

Full Credit: 2
Nil Credit: 0

Description of answer key and credits

Q7.2 Option(d) Brine, Calcium Chloride and NH_4Cl are in aqueous state. ----**Full Credit**

Student is expected to observe the colour of the arrow related to the physical state of products and reactants.

Any other Response**--- No Credit**

.

Q7.3 Which of the following is source of Carbon di oxide in the above shown flow chart?

a. Lime Kiln

b. Calcium Carbonate
c. Heater
d. $NaHCO_3$ and $CaCO_3$

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific	Theme: Solvay's Process Acids/bases/salts	Class(es): X Expected time:1 MIN Total Credit:2
Description of Item: √ Text √ Image Table Graph Map Poem	Learning Outcomes: (As per NCERT) Can Explain process and phenomenon Scientifically.	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Evaluate and design scientific enquiry.
Knowledge-system	Procedural
Context	Local
Cognitive demand	Medium
Item format	MCQ
Proficiency level	3

Credit Pattern

Full Credit: 2
Partial Credit: 1
Nil Credit: 0

Description of answer key and credits

Q7.3 (d) $NaHCO_3$ and $CaCO_3$ (Heater and Kiln are the site not the source) **---Full credit**

(a) Calcium Carbonate (This answer is partially correct) **--- PartialCredit**
Any other response ---No credit

.

Q7.4 Why Solvay's method of producing washing soda got popularity?

……
……

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific	Theme: Solvay's Process Acids/bases/salts	Class(es): X Expected time:1 MIN Total Credit:2
Description of Item: √ Text √ Image Table Graph Map Poem	Learning Outcomes: (As per NCERT) Can Explain process and phenomenon Scientifically.	

Scientific literacy

FRAMEWORK	CHARACTERISTICS
Competency	Evaluate and design scientific enquiry.
Knowledge-system	Procedural
Context	Local
Cognitive demand	Medium
Item format	Open Response
Proficiency level	4

Credit Pattern

Full Credit: 2
Partial Credit: 1
Nil Credit: 0

Description of answer key and credits

Q7.4 This method was cost effective and raw materials were easily available. **Partial Credit**

This method was cheap/easily available raw materials as well as some of the products formed at different steps are used as raw material in other steps. **Full Credit**
(It is expected that student carefully observe the flow chart and come to the conclusion that some of the products like Carbon di oxide, Ammonia are reused in early steps)
Any Other response –**No Credit**

Q7.5 Write the chemical equation involved in the last step of obtaining the product of the above process.

…….

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific	Theme: Solvay's Process Acids/bases/salts	Class(es): X Expected time:1 MIN Total Credit:2
Description of Item: √ Text √ Image Table Graph Map Poem	Learning Outcomes: (As per NCERT) Can Explain process and phenomenon Scientifically.	

Scientific literacy

FRAMEWORK	CHARACTERISTICS
Competency	Evaluate and design scientific enquiry.
Knowledge-system	Epistemic
Context	Local
Cognitive demand	Medium
Item format	Closed Response
Proficiency level	4

Credit Pattern

Full Credit: 2
Partial Credit: 1
Nil Credit: 0

Description of answer key and credits

Q7.5 Reactants – $NaHCO_3$ or Sodium hydrogen carbonate

Products- Na_2CO_3 (Sodium carbonate) ,Water and CO_2 **Full Credit**

Reaction- $NaHCO_3 \longrightarrow Na_2CO_3 + CO_2 + H_2O$

* If student write common name instead of chemical name like Baking soda or Soda ash then he will be awarded **Partial Credit.**

Name of the Teacher/Item Writer: **Kapil Mahajan**
Designation: **PGT Biology**
Email: **kapils.2904@gmail.com**
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KVS Region: **Jabalpu**r

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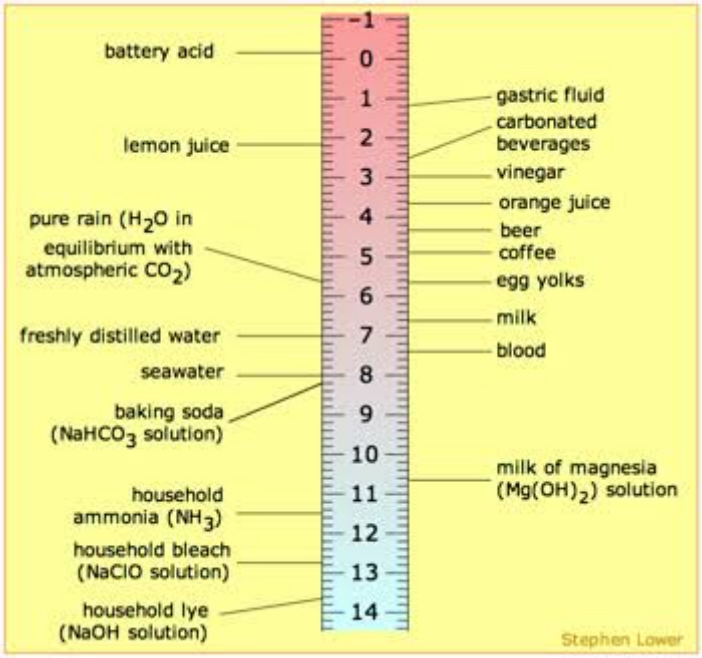
TEST ITEM -8

"POTENZ DE HYDROGEN"



(Image source- Science buddies)

The image show pH of different substances, Observe and answer the questions

Q8.1 Circle Yes for those items which when consumed by human may affect protein digestion in stomach?

a. Milk of Magnesia Yes/No

b. Cold Drinks Yes/No

c. Rain water Yes/No

d. Baking soda Yes/No

Template for preparation of Practice Items for Scientific Literacy

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(As per NCERT)
Can differentiate and identify given substances as acids, bases using pH scale.</td></tr>
</table>

Scientific literacy

FRAMEWORK	CHARACTERISTICS
Competency	Evaluate and design scientific enquiry.
Knowledge-system	Procedural
Context	Global
Cognitive demand	low
Item format	Multiple Choice
Proficiency level	1 b

Credit Pattern

Full Credit:2
Partial Credit:1
Nil Credit:0

Description of answer key and credits

Q8.1 Yes for Options a and d – **Full Credit**

Any one correct option – **Partial Credit**

Any other response- **No Credit**.

Q8.2 Arrange the following in the increasing Hydroxide ion concentration.

Household lye, Ammonia solution, orange juice, fresh distilled water, rain water, battery acid

……

Template for preparation of Practice Items for Scientific Literacy

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Can differentiate and identify given substances as acids, bases using pH.</td></tr>
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Scientific literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically
Knowledge-system	Procedural
Context	Local
Cognitive demand	Medium
Item format	Short response
Proficiency level	3

Credit Pattern

Full Credit:2
Nil Credit:0

Description of answer key and credits

Q8.2 Correct order-

Household Lye, Solution of ammonia, Distilled water, Rain water, Orange juice, Battery Acid.(**Full Credit**)

Any other order- **No Credit**

Q8.3 Rain water is formed by evaporation of water from earth's surface but its pH is not 7 as distilled water. Give your reason for the less pH of rain water.

……
……

Template for preparation of Practice Items for Scientific Literacy

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Can explain the phenomenon scientifically.</td></tr>
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Scientific literacy

FRAMEWORK	CHARACTERISTICS
Competency	Evaluate and design scientific enquiry.
Knowledge-system	Epistemic
Context	Global-Environment Quality
Cognitive demand	Medium
Item format	Open response
Proficiency level	4

Credit Pattern

Full Credit 2
Nil Credit 0

Description of answer key and credits

Q8.3 Due to dissolution of acidic gases like carbon di oxide, sulphur di oxide and Oxides of nitrogen Ph of rain water decreaes.--- **Full Credit**

Any other Response – **No credit**

Q8.4 Drinking coffee after meal may affect the process of digestion? Do you agree with this statement. Support your answer with reason.

……

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific	Theme: Acids/bases/salts	Class(es): X Expected time:1 MIN Total Credit:2
Description of Item: Text √ Image Table Graph Map Poem	Learning Outcomes: (As per NCERT) Can explain process scientifically.	

Scientific literacy

FRAMEWORK	CHARACTERISTICS
Competency	Explain phenomenon scientifically
Knowledge-system	Epistemic
Context	local
Cognitive demand	Medium
Item format	Open response
Proficiency level	4

Credit Pattern

Full Credit- 2
Partial Credit-1
Nil Credit- 0

Description of answer key and credits

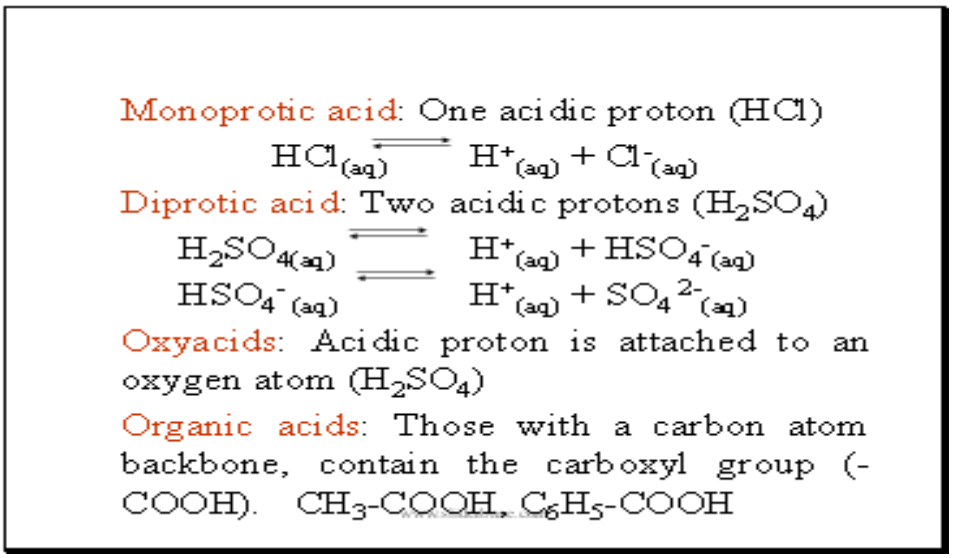
Q8.4 Yes, I agree with this statement

Process of digestion in stomach needs Acidic pH But drinking coffee may alter the pH to 5 temporarily that may slows down the process of protein digestion. **Full Credit**

Response like – It increases the pH or pH becomes 5 ----- **Partial Credit**

If student writes No or Any other response--- **No credit**

Q8.5 Choose the correct option(s) using the information displayed.(more than one option are required)



a. Nitric acid is an oxyacid
b. Acetic acid is polybasic acid because it contains 1 replacable hydrogen atom.
c. Nitric acid is monoprotic acid.
d. NaOH react to form two types of salts, one acidic salt and one neutral salt.

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific	Theme: Acids/bases/salts	Class(es): X Expected time:1 MIN Total Credit:2
Description of Item: Text: √ Image Table Graph Map Poem	Learning Outcomes: (As per NCERT) Can differentiate and identify given substances as acids, bases on the bases of ions they furnish on ionisation.	

Scientific literacy

FRAMEWORK	CHARACTERISTICS
Competency	Explain phenomenon scientifically
Knowledge-system	Epistemic
Context	local
Cognitive demand	High
Item format	Complex MCQ
Proficiency level	5

Credit Pattern

Full Credit- 2
Partial Credit- 1
Nil Credit- 0

Description of answer key and credits

Q8.5 Options a,c and d are correct----**Full correct** If two options are correct ---**partial credit** One optionis correct ----**no credit**

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Email: **kapils.2904@gmail.com**
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TEST ITEM -9

SULFURIC ACID, ITS IMPACT ON HEALTH AND ENVIRONMENT

(Source:npi.gov.au----Australian Government-Department of the Environment and Energy)

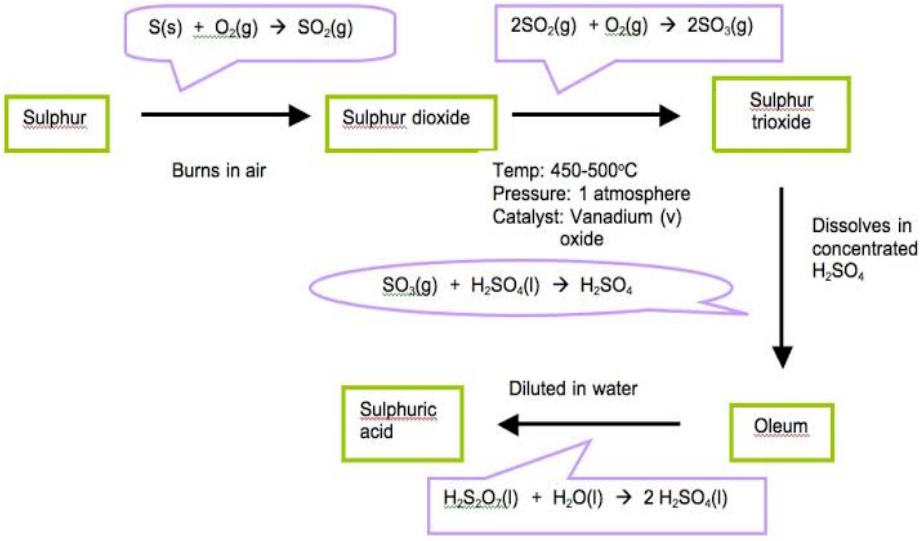

Figure 2-image source my-chem-assignment.blogspot

Sulfuric acid is the world's largest volume industrial chemical. The main use is in the production of phosphate fertilizers. It is used to manufacture explosives, other acids, dyes, glue, wood preservatives, and automobile batteries. It is used in the purification of petroleum, the pickling of metal, copper smelting, electroplating, metal work, and the production of rayon and film.

Entering the body

Sulfuric acid will enter the body if we breathe in contaminated air. While it is not absorbed through the skin, skin contact with strong concentrations may cause serious burns.

Exposure

Consumers are most likely to be exposed to sulfuric acid when using products containing the substance (e.g. some cleaning products, or car batteries). Workers in the industries that use or produce sulfuric acid are at risk of exposure. Consumers can also be exposed to sulfuric acid by exposure to air contaminated by sulfur dioxide emissions.

Entering the environment

Industrial emissions of sulfuric acid can produce elevated concentrations in the atmosphere. Sulfuric acid will exist as particles or droplets which may dissolve in clouds, fog, rain, dew, or snow, resulting in very dilute acid solutions. In clouds and

moist air it will travel along the air currents until it is deposited as wet acid deposition (acid rain, acid fog, etc). In waterways it readily mixes with the water.

Where it ends up

Sulfuric acid enters the air during production, use and transporting it. In the air it will react with other chemicals present (ammonia, magnesium, calcium) to form salts, which neutralise the acid. The acid particles dissolve in clouds, fog, rain, or snow, resulting in very dilute acid solutions. This may impact the environment as wet acid deposition ('acid rain').

Environmental guidelines

Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC, 1992): No guideline specifically for sulfuric acid, although the guideline value for pH (a measure of the acidity or alkalinity of water) is in the range 6.5 to 9.0 for fresh water.

After reading the passage answer the following questions.

Q9.1 Why there is use of catalyst in conversion of Sulphur-di-oxide to Sulphur-tri-oxide?

a. To enhance the rate of reaction.
b. To lower the activation energy for the reaction.
c. To promote forward reaction.
d. To lower the pressure required for the reaction.

Template for preparation of Practice Items for Scientific Literacy

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(As per NCERT)
Student can explain the process scientifically</td></tr>
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Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Evaluate and design scientific enquiry.
Knowledge-system	Procedural
Context	Global
Cognitive demand	Low
Item format	Multiple Choice
Proficiency level	2

Credit Pattern

Full Credit: 2
Partial credit: 1
Nil Credit: 0

Description of answer key and credits

Q9.1 Option a and b both are correct--- -Full credit If one of the option is attempted--- Partial credit Any other response---No credit

Q9.2 What would be the impact of acid-rain on living organisms?

……

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific	Theme: Acids/bases/salts	Class(es): X Expected time:1 MIN Total Credit:2
Description of Item: √ Text √ Image Table Graph Map Poem	Learning Outcomes: (As per NCERT) Student can explain the process scientifically	

Scientific literacy

FRAMEWORK	CHARACTERISTICS

Competency	Evaluate and design scientific enquiry.
Knowledge-system	Procedural
Context	Global
Cognitive demand	Medium
Item format	Open response
Proficiency level	3

Credit Pattern

Full Credit: 2
Nil Credit: 0

Description of answer key and credits

Q9.2 Acid rain will damage aquatic life as it will lower the pH of water thus affecting plant and animals in water.

It cause leaching of elements in soil thereby making it acidic and nutrient deficient.

Its corrosive nature damage plants on land and animals which come in contact with it.

Any of the above reason written ---- Full credit

No response or missing ------ No credit

Q9.3 Which would be more toxic Sulphur-di-oxide or Sulphuric acid? Why?

……

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific	Theme: Acids/bases/salts	Class(es): X Expected time:1 MIN Total Credit:2
Description of Item: √ Text √ Image Table Graph Map Poem	Learning Outcomes: (As per NCERT) Student can explain the process scientifically	

Scientific literacy

FRAMEWORK	CHARACTERISTICS

Competency	Evaluate and design scientific enquiry.
Knowledge-system	Epistemic
Context	Global-Environment quality
Cognitive demand	High
Item format	Open response
Proficiency level	5

Credit Pattern

Full Credit 2
Partial credit: 1
Nil Credit 0

Description of answer key and credits

Q9.3 Gaseous sulphur di oxide is more potent toxic to animals as it can come in direct contact of their respiratory system and damages respiratory surface, cause nose and throat irritation, Pulmonary oedema.---**Full credit** If student writes only sulphur di oxide without correct reason—**Partial credit** Sulphuric acid is more toxic---**No credit**

Q9.4 It has been observed that with the increase in pollution the growth of lichens is being retarded. Can we label such organisms as bio-indicators for pollution? What would you do prevent such degradation of living organisms?

……

Template for preparation of Practice Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific</td><td>Theme:
Acids/bases/salts</td><td>Class(es): X
Expected time:1 MIN
Total Credit:2</td></tr>
<tr><td>Description of Item:
<table><tr><td>√</td><td>Text</td></tr><tr><td>√</td><td>Image</td></tr><tr><td></td><td>Table</td></tr><tr><td></td><td>Graph</td></tr><tr><td></td><td>Map</td></tr><tr><td></td><td>Poem</td></tr></table></td><td colspan="2">Learning Outcomes:
(As per NCERT)
Student can explain the process scientifically</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS

Competency	Explain phenomenon scientifically
Knowledge-system	Epistemic
Context	Global-Environment
Cognitive demand	Medium
Item format	Open response
Proficiency level	4

Credit Pattern

Full Credit- 2
Partial Credit-1
Nil Credit- 0

Description of answer key and credits

Q9.4 Yes

Pollution kill the algal component of lichen thereby getting it killed

This can be prevented by banning the burning of fossil fuels, vehicular pollution etc---Full credit

Is student write yes without correct reason ----Partial credit

No or other reason---No credit

Q9.5 If there is dissolved sulphur di oxide in water supply of your home, then how would you confirm the acidic nature of drinking water in your kitchen without the availability of any chemicals?

……
……

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific	Theme: Acids/bases/salts	Class(es): X Expected time:1 MIN Total Credit:2
Description of Item: √ Text √ Image Table Graph Map Poem	Learning Outcomes: (As per NCERT) Can differentiate and identify given substances as acids, bases using indicators.	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically
Knowledge-system	Epistemic
Context	Global-Health
Cognitive demand	High
Item format	Open response
Proficiency level	6

Credit Pattern

Full Credit- 2
Partial credit: 1
Nil Credit- 0

Description of answer key and credits

Q9.5 Yes

By using natural indicators like red cabbage extract, hibiscus flower etc—**Full credit**

If student writes yes and don't mention the indicators---**Partial credit**

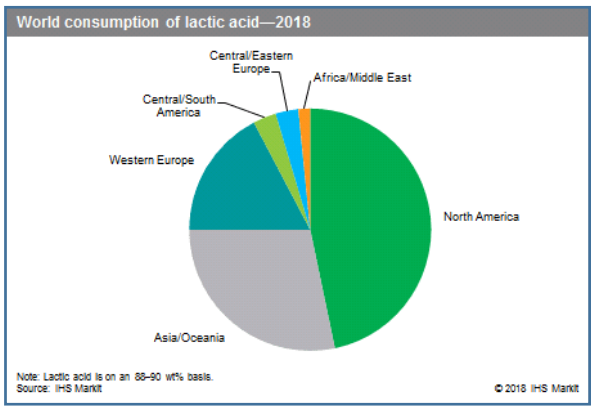
No or any other wrong reason----**No credit**

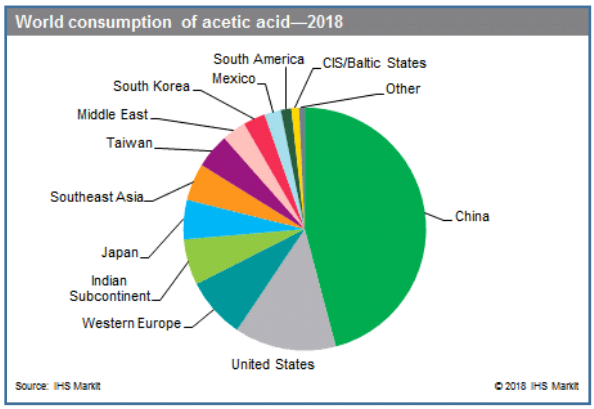
Name of the Teacher/Item Writer: **Kapil Mahajan**
Designation: **PGT Biology**
Email: **kapils.2904@gmail.com**
Phone No.**9012218358**
Name of the Vidyalaya: **Kendriya Vidyalaya Panna**
KVS Region: **Jabalpu**r

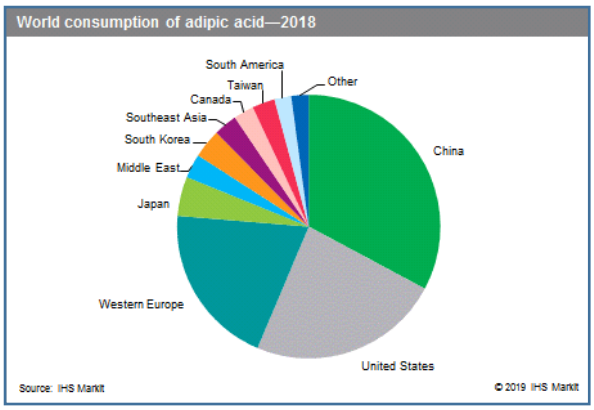
……..

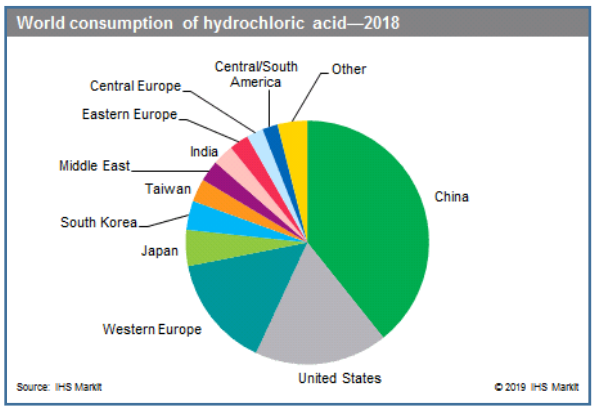
TEST ITEM -10

COMMERCIAL USE OF ACIDS









The above pie-charts show world's consumption of four different acids and following table show uses of the same acids. Observe them and answer the question that follows.

S.No.	Name of the acid	Uses
1	**Lactic acid**	Biodegradable polymers,Food & beverages,Personal care,Pro-biotics
2	**Hydrochloric acid**	Manufacturing glue, Common Salt, Glucose, Pickling of steel
3	**Adipic acid**	Manufacturing Nylon 6,6. Automotive industry ,textile industry
4	**Acetic acid**	Food industry,polymers,Preservative,antiseptic creams etc

Q10.1 Which country may be the leading producer of Nylon 6,6?

a. USA b. China c. Japan d. India

<table>
<tr><td>Domain: Scientific</td><td>Theme:
Acids/bases/salts</td><td>Class(es): X
Expected time:1 MIN
Total Credit:2</td></tr>
<tr><td>Description of Item:<table><tr><td></td><td>Text</td></tr><tr><td>√</td><td>Image</td></tr><tr><td></td><td>Table</td></tr><tr><td></td><td>Graph</td></tr><tr><td></td><td>Map</td></tr><tr><td></td><td>Poem</td></tr></table></td><td colspan="2">Learning Outcomes:
(As per NCERT)
Student can interpret data to come to conclusion scientifically</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically
Knowledge-system	Procedural
Context	Global
Cognitive demand	medium
Item format	Multiple Choice
Proficiency level	3

Credit Pattern

Full Credit:2
Nil Credit:0

Description of answer key and credits

Q10.1 Option b ----Full Credit

Any other response- No credit

Q10.2 If you are supposed to import Pro-biotics for your hospital which country would you prefer?

a. China b. North America c. Taiwan d. North Korea

Template for preparation of Practice Items for Scientific Literacy

<table>
<tr><td>Domain: Scientific</td><td>Theme:
Acids/bases/salts</td><td>Class(es): X
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(As per NCERT)
Student can interpret data to come to conclusion scientifically.</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically
Knowledge-system	Procedural
Context	Global
Cognitive demand	Medium
Item format	Multiple Choice
Proficiency level	3

Credit Pattern

Full Credit:2
Nil Credit:0

Description of answer key and credits

Q10.2 Option b--- Full Credit

Any other response --- No Credit

Q10.3 Which of the following statements is incorrect ?

a. China consumes more lactic acid than any other nation.
b. Japan's acetic acid consumption is more than the consumption of South-east Asia.
c. Taiwan and India has similar consumption of HCl.
d. Western Europe has least consumption of Adipic acid among all four acids.

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific	Theme:	Class(es): X

	Acids/bases/salts	Expected time:1 MIN Total Credit:2
Description of Item: Text √ Image Table Graph Map Poem	Learning Outcomes: (As per NCERT) Student can interpret data to come to conclusion scientifically	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically
Knowledge-system	Epistemic
Context	Global
Cognitive demand	High
Item format	MCQ
Proficiency level	5

Credit Pattern

Full Credit 2
Nil Credit 0

Description of answer key and credits

Q10.3 Option d---- Full Credit

Any other response--- No credit

Q10.4 Make a Bar Graph showing consumption of different acids by Western Europe.

……

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific	Theme: Acids/bases/salts	Class(es): X Expected time:1 MIN

		Total Credit:2
Description of Item: Text √ Image Table Graph Map Poem		Learning Outcomes: (As per NCERT) Student can interpret data to come to conclusion scientifically .

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpret data and evidence scientifically
Knowledge-system	Epistemic
Context	Global
Cognitive demand	High
Item format	Open response
Proficiency level	6

Credit Pattern

Full Credit- 2
Nil Credit- 0

Description of answer key and credits

Q10.4 Correct Bar Graph with all correct Data ----Full Credit

Student is expected to take his hypothetical data for all 4 pie chart to come to the production of the nation and then drawing a bar graph by measuring the angles of the given country in the pie-chart and finding its contribution

Name of the Teacher/Item Writer: **Kapil Mahajan**
Designation: **PGT Biology**
Email: **kapils.2904@gmail.com**
Phone No.**9012218358**
Name of the Vidyalaya: **Kendriya Vidyalaya Panna**
KVS Region: **Jabalpu**r

……..

CLASS X SUB: SCIENCE

CH-4 CARBON AND ITS COMPOUNDS

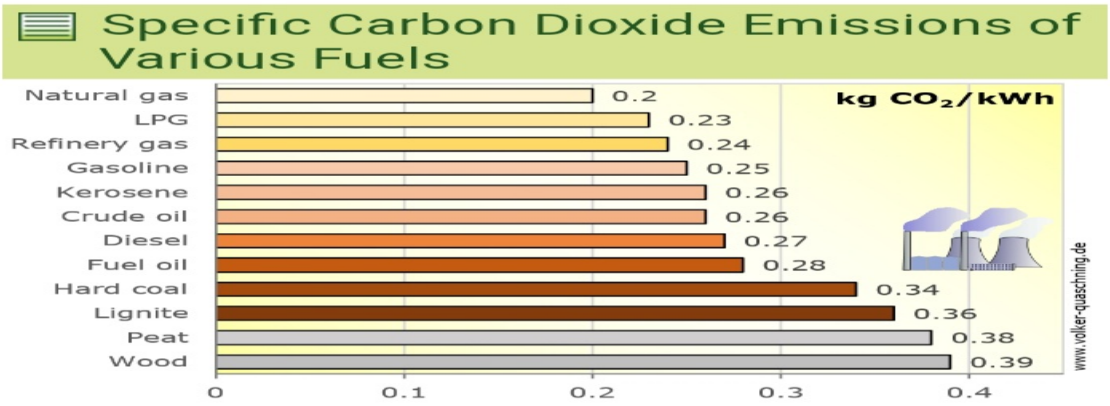
INDEX

TEST ITEM - 1

COMBUSTION OF CARBON COMPOUNDS

Fuels are substances that react with oxygen to releases useful energy (exothermic). Most of the energy is released as heat, but light energy is also released. About 21 percent of air is oxygen. When a fuel burns in plenty of air, it receives enough oxygen for complete combustion. Fuels such as natural gas and petrol contain hydrocarbons. For complete combustion:

Hydrocarbon + oxygen ⟶ carbon dioxide + water



The amount of carbon dioxide produced when a fuel is burnt is a function of the carbon content of the fuel. The heat content, or the amount of energy produced when a fuel is burnt, is mainly determined by the carbon and hydrogen content of the fuel. Heat is produced when C and H combine with oxygen during combustion. Natural gas is primarily methane(CH_4), which has a higher energy content relative to other fuels, and thus, it has a relatively lower CO_2-to- energy content.

Q1.1 Which is the most abundant element in the fuel in terms of mass?

……..

Q1.2.Reaction that occurs during burning of fuel is :

(i) Addition (ii) combustion (iii) substitution (iv) neutralisation

Q1.3. If % of oxygen in air is not enough , which gas will be released during combustion of fuel ?

……..

Q1.4. As per graph, which is the most harmful fuel for environment ?

……

Q1.5. As shown in graph, various kinds of fuels are used to produce electricity in thermal power plant. Suggest the fuel which is best suited for this purpose and why ?

Description of Answer Key & Credits

Q1.1

Domain : Scientific Literacy	Theme:Combustion of carbon compounds	Class:X Expected time:3 min Total Credits : 2
Description of item: Text : combustion of carbon compounds Image : graph of specific carbon dioxide emissions of various fuels	Learning outcomes: Students will understand the combustion reaction.	

Scientific Literacy

Framework System	Characteristics
Competency	Interpreting data and evidences scientifically
Knowledge system	Physical
Context	Global
Cognitive demand	Lower
Item format	Short response
Proficiency level	1

Credit Pattern:

Full credit : 2

No Credit:0

Description of answer key and credits:

Q1.1 full credit: carbon N0 credit : any other response

Q1.2

Domain : Scientific Literacy	Theme:Combustion of carbon compounds	Class:X Expected time:3 min Total Credits : 2
Description of item: Text : combustion of carbon compounds Image : graph of specific carbon dioxide emissions of various fuels	Learning outcomes: Students will understand the combustion reaction.	

Scientific Literacy:

Framework System	Characteristics
Competency	Interpreting data and evidences scientifically
Knowledge system	Physical
Context	Global
Cognitive demand	Lower
Item format	MCQ
Proficiency level	1

Credit Pattern:

Full credit : 2

Partial credit:1

No Credit:0

Description of answer key and credits:

Q1.2Full credit : combustion.
No credit : Any other response

Q1.3

Domain : Scientific Literacy	Theme:Combustion of carbon compounds	Class:X Expected time:5 min Total Credits : 2
Description of item: Text : combustion of carbon compounds Image : graph of specific carbon dioxide emissions of various fuels	Learning outcomes: Students will be able to understand the importance of oxygen gas in combustion.	

Scientific Literacy:

Framework System	Characteristics
Competency	Interpreting data and evidences scientifically
Knowledge system	Physical
Context	Global
Cognitive demand	Medium
Item format	closed constructed
Proficiency level	3

Credit Pattern:

Full credit : 2

Partial credit:1

No Credit:0

Description of answer key and credits:

Q1.3 Full credit : CO gas will be produced. No credit : any other response

Q1.4

Domain : Scientific Literacy	Theme:Combustion of carbon compouns	Class:X Expected time:5 min Total Credits : 2
Description of item: Text : combustion of carbon compounds Image : graph of specific carbon dioxide emissions of various fuels	Learning outcomes: Students will be able to interpret the data given in graph.	

Scientific Literacy:

Framework System	Characteristics
Competency	Interpreting data and evidences scientifically
Knowledge system	Physical
Context	Global
Cognitive demand	Medium
Item format	closed constructed
Proficiency level	3

Credit Pattern:

Full credit : 2

Partial credit:1

No Credit:0

Description of answer key and credits:

Q1.4 Full credit : Wood because it releases more carbon dioxide on burning and less energy as compared to other fuels.
Partial credit : only wood
No credit : any other response

Q1.5

Domain : Scientific Literacy	Theme:Combustion of carbon compounds	Class:X Expected time:5 min Total Credits : 2
Description of item: Text : combustion of carbon compounds Image : graph of specific carbon dioxide emissions of various fuels	Learning outcomes: Students will able to interpret and compare the data values given in graph.	

Scientific Literacy

Framework System	Characteristics
Competency	Interpreting data and evidences scientifically
Knowledge system	Physical
Context	Global
Cognitive demand	Medium
Item format	closed constructed
Proficiency level	4

Credit Pattern:

Full credit : 2

Partial credit:1

No Credit:0

Description of answer key and credits:

1.5Full credit : Natural gas emits least carbon dioxide per kWh energy production as compared to others. Partial credit : Natural gas No credit : any other response

Name of teacher: Amita Arora
Designation: TGT (Sc.)
Phone:8561987719
e- mail:ameeto27@rediffmail.com
Name of Vidyalaya: K.V. NO. 6 Pratap Nagar, Jaipur
Name of region : Jaipur

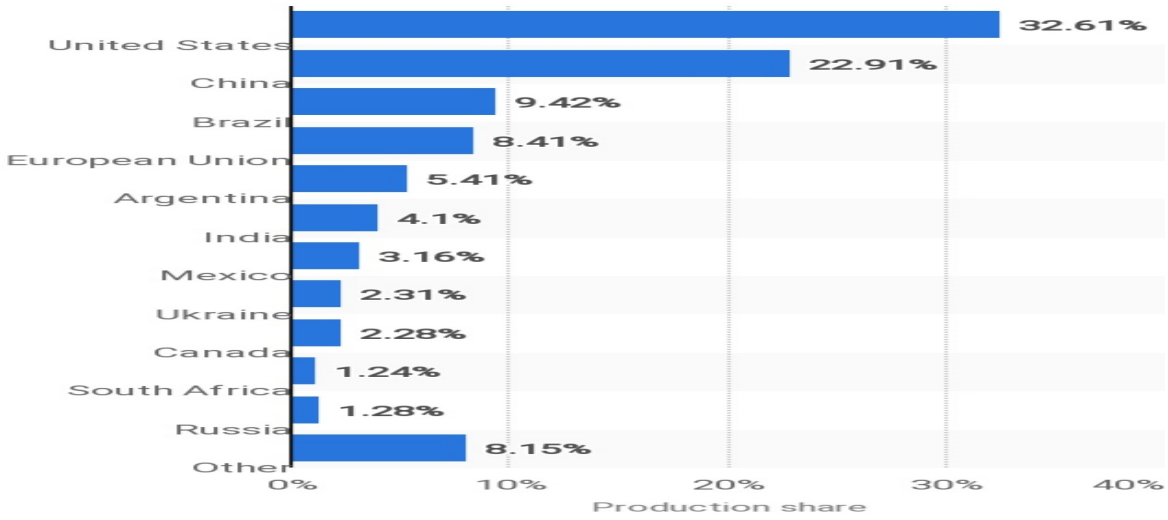
.....

TEST ITEM – 2

GRAIN ALCOHOL

Ethanol is a high-octane fuel that is produced domestically from corn and other renewable sources. Ethanol is essentially grain alcohol , and it is blended with gasoline to create fuel with lower costs , higher octane levels and less harmful emissions. The most common blend is 10% ethanol and 90% gasoline.This mixture will power cars and requires no changes to your existing engine. The other combination called E85 is comprised of 85% ethanol and 15 % unleaded gasoline.

Distribution of global corn production is 2018/2019 by following countries



Q2.1 . Identify the chemical formula of ethanol .

(i) CH_2CH_2OH (ii) CH_2CH_2COOH (iii) CH_3CH_2OH (iv) CH_2CH_3OH

Q2.2 . How will you find the molecular mass of ethanol, if molecular mass of ethane is 30 u?

……

……

Q2.3. On the basis of the graph given above , which country should have the highest possibility of reduction of petrol and diesel consumption?

……

……

Q2.4. Do you think that ethanol is the best bio-fuel ? Justify your answer.

……

Description of Answer Key & Credits

Q2.1

Domain : Scientific Literacy	Theme:Ethanol as fuel	Class: X Expected time: 2 min Total Credits :2
Description of item: Text :Ethanol as fuel Image : Graph of corn production by different countries	Learning outcomes: Students will be able to recall the formula of ethanol.	

Scientific Literacy:

Framework System	Characteristics
Competency	Interpreting data and evidences scientifically
Knowledge system	Physical
Context	Global
Cognitive demand	Lower
Item format	MCQ
Proficiency level	1

Credit Pattern:

Full credit: 2

Partial credit: 1

No Credit: 0

Description of answer key and credits:

Q2.1 full credit : (iii) No credit: any other response

Q2.2

Domain : Scientific	Theme:Ethanol as fuel	Class: X

Literacy		Expected time: 6 min Total Credits :2
Description of item: Text :Ethanol as fuel Image : Graph of corn production by different countries	Learning outcomes: Students will be able to use the formula of calculating molecular mass.	

Scientific Literacy:

Framework System	Characteristics
Competency	Interpreting data and evidences scientifically
Knowledge system	Physical
Context	Global
Cognitive demand	Medium
Item format	Closed constructed
Proficiency level	3

Credit Pattern:

Full credit: 2

Partial credit: 1

No Credit: 0

Description of answer key and credits:

Q2.2 Full credit :46 u No credit : any other response

Q2.3

Domain : Scientific Literacy	Theme:Ethanol as fuel	Class: X Expected time: 6 min Total Credits :2
Description of item: Text :Ethanol as fuel Image : Graph of corn production by different countries	Learning outcomes: Students will be able to interpret the data given in graph.	

Scientific Literacy:

Framework System	Characteristics
Competency	Interpreting data and evidences scientifically
Knowledge system	Physical
Context	Global
Cognitive demand	Medium
Item format	closed constructed
Proficiency level	4

Credit Pattern:

Full credit: 2

Partial credit: 1

No Credit: 0

Description of answer key and credits:

Q2.3Full credit : US because it has high yield of raw material like corn as compared to other countries.

Partial credit : US

No credit : any other response

Q2.4

Domain : Scientific Literacy	Theme:Ethanol as fuel	Class: X Expected time: 6 min Total Credits :2
Description of item: Text :Ethanol as fuel Image : Graph of corn production by different countries	Learning outcomes: Students will be able to understand the importance of biofuel. Students will be able to interpret the data given in graph.	

Scientific Literacy:

Framework System	Characteristics
Competency	Interpreting data and evidences scientifically
Knowledge system	Physical
Context	Social
Cognitive demand	Medium
Item format	open constructed
Proficiency level	3

Credit Pattern:

Full credit: 2

Partial credit: 1

No Credit: 0

Description of answer key and credits:

Q2.4Full Credit : Yes, because it is obtained from plants. Or No, we have more options of bio-fuels like jatropha No credit : if no explanation of response

Name of teacher: Amita Arora
Designation: TGT (Sc.)
Phone:8561987719
e- mail:ameeto27@rediffmail.com
Name of Vidyalaya: K.V. NO. 6 Pratap Nagar, Jaipur
Name of region : Jaipur

……..

TEST ITEM : 3

VINEGAR : USE IN KITCHEN

Vinegar is a household essential often used for cooking, and it even help unclog sinks. Vinegar is actually a solution that is made of 4- 8%of acetic acid that is dissolved in water and other substances that give vinegar its flavor depending on its type. Acetic acid, also known as ethanoic acid and methanecarboxylic acid, is a colorless liquid that has a strong and distinct pungent and sour smell. It has 2 Carbon (C) atoms, 4 Hydrogen(H) atoms and 2 Oxygen (O) atoms.

Q3.1 . Ram is provided with 2 test tubes both have colorless liquid . How will he confirm the the nature of sample?

……

……

Q3.2 . How can Rohit prepare 20 % solution of acetic acid in lab ?

……

……

Q3.3. What will be the next 2 members of homologus series of acid present in vinegar?

.....

Q3.4 . Vinegar is used in kitchen for cooking purpose. Mark Yes or No , whether it is used in following dishes on the basis of its taste.

Name of dish	Yes or No
Jalebi	Yes/No
Chowmein	Yes/No
Pickles	Yes/No
Idli	Yes/No

Q3.5. Vinegar is used to give sour taste to food. Is there any other natural product that can be used in its place. Suggest any 2 .

……

……

Description of Answer Key & Credits

Q3.1

Domain : Scientific Literacy	Theme:Vinegar : uses in kitchen	Class: X Expected time: 3 min Total Credits : 2
Description of item: Text:Vinegar : Use in kitchen	Learning outcomes: Students will be able to distinguish between substances using acid- base indicators.	

Scientifc Literacy :

Framework System	Characteristics
Competency	Interpreting data and evidences scientifically
Knowledge system	Physical
Context	Global
Cognitive demand	Lower
Item format	Short response
Proficiency level	3

Credit Pattern:

Full credit: 2

Partial credit:1

No Credit:0

Description of answer key and credits:

Q3.1 full credit: test with any acid – base indicator No credit : other response

Q3.2

Domain : Scientific Literacy	Theme:Vinegar : uses in kitchen	Class: X Expected time: 5 min Total Credits : 2
Description of item: Text:Vinegar : Use in kitchen	Learning outcomes :Students will be able to prepare the solution of different concentration.	

Scientific Literacy :

Framework System	Characteristics
Competency	Interpreting data and evidences scientifically
Knowledge system	Physical
Context	Global
Cognitive demand	Medium
Item format	Short response
Proficiency level	3

Credit Pattern:

Full credit: 2

Partial credit:1

No Credit:0

Description of answer key and credits:

Q3.2 Full credit : 20 ml of acetic acid dissolved in 80 ml of water.
No credit : other response

Q3.3

Domain : Scientific Literacy	Theme:Vinegar : uses in kitchen	Class: X Expected time: 5 min Total Credits : 2
Description of item: Text:Vinegar : Use in kitchen	Learning outcomes:Students will be able to recall concept of homologous series. Students will be able to write the formula of members of acids.	

Scientific Literacy :

Framework System	Characteristics
Competency	Interpreting data and evidences scientifically
Knowledge system	Physical
Context	Global
Cognitive demand	Medium
Item format	closed constructed
Proficiency level	4

Credit Pattern:

Full credit: 2

Partial credit:1

No Credit:0

Description of answer key and credits:

Q 3.3 Full credit : C_2H_5COOH and C_4H_7COOH
No credit : other response

Q3.4

Domain : Scientific Literacy	Theme:Vinegar : uses in kitchen	Class: X Expected time: 5 min Total Credits : 8
Description of item: Text:Vinegar : Use in kitchen	Learning outcomes:Students will be able to correlate the science with the daily life.	

Scientific Literacy :

Framework System	Characteristics
Competency	Interpreting data and evidences scientifically
Knowledge system	Physical
Context	Global
Cognitive demand	Lower
Item format	Complex MCQ
Proficiency level	2

Credit Pattern:

Full credit: 2

Partial credit:1

No Credit:0

Description of answer key and credits:

Q3.4 a) Full credit : No
No credit : Yes
b) Full credit :Yes
No credit : No
c) Full credit : Yes
No credit : No
d) Full credit : No
No credit : Yes

Q3.5

Domain : Scientific Literacy	Theme:Vinegar : uses in kitchen	Class: X Expected time: 5 min Total Credits : 2
Description of item: Text:Vinegar : Use in kitchen	Learning outcomes:Students will be able to correlate the science with the daily life. Students will be able to distinguish between weak and strong acids.	

Scientific Literacy :

Framework System	Characteristics
Competency	Interpreting data and evidences scientifically
Knowledge system	Physical
Context	Personal
Cognitive demand	Medium
Item format	open constructed
Proficiency level	3

Credit Pattern:

Full credit: 2

Partial credit:1

No Credit:0

Description of answer key and credits:

Q3.5 Full credit : Tamarind ,yogurt , tomato and lemon
No credit : any other response

Name of teacher: Amita Arora
Designation: TGT (Sc.)
Phone:8561987719
e- mail:ameeto27@rediffmail.com
Name of Vidyalaya: K.V. NO. 6 Pratap Nagar, Jaipur
Name of region : Jaipur

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TEST ITEM-4

MANUFACTURING PROCESS OF SOAP

The fats and oils required for manufacturing soap are extracted from the plants and animals. To make the fatty acids called triglyceride molecule, 3 fatty acid molecules are bonded to 1 molecule of glycerine. Fatty acids are weak acids composed of 2 parts. A carboxylic acid group having 1 hydrogen atom, 2 oxygen atoms, and 1 carbon atom and a hydrocarbon chain attached to the carboxylic acid group.Earlier the alkali required for making soaps were obtained from the animals but now they are clinically composed. The common alkalis used in soap making are sodium hydroxide and potassium hydroxide.

Q4.1 . Why do we consider fatty acid as weak acid?

……..

……..

Q4.2. How are atoms in "Acid" functional group bonded together?

……

Q4.3. Each chemical has common name such as sodium chloride known as common salt .Similarly NaOH and KOH also have common names. Give the names.

.....

Q4.4. Sonali's mother has cracked hands due to washing clothes regularly. What are the possible reasons of it ?

……..

…….

Description of Answer Key & Credits

Q4.1

Domain : Scientific Literacy	Theme: Processing of Soap	Class: X Expected time: 5min Total Credits :2
Description of item: Text: Processing of soap	Learning outcomes:Students will understand the importance of chemistry in life.	

Scientific Literacy :

Framework System	Characteristic
Competency	Evaluate and design scientific inquiry
Knowledge system	Physical
Context	Personal
Cognitive demand	Medium
Item format	Short response
Proficiency level	2

Credit Pattern:

Full credit : 2

Partial credit:1

No Credit:0

Description of answer key and credits:

Q4.1 full credit : low ionization when dissolve in water or low conductivity of electricity Partial credit: any one given above No credit : any other response

Q4.2

Domain : Scientific Literacy	Theme: Processing of Soap	Class: X Expected time: 3 min Total Credits :2
Description of item: Text: Processing of soap	Learning outcomes:Students will understand the importance of chemistry in life.	

Scientific Literacy :

Framework System	Characteristic
Competency	Evaluate and design scientific inquiry
Knowledge system	Physical
Context	Personal
Cognitive demand	Lower
Item format	closed constructed
Proficiency level	3

Credit Pattern:

Full credit : 2

Partial credit:1

No Credit:0

Description of answer key and credits:

Q4.2 Full credit : structure of –COOH
No credit : other response

Q 4.3

Domain : Scientific Literacy	Theme: Processing of Soap	Class: X Expected time: 3 min Total Credits :2
Description of item: Text: Processing of soap	Learning outcomes:Students will understand the importance of chemistry in life.	

Scientific Literacy :

Framework System	Characteristic
Competency	Evaluate and design scientific inquiry
Knowledge system	Physical
Context	Personal
Cognitive demand	Medium
Item format	closed constructed
Proficiency level	3

Credit Pattern:

Full credit : 2

Partial credit:1

No Credit:0

Description of answer key and credits:

Q4.3 Full credit : caustic soda and caustic potash Partial Credit : Any one of the above No credit : other response

Q4.4

Domain : Scientific Literacy	Theme: Processing of Soap	Class: X Expected time: 5 min Total Credits :2
Description of item: Text: Processing of soap	Learning outcomes:Students will understand the importance of chemistry in life.	

Scientific Literacy :

Framework System	Characteristic
Competency	Evaluate and design scientific inquiry
Knowledge system	Physical
Context	Personal
Cognitive demand	Medium
Item format	closed constructed
Proficiency level	4

Credit Pattern:

Full credit : 2

Partial credit:1

No Credit:0

Description of answer key and credits:

Q4.4 Full credit : Due to soap with high amount of NaOH(base). No credit : other response

Name of teacher: Amita Arora
Designation: TGT (Sc.)
Phone:8561987719
e- mail:ameeto27@rediffmail.com
Name of Vidyalaya: K.V. NO. 6 Pratap Nagar, Jaipur
Name of region : Jaipur

……

TEST ITEM - 5

NEUTRALISATION REACTION

It is a chemical reaction in which an acid and a base react quantitatively with each other. In a reaction in water, neutralization results in their being no excess of hydrogen or hydroxide ions present in the solution. The pH of the neutralized solution depends on the strength of the reactants.

It has many applications in our daily life. The stings of wasp is also treated with vinegar to neutralize its effect .Farmers uses chemicals to treat acidic and basic soils to make it neutral. Toothpaste helps in treating tooth decay caused by sweets. The sting of bee has formic acid neutralized by applying baking soda.

Q5.1. What are the end products of neutralization reaction?

……

Q5.2. Are stings of bees and wasps same ? Give reason for your answer.

……

Q5.3. What happens when we replace HCl with HNO_3 and NaOH by KOH. Which salt will be formed during this reaction?

……

Q5.4 . Identify the nature of reactant which can neutralize the given reactant:

S.NO.	Reactant	Nature of missing reactant
1	$Mg(OH)_2$	Acid / Base
2	H_2SO_4	Acid / Base
3.	HCOOH	Acid / Base

Description of Answer Key & Credits

Q 5.1

Domain : Scientific Literacy	Theme: Neutralisation	Class:X Expected time:3 min Total Credits :2
Description of item: Text and image	Learning outcomes:Students will be able to recall the neutralization reaction.	

Scientific Literacy :

Framework System	Characteristic
Competency	Evaluate and design scientific inquiry
Knowledge system	Physical
Context	Personal
Cognitive demand	Lower
Item format	Short response
Proficiency level	1

Credit Pattern:

Full credit : 2

Partial credit:1

No Credit: 0

Description of answer key and credits:

Q5.1 Full credit : salt and water Partial credit : any one No credit : any other response

Q5.2

Domain : Scientific Literacy	Theme: Neutralisation	Class:X Expected time: 5 min Total Credits : 2
Description of item: Text and image	Learning outcomes:Students will be able to differentiate between acidic and basic nature of substances.	

Scientific Literacy :

Framework System	Characteristic
Competency	Evaluate and design scientific inquiry
Knowledge system	Physical
Context	Personal
Cognitive demand	Medium
Item format	closed constructed
Proficiency level	3

Credit Pattern:

Full credit : 2

Partial credit:1

No Credit: 0

Description of answer key and credits:

Q5.2 Full credit : No, wasp's sting is basic in nature while bee's sting is acidic in nature.
Partial credit : No
No credit : other response

Q5.3

Domain : Scientific Literacy	Theme: Neutralisation	Class: Expected time: 5 min Total Credits :2
Description of item: Text and image	Learning outcome : Students will be able write the chemical reaction.	

Scientific Literacy :

Framework System	Characteristic
Competency	Evaluate and design scientific inquiry
Knowledge system	Physical
Context	Personal
Cognitive demand	Medium
Item format	closed constructed
Proficiency level	3

Credit Pattern:

Full credit : 2

Partial credit:1

No Credit: 0

Description of answer key and credits:

Q 5.3 Full credit : $HNO_3 + KOH \longrightarrow KNO_3 + H_2O$ and KNO_3
Partial credit : equation or KNO_3
No credit : Other response

Q5.4

Domain : Scientific Literacy	Theme: Neutralisation	Class:X Expected time:5 min Total Credits : 8
Description of item: Text and image	Learning outcomes: Students will be able to recall the neutralisation reaction. Students will be able write the chemical reaction.	

Scientific Literacy :

Framework System	Characteristic
Competency	Evaluate and design scientific inquiry
Knowledge system	Physical
Context	Personal
Cognitive demand	LOWER
Item format	Complex MCQ
Proficiency level	2

Credit Pattern:

Full credit : 2

Partial credit:1

No Credit: 0

Description of answer key and credits:

Q5.4 Full credit : Acid
No credit : base
4Full credit : Base
No credit : acid
4Full credit : Base
No credit : acid

Name of teacher: Amita Arora
Designation: TGT (Sc.)
Phone:8561987719
e- mail:ameeto27@rediffmail.com
Name of Vidyalaya: K.V. NO. 6 Pratap Nagar, Jaipur
Name of region : Jaipur

…….

CRITICAL AND CREATIVE THINKING TEST ITEMS

CLASS X SUB: SCIENCE

CH-5 PERIODIC CLASSIFICATION OF ELEMENTS

INDEX

TEST ITEM -1

IUPAC NOMENCLATURE OF ELEMENTS

While studying the arrangement of elements Aditya found that there are some elements with atomic number greater than 100 have not named till now as per the periodic table. He tried to find the system to know their names and he found that IUPAC recommended a system of naming new elements till they have given a proper name. the table for naming the elements is given below. With every name a suffix 'ium' is added.

Digit	0	1	2	3	4	5	6	7	8	9
Root	Nil	Un	Bi	tri	quad	pent	hep	sept	oct	Enn
abbreviation	N	U	B	t	q	p	h	s	o	e

Q1.1 The IUPAC name for the element with atomic number 120 is

(a) Ununquadrdium
(b) Unununium
(c) Unbinilium
(d) Unmilennium

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	**Theme: PERIODIC CLASSIFICATION OF ELEMENTS** **Unit name:** IUPAC NOMENCLATURE OF ELEMENTS	Class : X Expected time: 05 mines. Total Credit: 02
Description of item: Text Image	**Learning Outcome:** **ability to get and grasp the main idea.** **Analyse and interpret the given text and table**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific knowledge
Knowledge –system	Physical system
Context	GLOBAL
Cognitive demand	medium
Item Format	open ended question
Proficiency Level	3

Credit Pattern :
Full credit : 2
Partial credit : 1
No credit : 0

Description of answer key and credits :

Q1.1 Full credit – (c) unbinilium No credit – any other answer / missing.

Q2.2 The symbol for IUPAC element unnilquadium is

(a) unt
(b) unq
(c) uno
(d) uub

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	**Theme: PERIODIC CLASSIFICATION OF ELEMENTS** **Unit name:** IUPAC NOMENCLATURE OF ELEMENTS	Class : X Expected time: 05 mins. Total Credit: 02
Description of item: Text Image	**Learning Outcome:** **[As per NCERT] ability to get and grasp the main idea.** • **Analyse and interpret the given text and table**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	understanding
Knowledge –system	Physical system
Context	GLOBAL
Cognitive demand	Medium
Item Format	closed ended question
Proficiency Level	2

Credit Pattern :
Full credit : 2
Partial credit : 1
No credit : 0

Description of answer key and credits :

Q1.2 Full credit – (b) unq No credit – any other answer / missing.

Q1.3 What is the name and symbol of element with atomic number 118?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	**Theme: PERIODIC CLASSIFICATION OF ELEMENTS** **Unit name:** IUPAC NOMENCLATURE OF ELEMENTS	Class : X Expected time: 05 mins. Total Credit: 02
Description of item: Text Image	**Learning Outcome:** **[As per NCERT] ability to get and grasp the main idea.** • **Analyse and interpret the given text and table**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific knowledge
Knowledge –system	Physical system
Context	GLOBAL
Cognitive demand	Medium
Item Format	closed ended question
Proficiency Level	3

Credit Pattern :
Full credit : 2
Partial credit : 1
No credit : 0

Description of answer key and credits :

Q1.3 Full credit – Name - ununoctium Symbol - uuo No credit – any other answer / missing.

Q1.4 Write the name and atomic number of element with symbol uuu

---

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	**Theme: PERIODIC CLASSIFICATION OF ELEMENTS** **Unit name:** IUPAC NOMENCLATURE OF ELEMENTS	Class : X Expected time: 05 mins. Total Credit: 02
Description of item: Text Image	**Learning Outcome:** **[As per NCERT] ability to get and grasp the main idea.** • **Analyse and interpret the given text and table**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific knowledge
Knowledge –system	Physical system
Context	GLOBAL
Cognitive demand	Low
Item Format	closed ended question
Proficiency Level	2

Credit Pattern :

Full credit : 2

Partial credit : 1

No credit : 0

Description of answer key and credits :

Q1.4 Full credit – Name – unununium Atomic number – 111 No credit – any other answer / missing.

Name of the Teacher/Item Writer: **MANISHA GUPTA**
Designation: **PGT (PHYSICS)**
Email: manishagupta2008@gmail.com

Phone no.: **9452241952**

Name of the Vidyalaya: **KV AMC, LUCKNOW**

KVS Region: **LUCKNOW REGION.**

…….

TEST ITEM- 2

ELEMENT POSITION IN PERIODIC TABLE

Three elements X, Y, and Z have atomic numbers 10, 21 and 32 respectively. Garima wants to explain the properties of these elements according to the Modern Periodic Table. On studying the modern periodic table, Garima could answer the following questions.

Q2.1 In which group does the element X exist?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	**Theme: PERIODIC CLASSIFICATION OF ELEMENTS** **Unit name:** ELEMENT POSITION IN PERIODIC TABLE	Class : X Expected time: 05 mins. Total Credit: 02
Description of item: Text	**Learning Outcome:** **[As per NCERT] ability to get and grasp the main idea.** • **use of conventional knowledge**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific knowledge
Knowledge –system	Physical system
Context	GLOBAL
Cognitive demand	Low
Item Format	closed ended question
Proficiency Level	2

Credit Pattern :

Full credit : 2

Partial credit : 1

No credit : 0

Description of answer key and credits :

Q2.1 Full credit – 18th group No credit – any other answer / missing.

Q2,2 In which period does the element Y exist?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	**Theme: PERIODIC CLASSIFICATION OF ELEMENTS** Unit name: ELEMENT POSITION IN PERIODIC TABLE	Class : X Expected time: 05 mins. Total Credit: 02
Description of item: Text	**Learning Outcome:** **[As per NCERT] ability to get and grasp the main idea.** • **use of conventional knowledge**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific knowledge
Knowledge –system	Physical system
Context	GLOBAL
Cognitive demand	Low
Item Format	closed ended question
Proficiency Level	2

Credit Pattern :
Full credit : 2
Partial credit : 1
No credit : 0

Description of answer key and credits :

Full credit – 4th period NO credit – any other answer / missing.

Q2.3 What is the valency of element Z?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	**Theme: PERIODIC CLASSIFICATION OF ELEMENTS** Unit name: ELEMENT POSITION IN PERIODIC TABLE	Class : X Expected time: 05 mins. Total Credit: 02
Description of item: Text	**Learning Outcome:** **[As per NCERT] ability to get and grasp the main idea.** • **use of conventional knowledge**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge –system	Physical system
Context	GLOBAL
Cognitive demand	Low
Item Format	closed ended question
Proficiency Level	2

Credit Pattern :
Full credit : 2
Partial credit : 1
No credit : 0

Description of answer key and credits :

Q2.3 Full credit – 4 NO credit – any other answer / missing.

Q2.4 Arrange the three elements X, Y and Z from non-metal to metal.

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	**Theme: PERIODIC CLASSIFICATION OF ELEMENTS** Unit name: FIVE STATES OF MATTER	Class : X Expected time: 05 mins. Total Credit: 02
Description of item: Text	**Learning Outcome:** **[As per NCERT] ability to get and grasp the main idea.** • **use of conventional knowledge**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge –system	Physical system
Context	GLOBAL
Cognitive demand	Low
Item Format	closed ended question
Proficiency Level	2

Credit Pattern :
Full credit : 2
Partial credit : 1
No credit : 0

Description of answer key and credits :

Q2.4 Full credit – X, Z, Y No credit – any other answer / missing.

Name of the Teacher/Item Writer: **MANISHA GUPTA**
Designation: **PGT (PHYSICS)**
Email: manishagupta2008@gmail.com

Phone no.: **9452241952**

Name of the Vidyalaya: **KV AMC, LUCKNOW**

KVS Region: **LUCKNOW REGION.**

TEST ITEM-3

CHEMICAL NATURE OF ELEMENTS ACCORDING TO POSITION IN PERIODIC TABLE

Abdul and Raghav were discussing about the chemical nature of elements as they are given the position in modern periodic table. Raghav wanted to know about the metallic and non-metallic nature of the elements while Abdul was interested in oxidation of elements. After studying the periodic table thoroughly and discussion they are able to understand the position of chemicals and their chemical nature. Raghav told that on moving from left to right on periodic table, the nature of elements change from metal to non-metal.

Q3.1 Abdul said Ca^{20} will form oxide by reacting with oxygen as CaO_2. Do you agree with Abdul? Justify your answer.

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	**Theme: PERIODIC CLASSIFICATION OF ELEMENTS** Unit name: CHEMICAL NATURE OF ELEMENTS ACCORDING TO PERIODIC TABLE	Class : X Expected time: 05 mins. Total Credit: 02
Description of item: Text	**Learning Outcome:** **[As per NCERT] ability to get and grasp the main idea.** • **use of scientific learning and conventional outcome**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge –system	Physical system
Context	GLOBAL
Cognitive demand	Low
Item Format	closed ended question
Proficiency Level	2

Credit Pattern :

Full credit : 2

Partial credit : 1

No credit : 0

Description of answer key and credits :

Q3.1 Full credit – CaO_2 is not correct because the valency of Calcium and Oxygen both is 2. So the compound will be CaO. No credit – any other answer / missing.

Q3.2 Raghav said that along the period of periodic table, metallic nature of elements decreases. Is he correct?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	**Theme: PERIODIC CLASSIFICATION OF ELEMENTS** Unit name: CHEMICAL NATURE OF ELEMENTS ACCORDING TO PERIODIC TABLE	Class : X Expected time: 05 mins. Total Credit: 02
Description of item: Text	**Learning Outcome:** **[As per NCERT] ability to get and grasp the main idea.** • **use of scientific learning and conventional outcome**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge –system	Physical system
Context	GLOBAL
Cognitive demand	Low
Item Format	closed ended question
Proficiency Level	2

Credit Pattern :

Full credit : 2

Partial credit : 1

No credit : 0

Description of answer key and credits :

Q 3.2 Full credit – Raghav is correct. According to modern periodic table the elements are arranges from metals to non-metals. No credit – any other answer / missing.

Q3.3 Iron forms its oxide as Fe_2O_3 and Fe_3O_4. Give reason for such behavior of iron.

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	**Theme: PERIODIC CLASSIFICATION OF ELEMENTS** Unit name: CHEMICAL NATURE OF ELEMENTS ACCORDING TO PERIODIC TABLE	Class : X Expected time: 05 mins. Total Credit: 02
Description of item: Text	**Learning Outcome:** **[As per NCERT] ability to get and grasp the main idea.** • **use of scientific learning and conventional outcome**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge –system	Physical system
Context	GLOBAL
Cognitive demand	Low
Item Format	closed ended question
Proficiency Level	3

Credit Pattern :

Full credit : 2

Partial credit : 1

No credit : 0

Description of answer key and credits :

Q3.3 Full credit – Iron lies in d-block of periodic table, therefore its valency is not fixed but it varies. So its chemical nature also changes. It makes three oxides as FeO, Fe_2O_3 and Fe_3O_4. No credit – any other answer / missing.

Q3.4 Raghav said that between sodium hydroxide and potassium hydroxide, NaOH is more basic in nature. According to you which is more basic NaOH or KOH?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	**Theme: PERIODIC CLASSIFICATION OF ELEMENTS** Unit name: CHEMICAL NATURE OF ELEMENTS ACCORDING TO PERIODIC TABLE	Class : IX Expected time: 05 mins. Total Credit: 02
Description of item: Text	**Learning Outcome:** **[As per NCERT] ability to get and grasp the main idea.** • **use of scientific learning and conventional outcome**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge –system	Physical system
Context	GLOBAL
Cognitive demand	Low
Item Format	closed ended question
Proficiency Level	2

Credit Pattern :

Full credit : 2

Partial credit : 1

No credit : 0

Description of answer key and credits :

Q3.4 Full credit – According to me NaOH is more basic because Na is more metallic in nature as it lies above K in modern periodic table. No credit – any other answer / missing.

Name of the Teacher/Item Writer: **MANISHA GUPTA**
Designation: **PGT (PHYSICS)**
Email: manishagupta2008@gmail.com

Phone no.: **9452241952**

Name of the Vidyalaya: **KV AMC, LUCKNOW**

KVS Region: **LUCKNOW REGION.**

…….

TEST ITEM -4

ANOMALY IN MODERN PERIODIC TABLE

Meenal studied the modern periodic table and found some anomalies in it. She found two positions of hydrogen in periodic table while helium get a special position. Similarly after lanthanum with atomic number 57, the next element is not Cesium with atomic number 58. But there is another element Hafnium with atomic number 72. Similarly after Actinium with atomic number 89, next element is not thorium with atomic number 90 but there is another element Rutherfordium with atomic number 104. She found that at the bottom of periodic table there are two series of elements in which these missing elements are placed. These series are named as lanthanides and actinides. She wanted to know the reason behind it.

Q4.1 Hydrogen has given two positions in the periodic table. Give reason.

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	**Theme: PERIODIC CLASSIFICATION OF ELEMENTS** Unit name: ANOMALY IN MODERN PERIODIC TABLE	Class : X Expected time: 05 mins. Total Credit: 02
Description of item: Text	**Learning Outcome:** **[As per NCERT] ability to get and grasp the main idea.** • **Analysis the given content and use of conventional knowledge**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge –system	Physical system
Context	GLOBAL
Cognitive demand	Low
Item Format	open ended question
Proficiency Level	3

Credit Pattern :

Full credit : 2

Partial credit : 1

No credit : 0

Description of answer key and credits :

Q4.1 Full credit – Hydrogen has only one electron. It has a tendency of receiving and giving to complete its octet. Due to its dual tendency it has given two positions in periodic table. No credit – any other answer / missing.

Q4.2 Helium has not got a proper position in periodic table. It has only two electrons in its orbit but it lies in 18th group. According to preparation of periodic table it should be in 2nd group. Justify the reason.

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	**Theme: PERIODIC CLASSIFICATION OF ELEMENTS** Unit name: ANOMALY IN MODERN PERIODIC TABLE	Class : X Expected time: 05 mins. Total Credit: 02
Description of item: Text	**Learning Outcome:** **[As per NCERT] ability to get and grasp the main idea.** • **Analysis the given content and use of conventional knowledge**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge –system	Physical system
Context	GLOBAL
Cognitive demand	Low
Item Format	open ended question
Proficiency Level	2

Credit Pattern :
Full credit : 2
Partial credit : 1
No credit : 0

Description of answer key and credits :

Q4.2 Full credit – Helium has only two electrons. Its outermost orbit is already completed as first orbit require only two electrons in it. It behaves as ideal or inert gas. Therefore it is kept in 18^{th} group with inert gases. No credit – any other answer / missing.

Q4.3 In 6^{th} period, after lanthanum of atomic number 57, the next element is Hafnium with atomic number 72 instead of Cesium of atomic number 58. Why?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	**Theme: PERIODIC CLASSIFICATION OF ELEMENTS** Unit name: ANOMALY IN MODERN PERIODIC TABLE	Class : X Expected time: 05 mins. Total Credit: 02
Description of item: Text	**Learning Outcome:** **[As per NCERT] ability to get and grasp the main idea.** • **Analysis the given content and use of conventional knowledge**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge –system	Physical system
Context	GLOBAL
Cognitive demand	Low
Item Format	open ended question
Proficiency Level	2

Credit Pattern :

Full credit : 2

Partial credit : 1

No credit : 0

Description of answer key and credits :

Q4.3 Full credit – After Lanthanum, next element Cesium has different chemical properties in comparison to element above it which is Zirconium. Similarly after it some element have different properties. Therefore they are kept at different position as f-block. No credit – any other answer / missing.

Name of the Teacher/Item Writer: **MANISHA GUPTA**
Designation: **PGT (PHYSICS)**
Email: manishagupta2008@gmail.com

Phone no.: **9452241952**

Name of the Vidyalaya: **KV AMC, LUCKNOW**

KVS Region: **LUCKNOW REGION.**

…….

TEST ITEM -5

POSITION OF ISOTOPES AND ISOBARS IN PERIODIC TABLE

Mohan's teacher taught him the modern periodic table. He told that the periodic table is made according to the atomic number of the elements. He also taught that these elements have special characteristics of being metallic nature in organized manner. As the atomic number of an element increases its mass number also increases. While teaching about elements he also told that some elements have same atomic number but different mass number these are called as isotopes. These are always the same elements with different number of neutrons. Some elements have same mass number but different atomic number. These are different elements with different numbers of protons and neutrons but the sum of proton and neutron in the nucleus is always same.

Q5.1 While studying the carbon dating, Mohan came to know about an isotope of carbon as C^{14}. At which position in modern periodic table you will place it and why?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	**Theme: PERIODIC CLASSIFICATION OF ELEMENTS** Unit name: POSITION OF ISOTOPES AND ISOBARS IN PERIODIC TABLE	Class : X Expected time: 05 mins. Total Credit: 02
Description of item: Text	**Learning Outcome:** **[As per NCERT] ability to get and grasp the main idea.** • **use of conventional knowledge**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge –system	Physical system
Context	GLOBAL
Cognitive demand	Low
Item Format	open ended question
Proficiency Level	2

Credit Pattern :
Full credit : 2
Partial credit : 1
No credit : 0

Description of answer key and credits :

Q5.1 Full credit – C^{14} will be placed at same position as C^{12} because periodic table is made according to atomic number and both the elements have same atomic number. No credit – any other answer / missing.

Q5.2 C^{14} and N^{14} has same mass number as 14. Can you place them at same position in modern periodic table?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	**Theme: PERIODIC CLASSIFICATION OF ELEMENTS** Unit name: POSITION OF ISOTOPES AND ISOBARS IN PERIODIC TABLE	Class : X Expected time: 05 mins. Total Credit: 02
Description of item: Text	**Learning Outcome:** **[As per NCERT] ability to get and grasp the main idea.** • **use of conventional knowledge**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	
Knowledge –system	Physical system
Context	GLOBAL
Cognitive demand	Low
Item Format	open ended question
Proficiency Level	2

Credit Pattern :
Full credit : 2
Partial credit : 1
No credit : 0

Description of answer key and credits :

Q5.2 Full credit – C^{14} and N^{14} can not be placed at same position because the atomic number of carbon is 6 while that of nitrogen is 7. So they are placed at different position. No credit – any other answer / missing.

Q5.3 What do you understand by carbon dating?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	**Theme: PERIODIC CLASSIFICATION OF ELEMENTS** Unit name: POSITION OF ISOTOPES AND ISOBARS IN PERIODIC TABLE	Class : X Expected time: 05 mins. Total Credit: 02
Description of item: Text	**Learning Outcome:** **[As per NCERT] ability to get and grasp the main idea.** • **use of conventional knowledge**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge –system	Physical system
Context	GLOBAL
Cognitive demand	Low
Item Format	closed ended question
Proficiency Level	2

Credit Pattern :

Full credit : 2

Partial credit : 1

No credit : 0

Description of answer key and credits :

Q5.3 Full credit – Carbon dating is a process to find the age of fossils and rocks. C^{14} is a radioactive element and found in every fossil. Its half life time is 5730 years. By knowing the amount of it present in any fossil or rock and decayed amount, its age can be calculated. No credit – any other answer / missing.

Q5.4 What is the difference between isotopes and isobars?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	**Theme: PERIODIC CLASSIFICATION OF ELEMENTS** Unit name: POSITION OF ISOTOPES AND ISOBARS IN PERIODIC TABLE	Class : X Expected time: 05 mins. Total Credit: 02
Description of item: Text	**Learning Outcome:** **[As per NCERT] ability to get and grasp the main idea.** • **use of conventional knowledge**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge –system	Physical system
Context	GLOBAL
Cognitive demand	Low
Item Format	closed ended question
Proficiency Level	2

Credit Pattern :
Full credit : 2
Partial credit : 1
No credit : 0

Description of answer key and credits :

Q5.4 Full credit – Isotopes are the elements with same atomic number but different mass number. Their chemical properties are same. Isobars are elements with same mass number but different atomic number. Their chemical properties are different. No credit – any other answer / missing.

Name of the Teacher/Item Writer: **MANISHA GUPTA**
Designation: **PGT (PHYSICS)**
Email: manishagupta2008@gmail.com

Phone no.: **9452241952**

Name of the Vidyalaya: **KV AMC, LUCKNOW**

KVS Region: **LUCKNOW REGION.**

…….

TEST ITEM -6

PERIODIC ELEMENTS

Table below represents the elements known in 19th century placed in a particular manner-

No.	No.	No.	No.	No.	No.	No.	No.
H 1	F 8	Cl 15	Co & Ni 22	Br 29	Pd 36	I 42	Pt & Ir 50
Li 2	Na 9	K 16	Cu 23	Rb 30	Ag 37	Cs 44	Os 51
G 3	Mg 10	Ca 17	Zn 24	Sr 31	Cd 38	Ba & V 45	Hg 52
Bo 4	Al 11	Cr 19	Y 25	Ce & La 33	U 40	Ta 46	Tl 53
C 5	Si 12	Ti 18	In 26	Zr 32	Sn 39	W 47	Pb 54
N 6	P 13	Mn 20	As 27	Di & Mo 34	Sb 41	Nb 48	Bi 55
O 7	S 14	Fe 21	Se 28	Ro & Ru 35	To 43	Au 49	Th 56

Answer the following questions regarding this table

Q6.1 What does this table show

(i) If elements are placed in increasing order of their atomic masses, each 8th element show same property as the first element.

(ii) If elements are placed in increasing order of their atomic numbers, each 8thelement show same property as the first element.

(iii) Elements that are placed in same group in above table show same properties.

(iv) All the elements are placed randomly they have no similarity in properties and relate the process

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit:** Periodic elements	Class :X Expected time: 5 min Total Credit: 02
Description of item: Text Table	**Learning Outcome :**Analysis of data	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge –system	Physical
Context	Global
Cognitive demand	Low
Item Format	Simple MCQ
Proficiency Level	1a

Credit Pattern :
Full credit : 2
Partial credit : 1
Nil credit : 0

Description of answer key and credits :

Q6.1 Full credit – (ii) Nil credit – any other answer / missing.

Q6.2 What should be the name of the 'law' representing such repetition in the properties of elements?

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit:** Periodic elements	Class :X Expected time: 1 min Total Credit: 02
Description of item: Text Table	**Learning Outcome:** tolerate processes **[As per NCERT]**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Evaluating and designing scientific enquiry
Knowledge -system	Physical system
Context	Global
Cognitive demand	Low
Item Format	Open constructed
Proficiency Level	1a

Credit Pattern :

Full credit : 2
Partial credit : 1
Nil credit : 0

Description of answer key and credits :

Q6.2 Full credit –Law of octaves Nil credit – any other answer / missing.

Q6.3 What do you think, why Co &Ni, Ce & La, Di & Mo, Ro & Ru, Ba & V, Pt &Ir are placed in same slot?

Domain: Scientific literacy	**Theme:**Classification of periodic elements **Unit:** Periodic elements	Class :X Expected time: 1 min Total Credit: 02
Description of item: Text Table	**Learning Outcome:** relate processes	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Explaining phenomenon scientifically
Knowledge -system	Physical system
Context	Global
Cognitive demand	Low
Item Format	Open constructed
Proficiency Level	1a

Credit Pattern :

Full credit : 2

Partial credit : 1

Nil credit : 0

Description of answer key and credits :

Q6.3 Full credit –Because they have same properties Nil credit – any other answer / missing.

Q6.4 What are the shortcomings of the table that you notice

a. Only elements having mass number upto 56 are placed in the table.
b. Iron which resembles cobalt and nickel in properties has been placed far away from these elements.
c. This similarity in properties is only applicable till calcium.

Which of the following statements is/ are correct?

(i) Only (a)
(ii) (a) and (b)
(iii) (a), (b), (c)
(iv) Only (b)

Domain: Scientific literacy	**Theme:**Classification of periodic elements **Unit:** Periodic elements	Class :X Expected time: 2 min Total Credit: 02
Description of item: Text Table	**Learning Outcome:** Applying learning and differentiates **[As per NCERT]**	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge -system	Physical system
Context	Global
Cognitive demand	Low
Item Format	Open constructed
Proficiency Level	2

Credit Pattern :

Full credit : 2

Partial credit : 1

Nil credit : 0

Description of answer key and credits :

Q6.4 Full credit –(iii) Nil credit – any other answer / missing.

Q6.5 At present total 118 elements are known. If it is required to place all the known elements in the same table given, how many more (horizontal) periods are needed ?

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit**: periodic elements	Class :X Expected time: 3 min Total Credit: 02
Description of item: Text Table	**Learning Outcome:** **know about** (horizontal) periods	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	.Evaluating and designing scientific enquiry
Knowledge -system	physical
Context	global
Cognitive demand	Low
Item Format	Simple MCQ
Proficiency Level	1a

Credit Pattern :

Full credit : 2

Partial credit : 1

Nil credit : 0

Description of answer key and credits :

Q6.5 Full credit – 8 Nil credit – any other answer / missing.

……..

TEST ITEM -7

HENRY MOSELEY'S CONTRIBUTION TO PERIODIC TABLE

Henry Moseley was an outstanding skilled experiment physicist. In 1913 Moseley celebrated his 26th birthday. Dmitri Mendeleev's periodic table was older. It had been around for 44 years. New chemical elements were still being discovered and added to it.

Since Mendeleev's time, elements in the periodic table had been arranged according to their atomic weights and their chemical properties.

There was, however a basic flaw in the table : the position predicted by an element's atomic weight did not always match the position predicted by its chemical properties. In these cases elements were positioned in the periodic table according to their properties, rather than their atomic weight.

Use the information given in above passage to answer the following questions-

Q7.1 Was it possible that elements could have a more fundamental property than atomic weight? If yes, which property is this?

<table>
<tr><td>Domain: Scientific literacy</td><td>Theme: Classification of periodic elements
Unit: Henry Moseley's contribution to periodic table.</td><td>Class :X
Expected time: 5 min
Total Credit: 02</td></tr>
<tr><td>Description of item:<table><tr><td></td><td>Text</td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr><tr><td></td><td></td></tr></table></td><td colspan="2">Learning Outcome: application of learning</td></tr>
</table>

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Explaining phenomenon scientifically
Knowledge -system	physical
Context	global
Cognitive demand	Low
Item Format	Open constructed
Proficiency Level	1a

Credit Pattern :

Full credit : 2
Partial credit : 1
Nil credit : 0

Description of answer key and credits :

Q7.1 Full credit – Yes, atomic number Nil credit – any other answer / missing.

Q7.2 What does the atomic number of an element represent?

(i) amount of charge in atom's nucleus
(ii) number of nucleons in nucleus
(iii) number of nucleus
(iv) number of neutrons

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit**: Henry Moseley's contribution to periodic table.	Class :X Expected time: 2 min Total Credit: 02
Description of item: Text	**Learning Outcome:** application of learning	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge –system	physical
Context	global
Cognitive demand	Low
Item Format	Open constructed
Proficiency Level	1a

Credit Pattern :
Full credit : 2

Partial credit : 1
Nil credit : 0

Description of answer key and credits :

Q7.2 Full credit – (i) Nil credit – any other answer / missing.

Q7.3 Moseley saw gaps in the new periodic table. He predicted the existence of 4 new elements-

(a) technetium
(b) promethium
(c) hafnium
(d) rhenium

Which of the above elements was/were discovered?

(i) (a) and (b)
(ii) (a) and (c)
(iii) (a), (b), (c), (d)
(iv) (a), (b), (c)

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit**: Henry Moseley's contribution to periodic table.	Class :X Expected time: 1 min Total Credit: 02
Description of item: Text	**Learning Outcome** gaps in the new periodic table	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge -system	physical

Context	global
Cognitive demand	Medium
Item Format	Open constructed
Proficiency Level	2

Credit Pattern :
Full credit : 2
Partial credit : 1
Nil credit : 0

Description of answer key and credits :

Q7.3 Full credit – (iii) Nil credit – any other answer / missing.

Q7.5 What were the other contributions of Moseley in the field of science?

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit**: Henry Moseley's contribution to periodic table.	Class :X Expected time: 2 min Total Credit: 02
Description of item: Text	**Learning Outcome:** applying learning	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS

Competency	Evaluating and designing scientific enquiry
Knowledge -system	physical
Context	global
Cognitive demand	Low
Item Format	Open constructed
Proficiency Level	1a

Credit Pattern :

Full credit : 2

Partial credit : 1

Nil credit : 0

Description of answer key and credits :

Q7.5 Full credit : X- ray spectra, contribution to understanding of periodic table Partial credit: if any other answer given is correct example Nil credit – any other answer / missing.

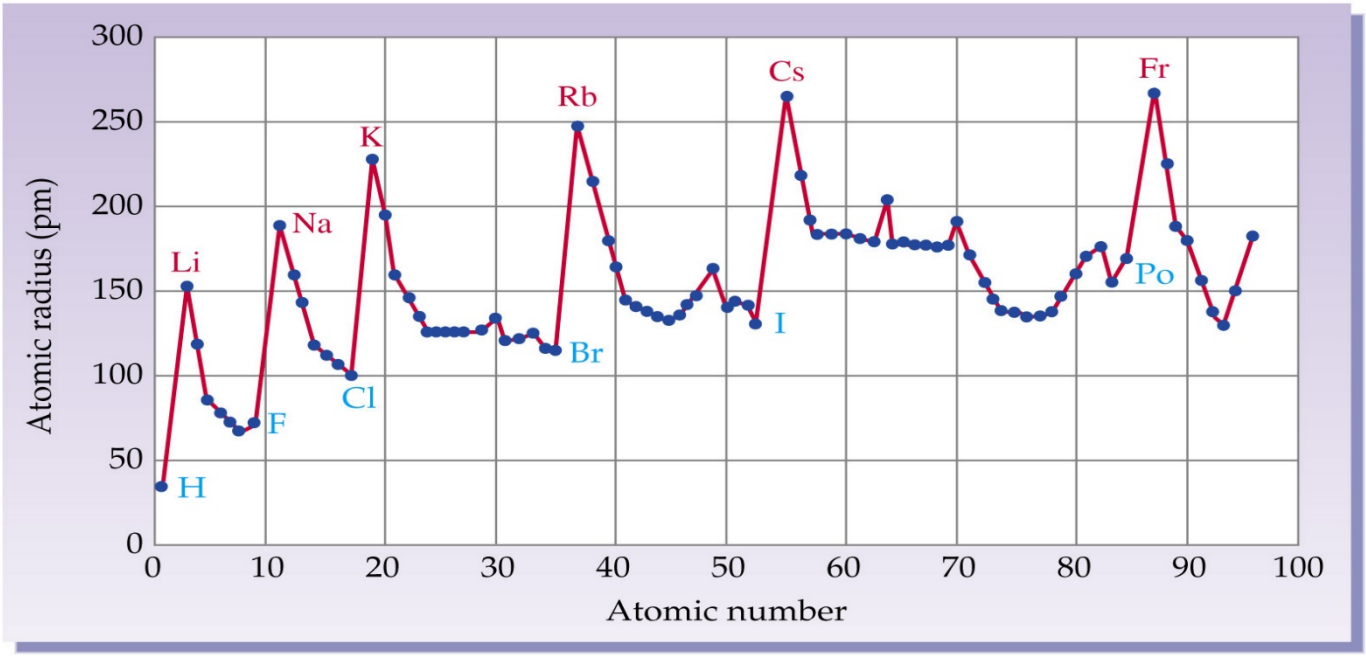
……..

TEST ITEM-8

ATOMIC SIZE

The size of atoms is important when trying to explain the behaviour of atoms. The term atomic size refers to the radius of an atom. It is the distance between the centre of nucleus and the outermost shell of an isolated atom.

A graph showing the variation of atomic radius with atomic number for 1st and 17th group of the periodic table is shown below. Observe the graph carefully and answer the following questions-



Q8.1 What does this graph indicate?

(i) On increasing the atomic number atomic radii of elements increase
(ii) On increasing mass number atomic radii of elements increase
(iii) On going down in a period atomic radii of elements increase
(iv) On going down in a group atomic radii of elements decreases

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit**: atomic size	Class :X Expected time: 5 min Total Credit: 02

Description of item: Text Graph	**Learning Outcome:** analyzing the graph	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge -system	physical
Context	global
Cognitive demand	Low
Item Format	Simple MCQ
Proficiency Level	1b

Credit Pattern :

Full credit : 2

Partial credit : 1

Nil credit : 0

Description of answer key and credits :

Q8.1 Full credit :(iii)

Nil credit – any other answer / missing.

Q8.2 Atomic number of F is 9, while that of Li 3 even then atomic radius of Li is greater than F why?

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit**: atomic size	Class :X Expected time: 3 min Total Credit: 02

Description of item: Text Graph	**Learning Outcome:** applying scientific concepts	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Evaluating and designing scientific enquiry
Knowledge -system	physical
Context	global
Cognitive demand	Low
Item Format	Closed constructed
Proficiency Level	1a

Credit Pattern :

Full credit : 2

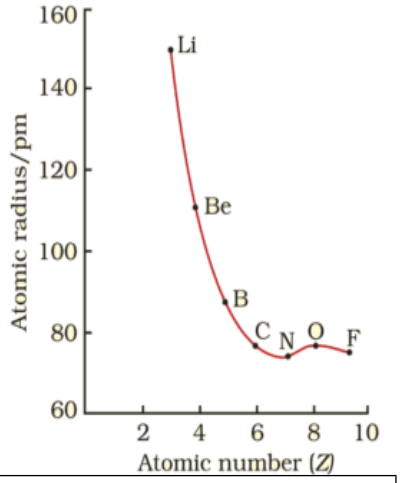
Partial credit : 1

Nil credit : 0

Description of answer key and credits :

Q8.2 Full credit -: On moving from left to right in a period, atomic radius decreases.
OR
On moving from left to right in a period, nuclear charge increases which tends to pull the electrons closer to nucleus and reduces the size of the atom
Nil credit – any other answer / missing.

Q8.3 In the given graph atomic radius of O is greater than N, is it true? Explain.



Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit**: atomic size	Class :X Expected time: 3 min Total Credit: 02

Description of item: Text Graph	**Learning Outcome:**analyzing andapplying learning	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge -system	physical
Context	global
Cognitive demand	Low
Item Format	Open constructed
Proficiency Level	2

Credit Pattern :

Full credit : 2

Partial credit : 1

Nil credit : 0

Description of answer key and credits :

Q 8.3 Full credit :: Yes, this is because N has unpaired electrons
Nil credit – any other answer / missing.

Q8.4 Arrange the following elements in increasing order of their radius-

H, Na, Ca, Cl, I, O, C, Ne.

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit**: atomic size	Class :X Expected time: 2 min Total Credit: 02

Description of item:		**Learning Outcome:** analyze and interpret data
	Text	
	Graph	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge -system	physical
Context	global
Cognitive demand	Low
Item Format	Closed constructed
Proficiency Level	1a

Credit Pattern :

Full credit : 2

Partial credit : 1

Nil credit : 0

Description of answer key and credits :

Q8.4 Full credit - H<O<C<Ne<Cl<Na<Ca<I Nil credit – any other answer / missing.

Q8.5 How does the radii of inert gases vary in a period?

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit**: atomic size	Class :X Expected time: 1 min Total Credit: 02

Description of item: Text	**Learning Outcome:** applying learning and using scientific conventions	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Expalining phenomenon scientifically
Knowledge –system	physical
Context	global
Cognitive demand	Medium
Item Format	Open constructed
Proficiency Level	3

Credit Pattern :

Full credit : 2

Partial credit : 1

Nil credit : 0

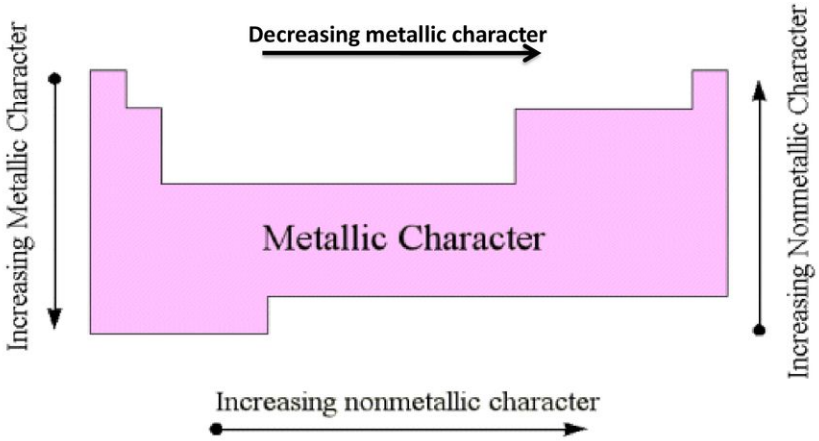
Description of answer key and credits :

Q8.5 Full credit - Radius of an inert gas is largest in a period.
Nil credit – any other answer / missing.

…….

TEST ITEM -9

Metallic & Non metallic properties



General trends for the metallic character of an element
(metallic character is the***opposite*** of nonmetallic character)

In the view of the above diagram , answer the following questions-

Q 9.1 Non metals are electronegative. Correct order of electronegativity of N,O,F and P is

(i) F>O>P>N

(ii) F>O>N>P

(iii) N>O>F>P

(iv) F>N>P>O

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit**: metallic and non metallic properties	Class :X Expected time: 3 min Total Credit: 02
Description of item: Image	**Learning Outcome:** Analyzing and interpretation data	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS

Competency	Interpreting data and evidence scientifically
Knowledge -system	physical
Context	global
Cognitive demand	Low
Item Format	Simple MCQ
Proficiency Level	1a

Credit Pattern :

Full credit : 2

Partial credit : 1

Nil credit : 0

Description of answer key and credits :

Q9.1 Full credit - (ii) Nil credit – any other answer / missing.

Q 9.2 Write the following oxides in decreasing order of their basic nature-

Na_2O, Al_2O_3, MgO

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit**: metallic and non metallic properties	Class :X Expected time: 3 min Total Credit: 02
Description of item: Text Image	**Learning Outcome:**use of scientific conventions	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge -system	physical
Context	global
Cognitive demand	Medium
Item Format	Open constructed
Proficiency Level	3

Credit Pattern :

Full credit : 2

Partial credit : 1

Nil credit : 0

Description of answer key and credits :

Q 9.2 Full credit -: Al_2O_3, MgO, Na_2O Nil credit – any other answer / missing.

Q9.3 Write the following in increasing order of their metallic character-

B, Be, Li

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit**: metallic and non metallic properties	Class :X Expected time: 3 min Total Credit: 02
Description of item: Text Image	**Learning Outcome:** analyzing and interpretation of data	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS

Competency	Evaluating and designing scientific enquiry
Knowledge -system	physical
Context	global
Cognitive demand	Medium
Item Format	Closed constructed
Proficiency Level	3

Credit Pattern :

Full credit : 2

Partial credit : 1

Nil credit : 0

Description of answer key and credits :

Q9.3 Full credit - (iv) Nil credit – any other answer / missing.

Q9.4 The element in periodic table which has highest tendency to accept an electron-

(i)bromine

(ii) iodine

(iii) chlorine

(iv)nitrogen

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit**: metallic and non metallic properties	Class :X Expected time: 3 min Total Credit: 02
Description of item: Text Image	**Learning Outcome:** applying scientific concepts	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Expalining phenomenon scientifically
Knowledge -system	physical

Context	global
Cognitive demand	Low
Item Format	Simple MCQ
Proficiency Level	1a

Credit Pattern :

Full credit : 2

Partial credit : 1

Nil credit : 0

Description of answer key and credits :

Q9.4 Full credit - (iii) Nil credit – any other answer / missing.

Q9.5 Which of the following halogen acids is least acidic-

(i)HI

(ii)HCl

(iii) HF

(iv)HBr

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit**: metallic and non metallic properties	Class :X Expected time: 3 min Total Credit: 02
Description of item: Text Image	**Learning Outcome:** applying learning and using scientific	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge –system	physical
Context	global

Cognitive demand	Low
Item Format	Simple MCQ
Proficiency Level	1a

Credit Pattern :

Full credit : 2

Partial credit : 1

Nil credit : 0

Description of answer key and credits :

Q9.5 Full credit - HI Nil credit – any other answer / missing.

…….

TEST ITEM -10

VALENCY

Hydride is the product when hydrogen reacts with any other element. Table below shows the hydrides of elements in the periodic table. On the basis of the table answer the following questions-

(1) 1A	(2) 2A		(13) 3A	(14) 4A	(15) 5A	(16) 6A	(17) 7A	(18) 8A
LiH 692	BeH_2 d 250		B_2H_6 −165	CH_4 −182	NH_3 −78	H_2O 0	HF −83	
NaH d 800	MgH_2 d 280		AlH_3 d 150	SiH_4 −185	PH_3 −134	H_2S −86	HCl −115	
KH d	CaH_2 816		GaH_3 −15	GeH_4 −165	AsH_3 −116	H_2Se −66	HBr −88	
RbH d	SrH_2 d 675		InH_3 (?)	SnH_4 −146	SbH_3 −88	H_2Te −51	HI −51	
CsH d	BaH_2 d 675		TlH_3 (?)	PbH_4	BiH_3	H_2Po	HAt	

Q10.1 What is the valency of the element 'B' lying in 13th group, 2nd period?

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit**: valency	Class :X Expected time: 4 min Total Credit: 02

Description of item: Text Image	**Learning Outcome:** analyzing and using scientific conventions	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge -system	physical
Context	global
Cognitive demand	medium
Item Format	Closed constructed
Proficiency Level	3

Credit Pattern :

Full credit : 2

Partial credit : -

Nil credit : 0

Description of answer key and credits :

Q10.1 Full credit - 3
Nil credit – any other answer / missing.

Q 10.2 What is the valency of elements lying in 18^{th} group?

(i) 0
(ii) all have 8 valency
(iii) 2,8
(iv) 2

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit**: valency	Class :X Expected time: 3 min Total Credit: 02

Description of item: Text Image	**Learning Outcome:** relate processes and using scientific conventions	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Explaining phenomenon scientifically
Knowledge -system	physical
Context	global
Cognitive demand	Low
Item Format	Simple MCQ
Proficiency Level	1a

Credit Pattern :

Full credit : 2

Partial credit : 1

Nil credit : 0

Description of answer key and credits :

Q 10.2 Full credit -(iii)
Nil credit – any other answer / missing.

Q 10.3 Choose the most correct statement

In a period-

(i) From left to right valency of elements increases

(ii) From left to right valency of elements decreases

(iii) On going from left to right valency of elements increases till 14th group and then decreases

(iv) On going from left to right valency of electrons increases from 1st to 14thgroup (excluding elements lying between 2nd to 13th group) and then decreases to 18th group.

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit**: valency	Class :X Expected time: 4 min Total Credit: 02
Description of item: Text Image	**Learning Outcome:** analyzing and interpretation	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Explaining phenomenon scientifically
Knowledge -system	physical
Context	global
Cognitive demand	Medium
Item Format	Simple MCQ
Proficiency Level	2

Credit Pattern :
Full credit : 2
Partial credit : -0
Nil credit : 0

Description of answer key and credits :

Q 10.3 Full credit - iv Nil credit – any other answer / missing.

Q 10.4 Which statement for the elements lying between 2nd to 13th group is true?

(a)These elements show variable valency

(b)All these elements are metals.

(c)These elements are colourful

(d)These elements have a definite valency

(i) only (a)

(ii) only (d)

(iii) (a), (b), (c)

(iv)All of the above

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit**: valency	Class :X Expected time: 4 min Total Credit: 02
Description of item: Text Image	**Learning Outcome:** application of learning	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Evaluating ad designing scientific enquiry
Knowledge -system	physical
Context	global
Cognitive demand	Medium
Item Format	Complex MCQ
Proficiency Level	2

Credit Pattern :

Full credit : 2

Partial credit : 0

Nil credit : 0

Description of answer key and credits :

Q 10.4 Full credit - (iii) Nil credit – any other answer / missing.

Q 10.5 An element has atomic number 24. In which group does it lie?

Domain: Scientific literacy	**Theme:** Classification of periodic elements **Unit**: valency	Class :X Expected time: 4 min Total Credit: 02
Description of item: Text Image	**Learning Outcome:** applying scientific concepts	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge -system	physical
Context	global
Cognitive demand	Medium
Item Format	Open constructed
Proficiency Level	2

Credit Pattern :

Full credit : 2

Partial credit : 0

Nil credit : 0

Description of answer key and credits :

Q10.5 Full credit -Group (6) Nil credit – any other answer / missing.

Name of teacher/Item writer: Akanksha Jain
Designation: PGT (Physics)
Email: akankshajain8043@gmail.com

Name of vidyalaya: KVNER, Bareilly
Name of region: Lucknow

……

TEST ITEM-11
CLASSIFICATION OF ELEMENTS

The *periodic table, also known as the periodic table of elements, is a tabular display of the chemical elements, which are arranged by atomic number, electron configuration, and recurring chemical properties. The structure of the table shows periodic trends. The seven rows of the table, called periods, generally have metals on the left and non-metals on the right. The columns, called groups, contain elements with similar chemical behaviours. Six groups have accepted names as well as assigned numbers: for example, group 17 elements are the halogens; and group 18 are the noble gases. Also displayed are four simple rectangular areas or blocks associated with the filling of different atomic orbitals.*

The organization of the periodic table can be used to derive relationships between the various element properties, and also to predict chemical properties and behaviours of undiscovered or newly synthesized elements. Russian chemist Dmitri Mendeleev published the first recognizable periodic table in 1869, developed mainly to illustrate periodic trends of the then-known elements. He also predicted some properties of unidentified elements that were expected to fill gaps within the table. Most of his forecasts proved to be correct. Mendeleev's idea has been slowly expanded and refined with the discovery or synthesis of further new elements and the development of new theoretical models to explain chemical behaviour. The modern periodic table now provides a useful framework for analyzing chemical reactions, and continues to be widely used in chemistry, nuclear physics and other sciences.

The elements from atomic numbers 1 (hydrogen) through 118 (oganesson) have been discovered or synthesized, completing seven full rows of the periodic table. The first 94 elements all occur naturally, though some are found only in trace amounts and a few were discovered in nature only after having first been synthesized. Elements 95 to 118 have only been synthesized in laboratories or nuclear reactors. The synthesis of elements having higher atomic numbers is currently being pursued: these elements would begin an eighth row, and theoretical work has been done to suggest possible candidates for this extension.

There are specific patterns present in the arrangement of elements in the periodic table. These periodic table trends arise out of the specific arrangement of elements due to the Periodic Law. Studying these trends, allows chemists, scientists and even us to quickly identify certain properties of an element.

One of the trends in the modern periodic table is that of the valency of an atom. As you already know, the valency of an atom is the number of electrons it has in its outermost shell or the number of atoms in requires to complete its outermost shell. However one can determine the valency of an element simply from its position in the periodic table.

Atomic size is the distance between the centre of the nuclei and its outermost orbit. In simple terms, it is the radius of an atom. It is noticed that the atomic size of elements decrease as we move from left to right in a period. This is because the electrons increase hence increasing the nuclear charge.

When the nuclear charge is stronger, the nucleus pulls the electrons closer to itself so reducing the atomic radii. As opposed to this when one moves from the top to bottom of a group, the atomic size of elements increases. This is because the number of shells of the atom increase, increasing their radii.

Example: The atomic size of all elements in period 2 in picometer (pm)

Electronegativity is the ability of an atom of any element to attract a shared pair of electrons in a chemical bond, towards itself. It is a measure of atom's tendency to form a molecule by attracting electrons to itself. The most electronegative element is Fluorine and the least is Caesium. So by this, you can probably deduce that as you move in a row (period) from left to right the electronegativity increases. And from top to bottom in a column (group) it will decrease. This is because when the number of shells increases as we go down a group, so the pull of the nucleus to attract electrons decreases.

Q11.1 Out of the three elements P,Q and R having atomic number 11, 17 and 19 respectively ,which two elements will show similar properties and why? Draw the electron dot structures of elements having similar properties.

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item: TEXT	Learning Outcome: --To understand about the electron dot structures of elements having similar properties. .	

Scientific Literacy

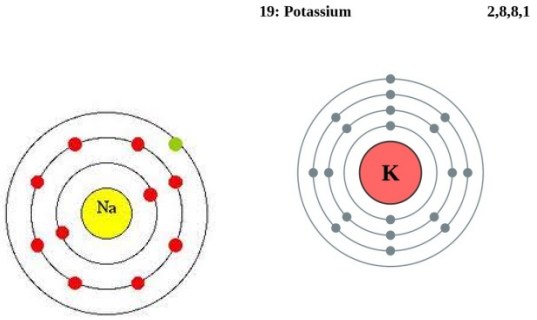
FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge -system	PHYSICAL
Context	GLOBAL
Cognitive demand	medium
Item Format	Open constructed

Proficiency Level	3

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Q11.1 Full credit – : 1. ANSWER: P(11) : 2,8,1 R(19) : 2,8,8,1 Q(17) : 2,8,7
Elements 'P' and 'R' will show similar properties as they belongs to same group with valency 1 due to same numbers of valence electrons.



No credit – any other answer / missing.

Q11.2 "Hydrogen occupies a unique position in modern periodic table". Justify the statement.

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item: TEXT	Learning Outcome: " Hydrogen occupies a unique position in modern periodic table".	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	GLOBAL
Cognitive demand	medium
Item Format	Open constructed

Proficiency Level	3

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Q 11.2 Full credit – : . ANSWER: Both hydrogen and alkali metals have similar outermost electronic configuration therefore some of the properties of hydrogen are similar to those of alkali metals. 2. Both hydrogen and halogens also have similar outermost electronic configuration and hence they have similar properties. No credit – any other answer / missing.

Q11.3 Write the formulae of chlorides of Eka-Silicon and Eka-Aluminium, the elements predicted by Mendeleev .

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item: TEXT	Learning Outcome: formulae of chlorides of Eka-Silicon and Eka-Aluminium	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	GLOBAL
Cognitive demand	medium
Item Format	Open constructed
Proficiency Level	4

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Q 11.3 Full credit – : ANSWER: Eka-Silicon is Germanium .It lies in group 4 of Mendeleev"s periodic table and thus has a valency of 4 then the formulae of its chloride is $GeCl_4$. Eka- Aluminium is Gallium . It lies in group 3rd of Mendeleev"s periodic table and thus has a valency of 3 then the formulae of its chloride is GaCl3. No credit – any other answer / missing.

Q 11.4 An element with atomic number 117 has recently been discovered. What is the group number and period number of the element? What is its IUPAC and officially accepted name? Also predict whether it is a metal or a non-metal.

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item: TEXT	Learning Outcome: IUPAC and officially accepted name? Also predict whether it is a metal or a non-metal.	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	GLOBAL
Cognitive demand	medium
Item Format	Open constructed
Proficiency Level	3

Credit Pattern :

Full credit : 02marks

Partial credit : 01marks

No credit : 0 marks

Description of answer key and credits :

Q 11.4 Full credit – : . ANSWER: The atomic number of the 1st halogen F is 9. Adding magic numbers 8, 8,18,18,32 and 32, the atomic number of the last halogen should be 8+8+18+18+32+32=117. Thus, the element with Z =117 is a halogen .Therefore its group number is 17 and period number is 7 and its IUPAC name is Uus and officially accepted name is*Tennessine*. Since halogen are non-metal therefore elements with Z =117 should also be a non-metal. No credit – any other answer / missing.

Q11.5 Differentiate between nuclear charge and effective nuclear charge?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item: TEXT	Learning Outcome: nuclear charge and effective nuclear charge	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	GLOBAL
Cognitive demand	medium
Item Format	Open constructed
Proficiency Level	3

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Q 11.5 Full credit – : ANSWER: Nuclear charge is equal to the number of protons present in the nucleus. Effective nuclear charge .The electrons present in the inner shells shield or screen the valence electrons from the nucleus. As a result the nuclear charge actually experienced by the valence electrons is little less than the actual nuclear charge this is called affective nuclear charge. No credit – any other answer / missing.

Name of the Teacher/Item Writer: ARVIND KUMAR
Designation: TGT (SCIENCE)
Email: Arvindbio1965@gmail.com
Phone no.: 9451087760
Name of the Vidyalaya: Kendriya Vidyalaya I I M LUCKNOW.
KVS Region: LUCKNOW REGION.

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TEST ITEM -12

INTERNATIONAL YEAR OF THE PERIODIC TABLE OF CHEMICAL ELEMENTS

UNESCO To Launch International Year Of The Periodic Table Of Chemical Elements

The International Year of the Periodic Table of Chemical Elements will be launched today at UNESCOs Headquarter

January 29, 2019 17:51 IST

New Delhi:
The International Year of the Periodic Table of Chemical Elements will be launched today at UNESCO's Headquarters, Paris. According to a statement from the United Nations Educational, Scientific and Cultural Organization (UNESCO), events and activities will be held throughout the year to celebrate the 150th anniversary of the organisation of the periodic table by Russian scientist Dmitri Mendeleev, one of the fathers of modern chemistry.

The Director-General of UNESCO, Audrey Azoulay, will open the event with Mikhail Kotyukov, Minister of Science and Higher Education of the Russian Federation, Pierre Corvol, President of France's Académie des Sciences, and Andrey Guryev, CEO of PhosAgro.

The event will bring together scientists, representatives of the private sector.

It will feature a lecture on the “Periodic Table for Society and the Future” by the Professor Ben Feringa, 2016 Nobel Laureate in Chemistry.

At the launch, UNESCO will present its educational initiative, 1001 Inventions: Journeys from Alchemy to Chemistry.

Consisting of educational material and science experiments to help young people improve their understanding of chemistry and its numerous uses, the initiative will be brought to schools around the world during 2019, the UNESCO statement said.

Q12.1 Name two other scientists before Mendeleev who attempted to classify the elements.

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item: TEXT	Learning Outcome: - UNESCO To Launch International Year Of The Periodic Table of the chemical elements.	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	GLOBAL
Cognitive demand	medium
Item Format	Open constructed
Proficiency Level	3

Credit Pattern :

Full credit : 02marks

Partial credit : 01marks

No credit : 0 marks

Description of answer key and credits :

Q12.1 Full credit – :1- Dobernier. 2- Newland. No credit – any other answer / missing.

Q12.2 What was the basis of arranging the elements followed by Mendeleev? Why was his criterion not correct?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item:	Learning Outcome:	

TEXT	basis of arranging the elements followed by Mendeleev.

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	GLOBAL
Cognitive demand	medium
Item Format	Open constructed
Proficiency Level	3

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Q12.2 Full credit – : The properties of elements are the periodic function of their atomic mass. Mendeleev's periodic table based on the chemical properties of elements.
The properties of elements are actually periodic function of their atomic numbers .The atomic mass have no regular trends .So his method of classification was wrong.
No credit – any other answer / missing.

Q12.3 How are the elements arranged in the modern periodic table?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02

Description of item: TEXT	Learning Outcome: ARRANGEMENT OF ELEMENTS

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	GLOBAL
Cognitive demand	medium
Item Format	Open constructed
Proficiency Level	3

Credit Pattern :

Full credit : 02marks

Partial credit : 01marks

No credit : 0 marks

Description of answer key and credits :

Q 12.3 Full credit – :

Modern periodic table contains 18 vertical columns known as groups and 7 horizontal rows known as periods.

This arrangement is made as per the modern periodic law stated by Mosely-

Properties of elements are a periodic function of their atomic number.

No credit – any other answer / missing.

Q 12.4 Why does the first period have only two elements?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02

Description of item: TEXT	Learning Outcome: the first period have only two elements

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	GLOBAL
Cognitive demand	medium
Item Format	Open constructed
Proficiency Level	3

Credit Pattern :

Full credit : 02marks

Partial credit : 01marks

No credit : 0 marks

Description of answer key and credits :

Q 12.4 Full credit – : elements in 1st period have their electrons in 1st orbit and 1st orbit can accomodate only 2 electrons.so there are only 2 possible elements in 1st period. No credit – any other answer / missing.

Q 12.5-How does the valency of the elements in a given period vary from left to right?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements	Class: X Expected time: 05 min

	Unit name-periodic classification of elements	Total Credit: 02
Description of item: TEXT	Learning Outcome: -the valency of the elements in a given period vary from left to right	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge -system	PHYSICAL
Context	GLOBAL
Cognitive demand	medium
Item Format	Open constructed
Proficiency Level	3

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Q 12.5 Full credit – :
Valency is number of electrons present in the outermost shells. Valency remains the same down a group but changes across a period.It increases from 1-4 across a period and then decreases to zero .

No credit – any other answer / missing.

Name of the Teacher/Item Writer: ARVIND KUMAR
Designation: TGT (SCIENCE)
Email: Arvindbio1965@gmail.com
Phone no.: 9451087760

Name of the Vidyalaya: Kendriya Vidyalaya I I M LUCKNOW.

KVS Region: LUCKNOW REGION.

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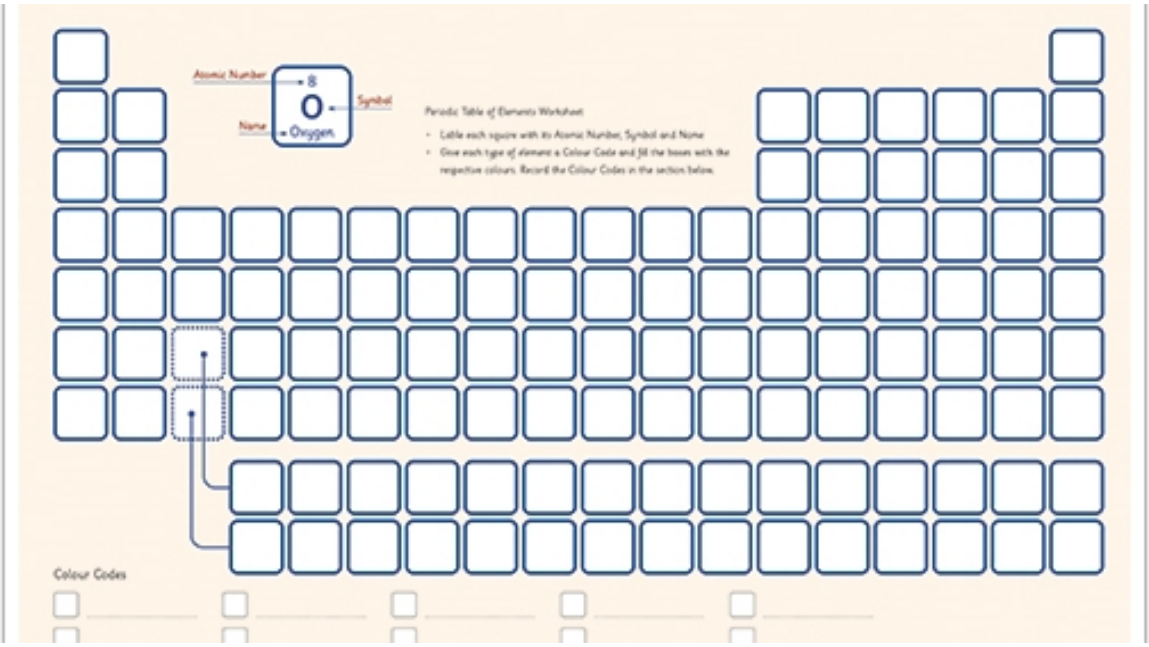
TEST ITEM -13

MODERN PERIODIC TABLE

Below is a blank periodic table. Answer the questions that follow it.



Q13.1 Shade the column which contain gaseous non metals only.

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item: TEXT	Learning Outcome: column which contain gaseous non metals	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	GLOBAL

Cognitive demand	medium
Item Format	Open constructed
Proficiency Level	3

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Q13.1 Full credit – : Shades the last column on right No credit – any other answer / missing.

Q13.2 What is the special name given to elements placed below the main periodic table.

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item: TEXT	Learning Outcome: special name given to elements placed below the main periodic table.	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	medium

Cognitive demand	understanding
Item Format	Open constructed
Proficiency Level	3

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Q13.2 Full credit – : Inner transition elements –Lanthanoids and actinoids No credit – any other answer / missing.

Q13.3 Name the liquid non metal.

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item: TEXT	Learning Outcome: Name the liquid non metal.	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	GLOBAL

Cognitive demand	medium
Item Format	Open constructed
Proficiency Level	3

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Full credit – : Bromine No credit – any other answer / missing.

Q13.4 Two element X, Y and Z belong to 17th group but to 2nd,3rd and 4th period respectively. Number of valence electrons in Y is 7. Find the number of valence electrons in X and Z.

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item: TEXT	Learning Outcome: Two element X, Y and Z belong to 17th group but to 2nd,3rd and 4th period respectively. Number of valence electrons in Y is 7. Find the number of valence electrons in X and Z.	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Interpreting data and evidence scientifically
Knowledge -system	PHYSICAL
Context	GLOBAL

Cognitive demand	medium
Item Format	Open constructed
Proficiency Level	3

Credit Pattern :

Full credit : 02marks

Partial credit : 01marks

No credit : 0 marks

Description of answer key and credits :

Q13.4 Full credit – : All will have seven valence electron as the valency remains same in a group. No credit – any other answer / missing.

Q13.5 Name the elements present in the third period and classify them into metals and nonmetals.

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item: TEXT	Learning Outcome: Name the elements present in the third period and classify them into metals and nonmetals.	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	GLOBAL

Cognitive demand	medium
Item Format	Open constructed
Proficiency Level	3

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Q13.5 Full credit – : Na Mg Al Si P S Cl

Metals	Non metals
Na Mg Al	Si P S Cl

No credit – any other answer / missing.

Name of the Teacher/Item Writer: ARVIND KUMAR
Designation: TGT (SCIENCE)
Email: Arvindbio1965@gmail.com
Phone no.: 9451087760
Name of the Vidyalaya: Kendriya Vidyalaya I I M LUCKNOW.
KVS Region: LUCKNOW REGION.

……

TEST ITEM -14

EVOLUTION OF PERIODIC TABLE

The term “periodic” reflects the fact that the elements show patterns in their chemical properties in certain regular intervals. Dimitri Ivanovich Mendeleev, completed the first of his numerous periodic charts. It included 63 known elements arranged according to increasing atomic weight; Mendeleev also left spaces for as yet undiscovered elements for which he predicted atomic weights.

The arrangement of elements by atomic weight devised in 1862 by French geologist Alexandre- Emile Béguyer. De Chancourtois positioned the elements according to increasing atomic weight along a spiral inscribed on the surface of a cylinder and inclined at 45 degrees from the base. The first full turn of the spiral coincided with the element oxygen, and the second full turn occurred at sulfur. After evolving for over 200 years through the work of many people, the periodic table remains at the heart of the study of chemistry. Unit-4- Evolution of periodic table

Q14.1 What does the term ‘’periodic ‘’ in periodic table reflects?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item: TEXT	Learning Outcome: the term ‘’periodic ‘’ in periodic table reflects	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	GLOBAL
Cognitive demand	medium

Item Format	Open constructed
Proficiency Level	3

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Q14.1 Full credit – : The term ''periodic'' reflects the fact that the elements show patterns in their chemical properties in certain regular intervals. No credit – any other answer / missing.

Q14.2 How many elements were arranged according to increasing atomic weight in mendeleev periodic table?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item: TEXT	Learning Outcome: elements were arranged according to increasing atomic weight in mendeleev periodic table?	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	GLOBAL
Cognitive demand	medium

Item Format	Open constructed
Proficiency Level	3

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Q14.2 Full credit – : 63 No credit – any other answer / missing.

Q14.3 Who devised the arrangement of elements by atomic weight ?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item: TEXT	Learning Outcome: the arrangement of elements by atomic weight	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	GLOBAL
Cognitive demand	medium

Item Format	Open constructed
Proficiency Level	3

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Q14.3 Full credit – : The arrangement of elements by atomic weight devised in 1862 by French geologist Alexandre- Emile Béguyer. No credit – any other answer / missing.

Q14.4 Dechancourtois's spiral inclined at which angle?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02 marks
Description of item: TEXT	Learning Outcome: Dechancourtois's spiral inclined at which angle	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	GLOBAL
Cognitive demand	medium

Item Format	Open constructed
Proficiency Level	3

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Q14.4 Full credit – : . 45 degrees No credit – any other answer / missing.

Q14.5 After evolving for over 200 years through the work of many people, the periodic table remains at the heart of the study of chemistry .why?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item: TEXT	Learning Outcome: After evolving for over 200 years through the work of many people, the periodic table remains at the heart of the study of chemistry	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	GLOBAL
Cognitive demand	medium

Item Format	Open constructed
Proficiency Level	3

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Q14.5 Full credit – : It ranks as one of the most fruitful ideas in modern science, comparable perhaps to Charles Darwin's theory of evolution. Unlike theories such as Newtonian mechanics, it has not been falsified or revolutionized by modern physics but has adapted and matured while remaining essentially unscathed. No credit – any other answer / missing.

Name of the Teacher/Item Writer: ARVIND KUMAR
Designation: TGT (SCIENCE)
Email: Arvindbio1965@gmail.com
Phone no.: 9451087760
Name of the Vidyalaya: Kendriya Vidyalaya I I M LUCKNOW.
KVS Region: LUCKNOW REGION.

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TEST ITEM -15

THE CURRENT PERIODIC TABLE

The current periodic table holds 118 elements in a very distinct order for the purpose of showing similarities and differences in chemical properties. Out of all of the elements, 94 are found in nature and the other 24 were synthetically produced with particle accelerators. As well, most copies of the periodic table separate the metal and non-metal elements with a dark stair-step line. The metals are on the left and the non-metals on the right. Additionally, elements are placed in order of increasing atomic number, which is the number of protons in the nucleus of the element's atom. The rows are also organized so that elements with similar properties are found in the same columns. Within each element square, information on the element's symbol, atomic number, atomic mass, electronegativity, electron configuration, and valence numbers can be found. At the bottom of the periodic table is a two row block of elements that contain the lanthanoids and actinides. These groups are classified as inner transitional metals.The blocks of the periodic table include the s-block, p-block, d-block, and f-block. Other groupings include poor metals, transitional metals, metalloids, and the platinum group. New research shows how chemical elements mix in the universe. Without this process, you wouldn't be here. Gold is one of 12 confirmed elements on the periodic table whose discoverer is unknown.

Q15.1 How many elements are there in current periodic table?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item: TEXT	Learning Outcome: elements are there in current periodic table	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	GLOBAL

Cognitive demand	medium
Item Format	Open constructed
Proficiency Level	3

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Q15.1 Full credit – : 118 No credit – any other answer / missing.

Q15.2 How many of the total elements of periodic table are natural and how many of them are synthetic?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item: TEXT	Learning Outcome: Natural and synthetic elements.	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	GLOBAL

Cognitive demand	medium
Item Format	Open constructed
Proficiency Level	3

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Q15.2 Full credit – : 94 Natural and 24 Synthetic No credit – any other answer / missing.

Q15.3 What information does an element square holds?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item: TEXT	Learning Outcome: What information does an element square holds	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL
Context	GLOBAL

Cognitive demand	medium
Item Format	Open constructed
Proficiency Level	3

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Q15.3 Full credit – Within each element square, information on the element's symbol, atomic number, atomic mass, electronegativity, electron configuration, and valence numbers can be found. No credit – any other answer / missing.

Q15.4 Discoverer of which metal in periodic table is still unknown?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02
Description of item: TEXT	Learning Outcome: which metal in periodic table is still unknown	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL

Context	GLOBAL
Cognitive demand	medium
Item Format	Open constructed
Proficiency Level	3

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Q15.4 Full credit – Gold No credit – any other answer / missing.

Q15.5 Why are lanthanoids and actinides are placed at bottom of a periodic table?

Template for preparation of Practice Items for Scientific Literacy

Domain: Scientific literacy	Topics- classification of elements Unit name-periodic classification of elements	Class: X Expected time: 05 min Total Credit: 02 marks
Description of item: TEXT	Learning Outcome: lanthanoids and actinides are placed at bottom of a periodic table	

Scientific Literacy

FRAMEWORK	CHARACTERISTICS
Competency	Scientific phenomena
Knowledge -system	PHYSICAL

Context	GLOBAL
Cognitive demand	medium
Item Format	Open constructed
Proficiency Level	3

Credit Pattern :
Full credit : 02marks
Partial credit : 01marks
No credit : 0 marks

Description of answer key and credits :

Q15.5 Full credit – :
Lanthanides and Actinides are known as Inner-Transition metals and they have different properties compared to other elements. Inner-Transition metals were only discovered recently and not much is known about them. It is very important to understand why they are located at the bottom because it plays a big role in the shape, size and history of periodic table and why they have been separated.

No credit – any other answer / missing.

Name of the Teacher/Item Writer: ARVIND KUMAR
Designation: TGT (SCIENCE)
Email: Arvindbio1965@gmail.com
Phone no.: 9451087760
Name of the Vidyalaya: Kendriya Vidyalaya I I M LUCKNOW.
KVS Region: LUCKNOW REGION.

…….

CRITICAL AND CREATIVE THINKING TEST ITEMS

CLASS X SUB: SCIENCE

CH-3 METALS AND NON-METALS

INDEX

TEST ITEM -1

Understanding Gold Purity

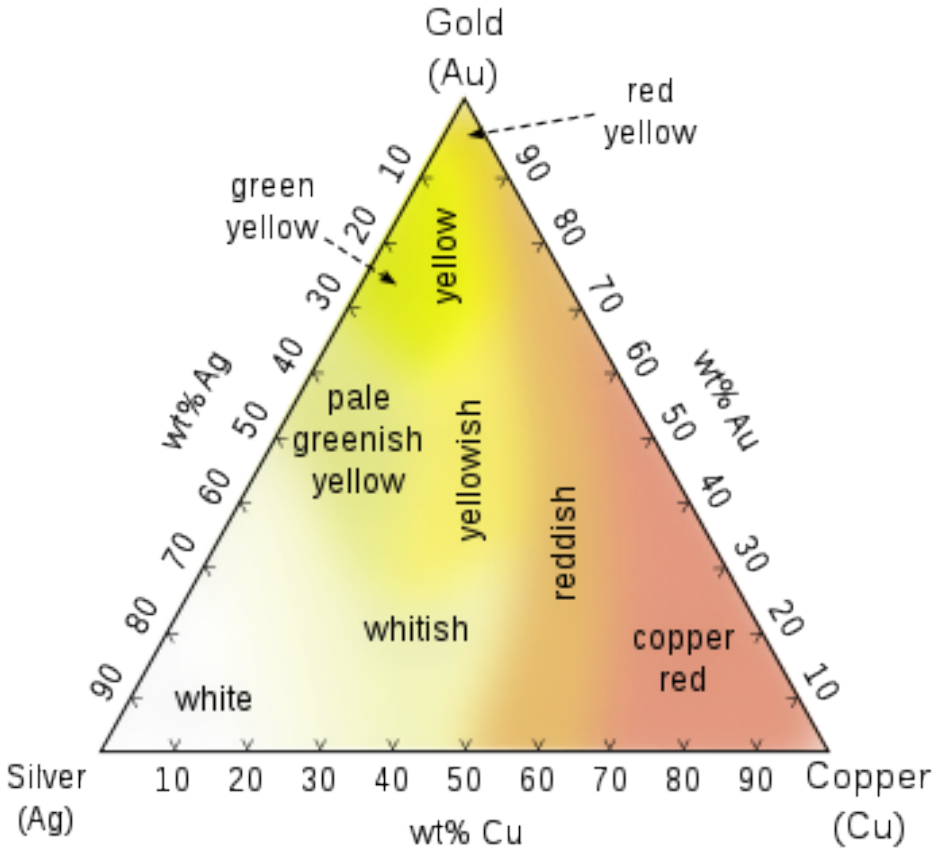
Domain: Scientific Literacy	**Theme:** **Metals and Non-metals** (Understanding Gold Purity)	**Class(es): X** **Expected time: 15 min** **Total Credit: 10**
Description of Item: ✓ Text Image Table ✓ Graph Map Poem	**Learning Outcome: (As per NCERT)** • Observes the given data and graph, • analyses and interprets data to derive conclusions • justifies explanations of the scientific facts • thinks critically to consider and evaluate alternative explanation. • Calculates using the data given.	

Karats, spelled "carats", are the little numbers stamped on a piece of gold in the format of "xxK" or "xxKT". The numbers refer to the type of gold and to the actual gold content in the particular piece of jewellery. Karat is a measurement of the ratio of gold to other metals or alloys. Karats are measured on a scale from 0 to 24. The higher the karat number, the more gold there is and the less other metal content. Other metals and alloys could include copper, nickel (not common anymore), silver, or palladium. Other metals are added to strengthen it and in some cases to enhance color. The lower the karat, the stronger it will be, while higher karat gold will be softer. Lower karat gold is not tarnish-resistant. Higher karat gold is much more resistant to tarnishing. Lower karat gold is not worth as much monetarily. Higher karat gold is more valuable because it is purer. Higher karat gold will appear more yellow.

Gold Purity Conversion Chart

- Knowing the number of karats is key to calculating the gold content on your own.
- **999** means the gold is 99.9% pure, or 24K.

Number of Karats	Parts of Gold	% of Gold Purity
10K	**10/24**	**41.7**
12K	**12/24**	**50.0**
14K	**14/24**	**58.3**
18K	**18/24**	**75.0**



[Courtesy: ChemMatter]

Q1.1: Based on the given image, what would be the colour of gold if weight percentages of Ag, Cu and Au are respectively 38, 32 and 75?

(a) Whitish (b) yellow (c) pale greenish yellow (d) copper red

FRAMEWORK	CHARACTERISTICS
Competency	***analyses and interprets data to derive conclusions***
Knowledge-system	***Physical systems***
Context	***Global***
Cognitive demand	***Easy***
Item format	***Short response item***
Proficiency Level	***2***

Description of Answer Key and Credits:
Q1.1 Full Credit: Option (c) pale greenish yellow
No Credit: Other response or missing

Q1.2: What is meant by 916 gold? What is the ratio of pure gold and other metals present in it?

FRAMEWORK	CHARACTERISTICS
Competency	***Calculates using the data given.***
Knowledge-system	***Physical systems***
Context	***Global***
Cognitive demand	***Easy***
Item format	***Short response item***
Proficiency Level	***1***

Description of Answer Key and Credits:
Q1.2 Full Credit:916 gold means-it is 91.6% pure. It ratio of gold to other metals is 91.6: 8.4 OR 11:1
No Credit: Other response or missing

Q1.3: A purity of a sample of gold is marked as 908. Determine the following data pertaining to this sample of gold

Percentage of pure gold present	
Colour of the gold sample	
Number of karats (carats)	
Parts of gold present	

FRAMEWORK	CHARACTERISTICS
Competency	***analyses and interprets data to derive conclusions***
Knowledge-system	***Physical systems***
Context	***Global***
Cognitive demand	***Difficult***
Item format	***Closed structured response***
Proficiency Level	***5***

Description of Answer Key and Credits:
Q1.3 Full Credit: Percentage of pure gold present- 90.8%
Colour of the gold sample- yellow
Number of karats (carats)- 0.908 x 24 = 21.792
Parts of gold present – 21.792/24
Partial Credit: Any two correct responses
No Credit: Other response or missing

Q1.4: Below are some of the uses of gold, but each letter has been randomly substituted with another letter of the alphabet. The letter substitutions are the same for each word.
(Starting hint: N stands for C and R stands for L)

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
D	O	N	B	H	S	Q	C	K	Y	W	R	P	U	E	L	T	A	X	V	F	J	Z	G	M	I

Identify the following uses of gold.

1) YHZHRAM
2) NEKUX
3) PHBDRX
4) XPDAVLCEUH NKANFKVX
5) HRHNVAKNDR NEUVDNVX

FRAMEWORK	CHARACTERISTICS
Competency	***analyses and interprets data to derive conclusions***
Knowledge-system	***Physical systems***
Context	***Global***
Cognitive demand	***Easy***
Item format	***Closed structured response***
Proficiency Level	***2***

Description of Answer Key and Credits:
Q1.4 Full Credit:JEWELLERY, COINS, MEDALS, SMARTPHONE CIRCUITS, ELECTRICAL CONTACTS
No Credit: Other response or missing

Q1.5: List four characteristics that make gold a good metal in designing of electronic devices.

……

FRAMEWORK	CHARACTERISTICS
Competency	***Applies scientific concepts in daily life and solving problems.***
Knowledge-system	***Physical systems***
Context	***Global***
Cognitive demand	***Medium***
Item format	***Closed constructed response***
Proficiency Level	***3***

Description of Answer Key and Credits:
Q1.5 Full Credit:(a)Gold is malleable and can be beaten into thin sheets.
(a) Gold is ductile and can be drawn into wires
(b) It is inert to most acids and oxidants
(c) It is a good conductor of heat and electricity
Partial Credit: Any two responses
No Credit: Other response or missing

.....

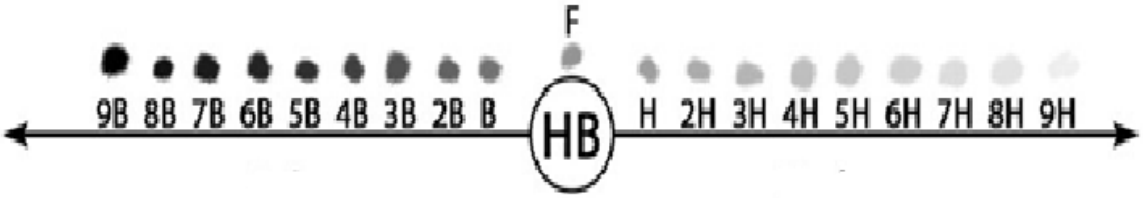
TEST ITEM -2

The Write Stuff-Pencil

<table>
<tr><td>Domain:
Scientific Literacy</td><td>Theme:
Metals and Non-metals
(The writing Stuff-Pencil)</td><td>Class(es): X
Expected time: 20
Total Credit: 12</td></tr>
<tr><td>Description of Item:
<table><tr><td>✓</td><td>Text</td></tr><tr><td>✓</td><td>Image</td></tr><tr><td></td><td>Table</td></tr><tr><td></td><td>Graph</td></tr><tr><td></td><td>Map</td></tr><tr><td></td><td>Poem</td></tr></table></td><td colspan="2">Learning Outcome: (As per NCERT)
Observes the given scientific data
Analyses the given data to derive the conclusion
Categorizes different types of grades of pencils
Compares and differentiates the types of hardness and smoothness of pencils
Ranks the smoothness and hardness of pencils
Constructs answers based on the data provided</td></tr>
</table>

Pencils are graded using the ‘Graphite Scale’ which measures the softness/hardness of the lead. Graphite is a naturally soft substance and clay is mixed with it to make it harder. This means a lead with a high graphite content is known as a soft lead and pencils with a soft lead will make a dark mark when used.Conversely, a lead with less graphite and a higher clay content is known as a hard lead and will make a lighter mark.

Soft leads are graded using the letter ‘B’ to designate how ‘black’ the mark they make is. Numbers are then used to indicate the degree of softness - the higher the number the softer the lead and the blacker the mark. Hard leads are graded in the same way, but use an ‘H’ to show how ‘hard’ they are.



Erasers which are basically polymers, eradicate pencil markings using London forces by lifting graphite particles from the paper. A single pencil is said to hold enough graphite to draw a line 35 miles long, or write 45,000 words.

Q2.1: The core part of a pencil is chemically:

(a) Lead (b) Pure form of carbon (c) Impure form of carbon (d) Clay

FRAMEWORK	CHARACTERISTICS
Competency	**Classifies/identifies materials based on properties characteristics.**
Knowledge-system	**Physical systems**
Context	**Global**
Cognitive demand	**Easy**
Item format	**Closed constructed response**
Proficiency Level	**3**

Description of Answer Key and Credits:
Full Credit: Pure form of carbon
No Credit: Other response or missing

Q2.2: London dispersion forces are strong forces of attraction like covalent bonds.

(Agree/ Disagree) …….

FRAMEWORK	CHARACTERISTICS
Competency	**Applies scientific concepts in daily life and solving problems**
Knowledge-system	**Physical systems**
Context	**Global**

Cognitive demand	***Easy***
Item format	***Closed constructed response***
Proficiency Level	***2***

Description of Answer Key and Credits:
Q2.2 Full Credit: Disagree
No Credit: Other response or missing

Q2.3: Howdoes pencil lead markscling to paper?

FRAMEWORK	CHARACTERISTICS
Competency	***Explains processes and phenomena***
Knowledge-system	***Physical systems***
Context	***Global***
Cognitive demand	***Difficult***
Item format	***Closed constructed response***
Proficiency Level	***5***

Description of Answer Key and Credits:
Q2.3 Full Credit: The graphite "lead" flakes off and leaves a layer of graphite on the surface of the paper as we write or draw. The cellulose fibers in paper catch many of the graphite flakes. Because graphite and cellulose are both nonpolar, the flakes attract to the paper due to London Dispersion forces.
No Credit: Other response or missing

Q2.4: How do pencil erasers work to remove marks?

FRAMEWORK	CHARACTERISTICS
Competency	**Explains processes and phenomena**
Knowledge-system	**Physical systems**
Context	**Global**
Cognitive demand	**Difficult**
Item format	**Closed constructed response**
Proficiency Level	**5**

Description of Answer Key and Credits:

Q2.4 Full Credit: Pencil erasers work by physically removing the graphite particles from the paper. Because rubber, graphite, and cellulose are nonpolar substances, only weak, London Dispersion forces bind the graphite to the paper. The nonpolar forces between the eraser and the graphite are stronger than the nonpolar forces between the graphite and the paper, so the eraser removes the mark.
No Credit: Other response or missing

Q2.5: Which of the following statements are correct.

(a) A 2H lead is harder than an H lead and will produce a lighter mark.

(b) A 4B lead is softer than a 2Band will produce a lighter mark.

(c) A 2B lead is soft and has less amount of clay than a B lead

FRAMEWORK	CHARACTERISTICS
Competency	**Analyses and interprets data**
Knowledge-system	**Physical systems**
Context	**Global**
Cognitive demand	**Medium**
Item format	***Complex multiple choice question***
Proficiency Level	***4***

Description of Answer Key and Credits:
Q2.5 Full Credit: Options (a) and (c)
Partial Credit: Any one correct response
No Credit: Other response or missing

Q2.6: The length of line drawn by graphite lead on a sheet of paper by a soft 2B pencil is about 20 nanometers and a carbon atom has a diameter of 0.14nanometers. Assuming that all the atoms are aligned in straight line, calculate the approximate number of atoms present in the line?

FRAMEWORK	CHARACTERISTICS
Competency	**Calculates using the data given**
Knowledge-system	**Physical systems**
Context	**Global**
Cognitive demand	**Medium**
Item format	**Closed structured response**
Proficiency Level	**4**

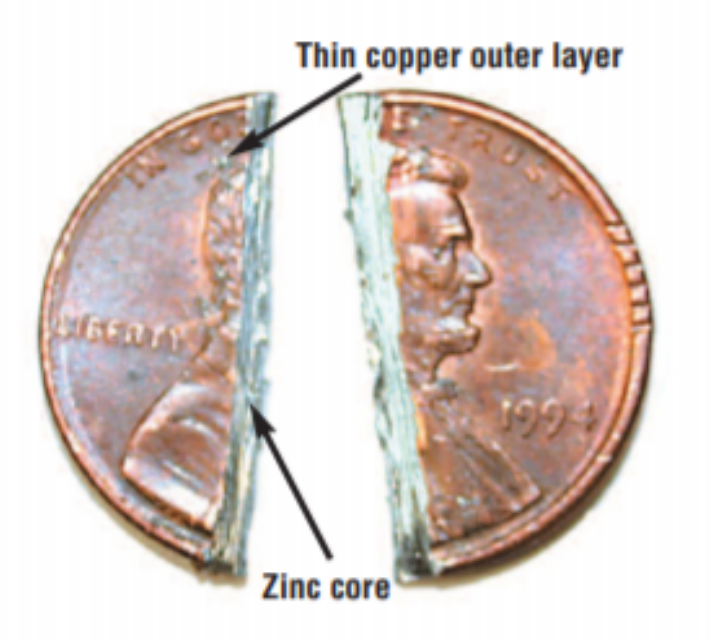
Description of Answer Key and Credits:
Q2.6 Full Credit: No. of atoms in the line = length of the line/ diameter of an atom
= 20nm/0.14nm
= 143 atoms (approx.)
No Credit: Other response or missing

.....

TEST ITEM -3

The Captivating Coins and A pretty penny

<table>
<tr><td>Domain:
Scientific Literacy</td><td>Theme:
Metals and Non-metals
(The Captivating Coins and A pretty penny)</td><td>Class(es): X
Expected time: 12
Total Credit: 08</td></tr>
<tr><td>Description of Item:
<table><tr><td></td><td>Text</td></tr><tr><td></td><td>Image</td></tr><tr><td></td><td>Table</td></tr><tr><td></td><td>Graph</td></tr><tr><td></td><td>Map</td></tr><tr><td></td><td>Poem</td></tr></table></td><td colspan="2">Learning Outcome: (As per NCERT)
Justifies scientific explanations
Thinks critically to evaluate scientific explanation.
Evaluates the composition of coins
Compares the composition of different types of coins.
Synthesizes conclusions based on scientific phenomena</td></tr>
</table>



Cross-section showing the structure and composition of a post-1982 penny.

Metallic money has been around for thousandsof years, while paper money has only been popular for a few hundred years. Thefirst coins were worth their face value of whateverprecious metal they were made from.Today, all coins are deliberately made to be

worthless than their facevalue. All coins wereoriginally made from gold, silver, and copper, and these elements are still referred to as thecoinage metals.Although some ancient coins weresometimes made from pure metals, today, allcoins intended for circulation are made fromalloys. Thebronze alloyused to makecoins today istypically composedof 95%copper, 4% tin,and 1% zinc. The ubiquitous penny used to be mademostly of copper but is now mostly zinc. Zinc is much less expensive than copper. Today'spenny is made up of 97.5% zinc, with a paperthincopper coating that only makes up 2.5%of its total mass.There are several ways to distinguishbetween old and new pennies. A post-1982penny has a mass of 2.5 grams, while the pre-1982 pennies have a mass of 3.1 grams.

Before 1982, if a small child swallowed apenny, doctors would generally advise to just let it pass. With coins nowadays, little is as itappears. Not only are our "copper" pennies mostly zinc, but our "silver" coins are mostlycopper!Dimes and quarters minted before 1965were composed of an alloy of 90% silver and10% copper, and they are considered somewhatvaluable by collectors. You can easilytest for the presence of silver with a simple experiment. Rub a little mustard (which naturally contains sulphur) on a silvercoin and also on a non-silver coin and let themstand overnight. In the morning, rub off themustard.

Q3.1: Why in this present era, the coins are deliberately made to be worth less than their face value?

(a) due to poor market value of the metals used for making coins.

(b) to help and support the poor people of society

(c)to prevent them from being melted down and the metals recovered and sold.

(d) to have a check on black money.

FRAMEWORK	CHARACTERISTICS
Competency	**Applies scientific concepts in daily life and solving problems**
Knowledge-system	**Physical systems**
Context	**Global**
Cognitive demand	**Medium**
Item format	**Closed structured response**
Proficiency Level	**3**

Description of Answer Key and Credits:

Q3.1 Full Credit: Option(c)to prevent them from being melted down and the metals recovered and sold.

No Credit: Other response or missing

Q3.2: What is the ratio of the masses of zinc and copper present in the post-1982 penny?

……

FRAMEWORK	CHARACTERISTICS
Competency	**Calculates using the data given**
Knowledge-system	**Physical systems**
Context	**Global**
Cognitive demand	**Medium**
Item format	**Closed structured response**
Proficiency Level	**4**

Description of Answer Key and Credits:
Q3.2 Full Credit: Mass of coin in the post 1982 era = 2.5g
Mass of zinc in the coin = 97.5% of 2.5g = 2.4375g
Mass of copper in the coin = 2.5% of 2.5g = 0.0625g
OR
Mass of coin in the post 1982 era = 2.5g
Mass of zinc in the coin = 97.5% of 2.5g = 2.4375g
Mass of copper in the coin = 2.5g – 2.4375g = 0.0625g
Ratio of masses of zinc to copper = 2.4375 : 0.0625 = 39: 1
No Credit: Other response or missing

Q3.3: Before 1982, if a small child swallowed a penny, doctors would generally advise to just let it pass. Why?

FRAMEWORK	CHARACTERISTICS
Competency	**Explains processes and phenomena.**
Knowledge-system	**Physical systems**
Context	**Global**
Cognitive demand	**Medium**
Item format	**Closed structured response**
Proficiency Level	**4**

Description of Answer Key and Credits:
Q3.3 Full Credit: Pre 1982 coins mainly contain copper and the hydrochloric acid (HCl) in the gastric juices of the stomach will not react with copper. In the metal activity series, copper is less reactive than zinc. Most of the time, these swallowed pennies pass with little harm done.
No Credit: Other response or missing

Q3.4: What is the chemistry behind the test for the presence of silver in a coin by rubbing with mustard oil?

FRAMEWORK	CHARACTERISTICS
Competency	**Explains processes and phenomena.**
Knowledge-system	**Physical systems**
Context	**Global**
Cognitive demand	**Medium**
Item format	**Closed structured response**
Proficiency Level	**4**

Description of Answer Key and Credits:
Q3.4 Full Credit:A black spot will remain on the silvercoin, but not on the non-silver coin. Mustard naturally contains sulphur compounds, and sulphurreacts with silver to form a black precipitate of silver sulphide (Ag_2S).
No Credit: Other response or missing

.....

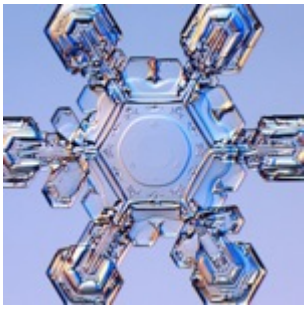
TEST ITEM -4

SNOWFLAKES

Domain: Scientific Literacy	**Theme:** Metals and Non-metals (Snowflakes)	**Class(es): X** **Expected time: 15** **Total Credit: 10**
Description of Item: ✓ Text ✓ Image	**Learning Outcome: (As per NCERT)** Observes different patterns of snowflakes	

	Table	Analyses and interprets data provided on pattern of snowflakes Communicates explanations for the different of snowflakes. Compares, differentiates patterns of snowflakes on the basis of climatic conditions.
✓	Graph	
	Map	
	Poem	

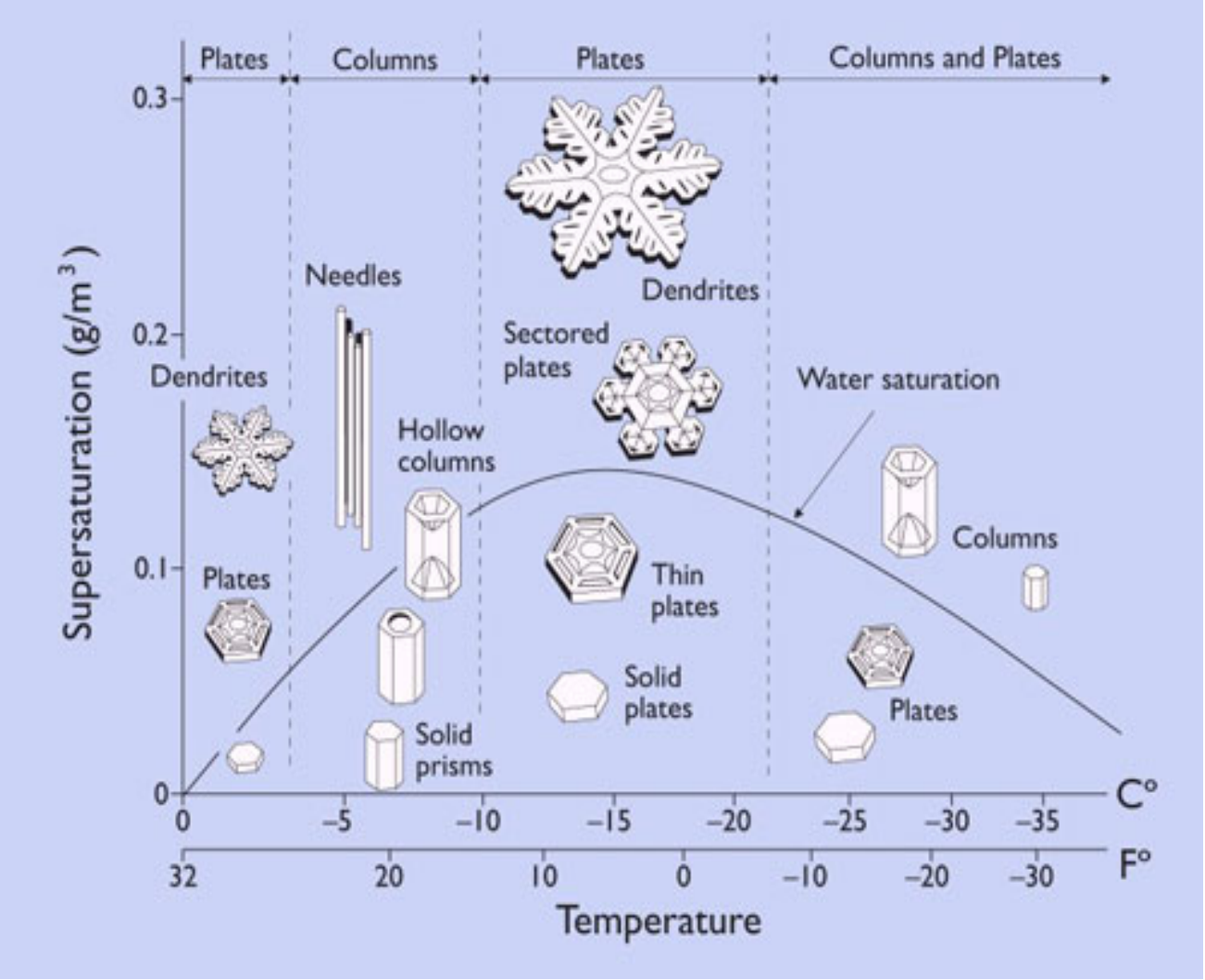




A **snowflake** is a single ice crystal that has achieved a sufficient size, and may have amalgamated with others, then falls through the Earth's atmosphere as snow. Depending on the temperature and humidity of the air where the snowflakes form, the ice crystals can grow into a myriad of different shapes.Kenneth Libbrecht, Professor of Physics at the California Institute of Technology, has made extensive observations of how water molecules get incorporated into snow crystals. In his research, he observed that the most intricate snowflake patterns are formed when there is moisture in the air. Snowflakes produced in drier conditions tend to have simpler shapes.

Snowflakes formed in temperatures below -7.6 degrees Fahrenheit (-22 degrees C) consist primarily of simple crystal plates and columns. Meanwhile, snowflakes with extensive branching patterns are formed in warmer temperatures.

The second question has to do with the way in which snowflakes are formed. During this process, the molecules (in this case, water molecules) align themselves to maximize attractive forces and minimize repulsive ones. As a result, the water molecules arrange themselves in predetermined spaces and in a specific arrangement. This process is much like tiling a floor in accordance with a specific pattern: once the pattern is chosen and the first tiles are placed, then all the other tiles must go in predetermined spaces in order to maintain the pattern of symmetry. Water molecules simply arrange themselves to fit the spaces and maintain symmetry; in this way, the different arms of the snowflake are formed.



Q4.1: All snowflakes are symmetric in nature/shape. (Agree/Disagree)

……

FRAMEWORK	CHARACTERISTICS
Competency	**Differentiates materials/ objects based on properties/ characteristics.**
Knowledge-system	**Physical systems**
Context	**Global**

Cognitive demand	**Easy**
Item format	**Multiple choice response**
Proficiency Level	**1**

Description of Answer Key and Credits:
Q4.1 Full Credit: Agree
No Credit: Other response or missing

Q4.2: Why are no two snowflakes exactly alike?

FRAMEWORK	CHARACTERISTICS
Competency	**Differentiates materials/ objects based on properties/ characteristics.**
Knowledge-system	**Physical systems**
Context	**Global**
Cognitive demand	**Easy**
Item format	**Closed structured response**
Proficiency Level	**1**

Description of Answer Key and Credits:
Q4.2 Full Credit: That's because *individual snowflakes* all follow slightly different paths from the sky to the ground —and thus encounter slightly different atmospheric conditions along the way.
No Credit: Other response or missing

Q4.3: Which of the following snowflake(s) may be formed when the water saturation is highest.

(a) Needle (b) Columns (c) Thin plates (d) Dendrites

FRAMEWORK	CHARACTERISTICS
Competency	**Applies learning and draws conclusion to hypothetical situations.**
Knowledge-system	**Physical systems**
Context	**Global**
Cognitive demand	**Easy**
Item format	**Complex multiple choice**
Proficiency Level	**2**

Description of Answer Key and Credits:
Q4.3 Full Credit: Option (c) Thin plates and Dendrites
Partial Credit: Any one correct response
No Credit: Other response or missing

Q4.4: Name the physical phenomenon responsible for formation of snowflakes.

FRAMEWORK	CHARACTERISTICS
Competency	**Relates processes and phenomena with causes/ effects.**
Knowledge-system	**Physical systems**
Context	**Global**
Cognitive demand	**Easy**
Item format	**Short response item**
Proficiency Level	**1**

Description of Answer Key and Credits:
Q4.4 Full Credit: Solidification
No Credit: Other response or missing

Q4.5: Encircle the approximate conditions (either temperature or water saturation or both) that favour the formation of the following snowflakes.

Shape	Temperature (^{0}C)	Water Saturation (g/m^3)

Needle	**− 0.3**	**0.2**
Hollow columns	**7**	**0.12**
Dendrites	**35**	**0.17**

FRAMEWORK	CHARACTERISTICS
Competency	**Analyses and interprets data/ graph/ figure**
Knowledge-system	**Physical systems**
Context	**Global**
Cognitive demand	**Medium**
Item format	**Closed structured response**
Proficiency Level	**3**

Description of Answer Key and Credits:
Q4.5 Full Credit: Needle- temperature
Hollow columns- water saturation
Dendrites- both temperature and water saturation
No Credit: Other response or missing

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TEST ITEM -5

ALUMINIUM-SOME FAST FACTS

Domain: Scientific Literacy	**Theme:** Metals and Non-metals (Aluminium-some fast facts)	**Class(es): X** **Expected time: 15** **Total Credit: 08**
Description of Item: ✓ Text Image Table ✓ Graph Map Poem	**Learning Outcome: (As per NCERT)** Communicates explanations with evidence. Justifies explanations pertaining to properties of aluminum. Compares and differentiates the properties of aluminum with that of other metals. Evaluation/Evaluating: assess, critique, evaluate, rank, rate; Synthesis/Creating: construct, design, formulate, organize, synthesize.	

- Aluminium is present in more than 270 minerals. It is the most abundant mineral on Earth after oxygen and silicon.
- 8% of Earth's outer crust (by weight) is made of aluminium.
- Aluminium is almost always used as an alloy, even if the aluminium content is as high as 99%. The most commonly used elements to combine with aluminium to create an alloy are zinc, copper, silicon, magnesium, and manganese.
- Aluminium reflects about 92% of visible light and about 98% of infrared rays.
- Its density and stiffness are about a third of the density and stiffness of steel.
- There are many recognized isotopes of aluminium, but only two are found in nature.
- Aluminium's silicates or oxides are more likely to be found naturally.
- The ores that contain aluminium have a very high melting point, making extraction problematic.
- Australia is the leading producer of the world's aluminium.
- Aluminium is potentially fully recyclable.Recycling aluminium requires only five percent of the energy that extracting it from ore requires.
- A block of aluminium weighs one third as much as a block of steel of the same size
- Aluminium foil is typically less than 0.15 mm (0.0060 in.) thick.
- Pure aluminium reacts rapidly with air to form a rustproof protective layer of aluminium oxide.
- It takes around 2–3 kg of bauxite (aluminium ore) to make just 1 kg of pure aluminium metal
- 890 million (metric) tons of aluminium worth $1.61 billion was produced in the United States in 2017. That's dramatically down on the 1.71 million (metric) tons of aluminium worth $3.94 billion produced in 2014, but up on the 2017 figure of 741 million (metric) tons.

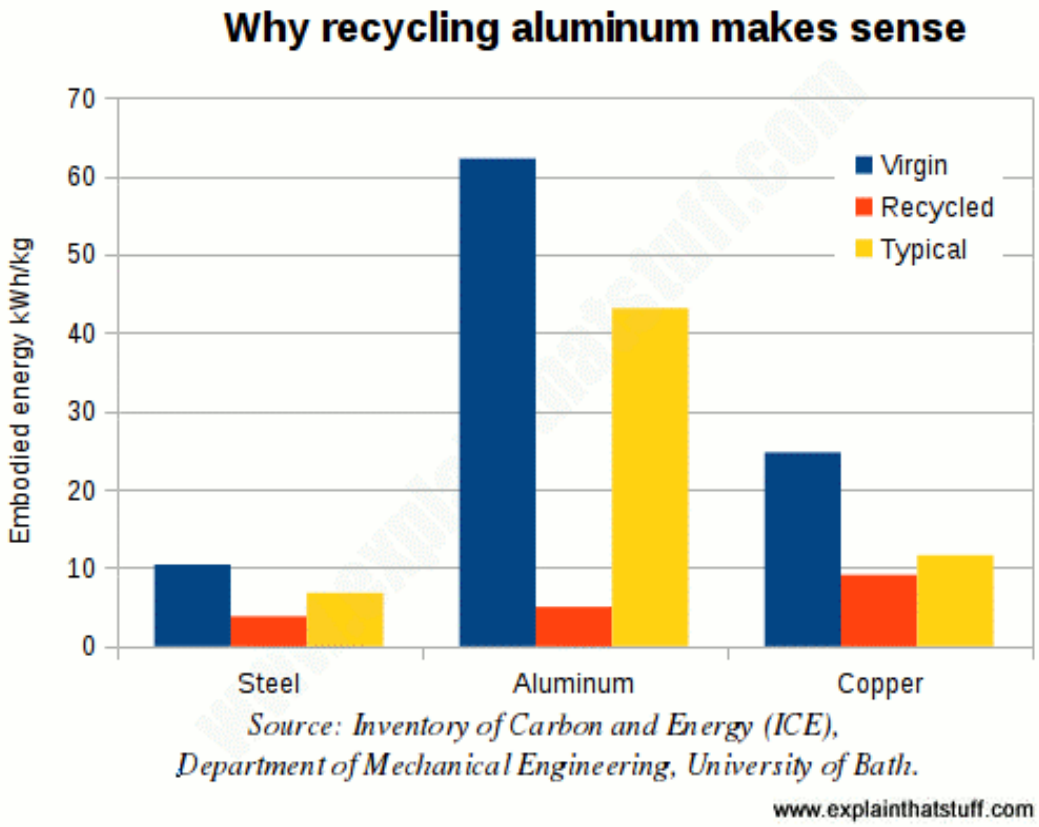
Q5.1: What may be the scientific reason(s) that full-bodied aluminium cars are becoming much more common (especially in the high-end, luxury market).

FRAMEWORK	CHARACTERISTICS
Competency	***Communicates the findings and conclusions effectively***
Knowledge-system	***Physical systems***
Context	***Global***
Cognitive demand	***Easy***
Item format	***Closed structured response***
Proficiency Level	***2***

Description of Answer Key and Credits:
Q5.1 Full Credit: Aluminum is soft, lightweight, fire-proof and heat-resistant, easy to work into new shapes, and able to conduct electricity. It reflects light and heat very effectively and it doesn't rust. It reacts easily with other chemical elements, especially oxygen, and readily forms an outer layer of aluminum oxide if we leave it in the air. Itshard-wearing, and able to survive the high temperatures in acar engine.

No Credit: Other response or missing

Q5.2: How many atoms of aluminium are there in a piece of foil that has a volume of 2.00 cm^3? The density of aluminium is 2.702g/cm^3. (Atomic weight of Al = 27)



FRAMEWORK	CHARACTERISTICS
Competency	***Calculates using the data given***
Knowledge-system	***Physical systems***
Context	***Global***
Cognitive demand	**Difficult**
Item format	***Closed structured response***
Proficiency Level	***5***

Description of Answer Key and Credits:

Q5.2 Full Credit: Mass of aluminium sheet = volume x density
= $2cm^3$ x 2.702g/ = 5.404 g
No. of atoms of Al in the sheet = 5.404 x 6.02 x 10^{23} / 27 = 1.205 x 10^{23} atoms
No Credit: Other response or missing

Q5.3: On the basis of the above graph justify that recycling of aluminium is better than its production.

FRAMEWORK	CHARACTERISTICS
Competency	**Analyses and interprets data/ graph/ figure**
Knowledge-system	**Physical systems**
Context	**Global**
Cognitive demand	**Medium**
Item format	**Closed structured response**
Proficiency Level	**4**

Description of Answer Key and Credits:
Q 5.3 Full Credit: The amount of energy it takes to recycle metal for reuse (orange bars) is a fraction of what it takes to produce virgin metal in the first place (blue bars), but the difference is much greater for aluminum (center) than for either steel (left) or copper (right) because it's so hard to extract and refine aluminum in the first place
No Credit: Other response or missing

Q5.4: Aluminium oxide shows tendency to react with

A. Water (b) acid (c) base (d) alkali

FRAMEWORK	CHARACTERISTICS
Competency	***Relates processes and phenomena with causes/ effects***
Knowledge-system	***Physical systems***
Context	***Global***
Cognitive demand	***Easy***
Item format	***Complex multiple choice***
Proficiency Level	***2***

Description of Answer Key and Credits:
Q 5.4 Full Credit: Option (b) acid and (c) base
No Credit: Other response or missing

.....

TEST ITEM -6

ITAI ITAI

DOMAIN : SCIENTIFIC LITERACY	Theme **ITAI ITAI**	Classes ; IX, X Expected time : 10 MIN Total credit : 08
Description of item Text Image	Learning outcome Observing, hypothesizing, Thinking critically to consider and evaluate alternate explanation	

Starting in 1910 and continuing through 1945, cadmium was released in significant quantities by mining operations, and the disease first appeared around 1912.[1] Prior to World War II, the mining, controlled by the Mitsui Mining & Smelting Co., Ltd., increased to satisfy the wartime demand. This subsequently increased the pollution of the Jinzū River and its tributaries. The river was used mainly for irrigation of rice fields, but also for drinking water, washing, fishing, and other uses by downstream populations

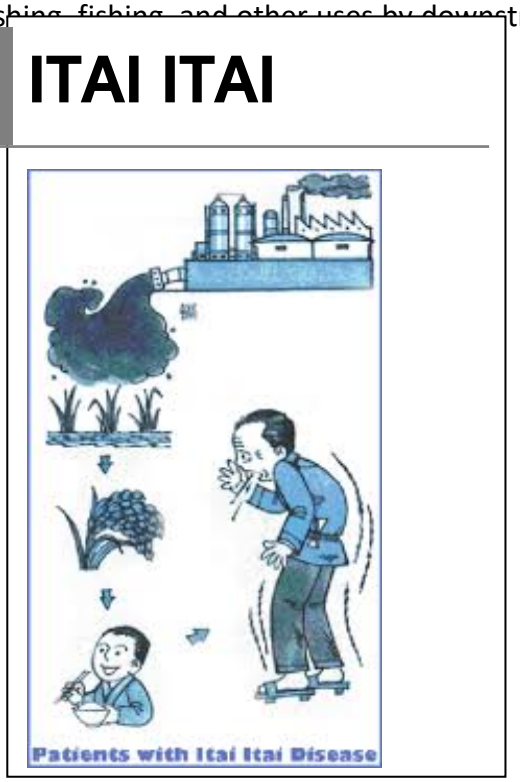
Heavy metal pollution affected many areas in Japan .The cadmium pollution had contaminated many agricultural areas.,

Due to the cadmium poisoning, the fish in the river started to die, and the rice irrigated with river water did not grow well.

The reduction of the levels of cadmium in the water supply reduced the number of new cases; no new case has been recorded since 1946..

The mines are still in operation and cadmium pollution levels remain high, although improved nutrition and medical care has reduced the occurrence of itai-itai disease

The cadmium and other heavy metals accumulated at the bottom of the river and in the water of the river. This water was then used to irrigate the rice fields. The rice absorbed heavy metals, especially the cadmium, which accumulated in the people who consumed the contaminated rice.



Q6.1: ItaiItai disease is not a communicable disease, but an endemic disease . Answer the following questions. Circle Yes / No for each question .

Itaiitai disease was not caused by any microorganism Yes / No

Itaiitai disease was reported from Japan across the basins of river jinzu Yes / No

Medical practitioners could not use any antibiotics to treat the people more suffering from itaiitai disease Yes / No

Eating more fishes or more rice can cause itaiitai disease Yes / No

……

Framework	**Characteristics**
Competency	**Explaining the phenomena scientifically**
Knowledge system	**Physical systems / Metallurgy and environment**
Context	**Global**
Cognitive demand	**medium**
Item format	**Binary choice type**
Proficiency level	**Level 3**

Description of Answer Key and Credits:

Q6.1Full Credit : Yes, Yes,Yes,No in that order

No credit: other responses and missing

Q 6.2 (ATTITUDE)

How much do you agree with the following statements? Tick only one box in each row

	Strongly agree	Agree	Strongly disagree	disagree
A systematic study of factory effluents is important				
A manufacturing company can deny the demand of publics to investigate the possible reason of diseases due to its effluents				
Action to protect the aquatic wild life should done periodically from the part of manufacturing companies				
Factory effluent can be released into near by places without treatment				

Framework	Characteristics
Competency	Explaining phenomena scientifically
Knowledge system	Physical systems/ Metallurgy and environment
Context	Individual / social
Cognitive demand	Medium
Item format	MCQ
Proficiency level	Level 3

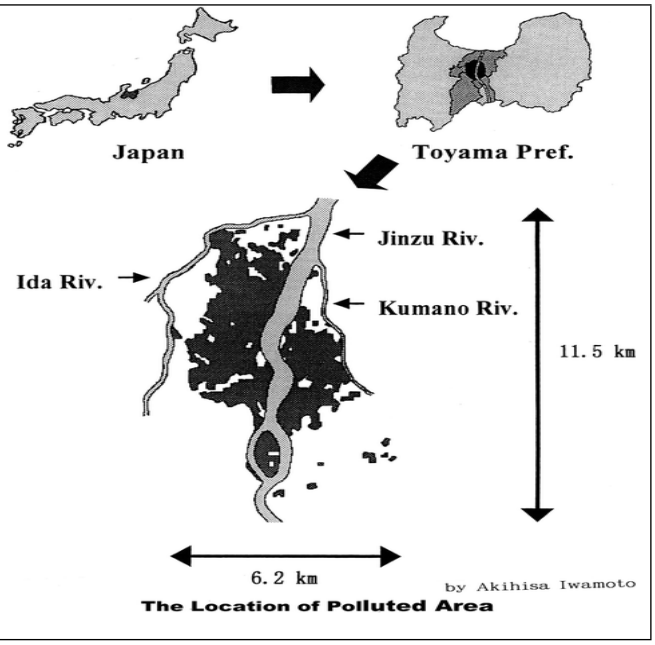
Description of Answer Key and Credits
Q6.2 Full credit: strongly agree, strongly disagree , agree, strongly disagree
Partial Credit: Any two correct responses
No credit : other responses and missing

Q 6.3 Which of the following were actually aggravating the condition of itaiitai

A. Cadmium accumulated at the bottom of the river
B. Cadmium polluted water was used for irrigation in rice fields
C. People consumed fishes from the polluted source
D. All the above

Framework	Characteristics
Competency	Explaining scientific phenomena
Knowledge system	Physical systems/Metallurgy and environment
Context	global
Cognitive demand	medium
Item format	MCQ
Proficiency level	Level 4

Description of Answer Key and Credits
Q6.3 Full credit : D. all the above
Partial credit: A/B/ C
No credit other responses and missing

Q 6.4 Briefly describe the itaiitai disease in the context of Biomagnification	

Description of Answer Key and Credits

Q6.4 Full credit : Responses referring to the phenomenon of bio magnification

Such as: Release of cadmium containing effluents to water bodies / Jinzu river and tributaries

: cadmium reaches rice fields

: cadmium reaches the body of fishes in Jinzu river and tributaries

: cadmium enters food chain

: cadmium reaches the body of human beings

No credit : other responses , not relating the toxic substances entering food chain and reaching the higher trophic levels of habitat

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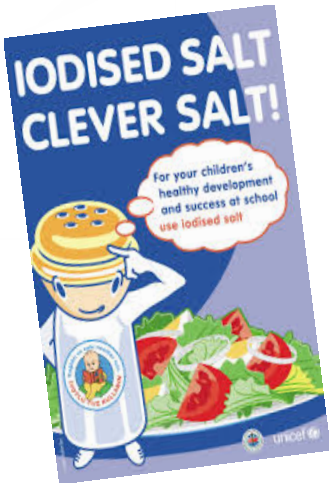
TEST ITEM-7

LITTLE IODINE

DOMAIN : SCIENTIFIC LITERACY	Theme - **LITTLE IODINE**	Classes : X,IX Expected time : 10 MIN Total credit : 08
Description of item IMAGE TEXT TABLE	Learning outcome ANALYSING , INTERPRETING DATA Observing , questioning	



Iodine, the nonmetal is an essential component of the hormones produced by the thyroid gland that are essential for mammalian life. Although Goitre is the most visible sequelae of iodine deficiency, the major impact of hypothyroidism as a result of iodine deficiency is impaired brain development, particularly early in life. According to the World Health Organization, it is the single most preventable cause of mental retardation and brain damage. The simplest, most effective and inexpensive preventive method is the consumption of iodized salt.

Q.7.1 While visiting your friend's house you notice that , they do not use iodised salt. Which of the following reason will you highlight to make them understand the need of consumption of iodised salt.

Circle your answer Yes or No

During childhood less intake of iodine can cause impaired brain development	Yes / No
Mental retardation can be prevented by the correct intake of dietary iodine	Yes/ No
Iodine deficiency can lead to hypothyroidism	Yes/ No
Consuming iodized salt is an inexpensive preventive method of mental retardation	Yes / No

Framework	Characteristics
Competency	Explaining phenomena scientifically
Knowledge system	Physical system/ metallurgy and environment
Context	Global
Cognitive demand	High
Item format	Open response type
Proficiency level	Level 5

Description of Answer Key and Credits

Q7.1 Full credit :Yes,Yes,Yes,Yes in that order

Partial Credit: Any two correct responses

No credit: other responses and missing

Q7.2 Mysore and Coorg are two districts in Indian subcontinent .Result obtained from a study conducted in Mysore and Coorg Districts among school children age 6-12 year is given

	Number of Goitre cases reported			
	Mysore district		Coorg district	
Class/ grade	Boys	girls	Boys	Girls
I	9	11	26	45
Ii	16	29	29	48
Iii	15	40	55	46
Iv	27	40	62	88
V	26	38	57	82
VI	33	65	62	96
VII	37	88	90	116
TOTAL	157	311	381	521

What conclusion from the table given , you get about the trend Goitre rate among the age groups 6-8 year old and 9-12 year old children?

Framework	Characteristics

Competency	**Explaining the phenomena scientifically**
Knowledge system	**Physical system , Non metals in daily life and health**
Context	**Individual**
Cognitive demand	**medium**
Item format	**Binary**
Proficiency level	**Level 3**

Description of Answer Key and Credits

Q7.2 Full credit : Goitre rate is increasing among the 9-12 year old age group as compared to 6-8 year old group

No credit : any other response and missing

Q7.3 Several environmental and genetic factors interfere with the processes of thyroxin synthesis leading to Goitre formation. The genetic factors, which are rare, mainly affect the enzymes involved in thyroxin synthesis.Environmental factors are amongst the most common factors that interfere in thyroxin synthesis and lead to Goitre formation. The most important environmental factors are (i) environmental iodine deficiency and (ii) goitrogens.
The most frequent cause of Goitre in India and other countries is environmental iodine deficiency. However, there is emerging evidence in different countries of world that goitrogens may play a secondary role in several endemic foci. Goitrogens are chemical substances that occur primarily in plant food. They can occasionally be present in contaminated drinking water. Goitrogens interfere in thyroxin synthesis by inhibiting the enzymes involved in the synthesis of thyroxin.

The passage says thatgoitrogens also interfere with common factors responsible for Goitreformation . Which of the following facts are correct about goitrogens .Circle your answer Yes or No

Goitrogens are mostly not present in plant origin food Yes or No

Contaminated drinking water also contain goitrogens Yes or No

Goitrogens block thyroxin synthesizing enzymes Yes or No

Goitrogens are much known to the people as a cause of Goitre Yes or No

Framework	**Characteristics**
Competency	**Explaining the phenomena scientifically**
Knowledge system	**Physical systems, Nonmetals in daily life**
Context	**global**

Cognitive demand	**High**
Item format	**Interpreting given data, open response type**
Proficiency level	**Level 5**

Description of Answer Key and Credits
Q7.3 Full credit : NO,YES,YES , NO in that order **No credit : Other responses and missing**

Q7.4

There is also evidence to show that intensive cropping, resulting in large scale removal of biomass from the soil, as well as widespread use of alkaline fertilizers, rapidly deplete the soil of its iodine content. Since both intensive cropping and use of alkaline fertilizers are widely practiced in almost all developing the countries, it is not surprising that nutritional iodine deficiency and endemic Goitre are seen wherever they are looked for in many regions..

Goitre is not just the condition caused by dietary deficiency of iodine . Apart from all these, list out other factors leading to Goitre in different parts of the world

Framework	**Characteristics**
Competency	**Explaining the phenomena scientifically**
Knowledge system	**Physical system, Nonmetal in daily life**
Context	**Social**
Cognitive demand	**Medium**
Item format	**Binary choice**
Proficiency level	**Level 3**

Description of Answer Key and Credits
Q7.4 Full credit: Any four reasons such as over intake of goitrogens,Intensive cropping , Removal of biomass from the field , Overuse of fertilisers **Partial credit : any two responses as cited above** **No credit: any other response such as nutritional deficiency of iodine**

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TEST ITEM -8

WATER

Water, a substance composed of the chemical elements hydrogen and oxygen and existing in gaseous, liquid, and solid states. It is one of the most plentiful and essential of compounds. A tasteless and odourless liquid at room temperature, it has the important ability to dissolve many other substances

Water is an inorganic, transparent, tasteless, odourless, and nearly colourless chemical substance, which is the main constituent of Earth's hydrosphere and the fluids of most living organisms. It is vital for all known forms of life, even though it provides no calories or organic nutrients.

Fig 1

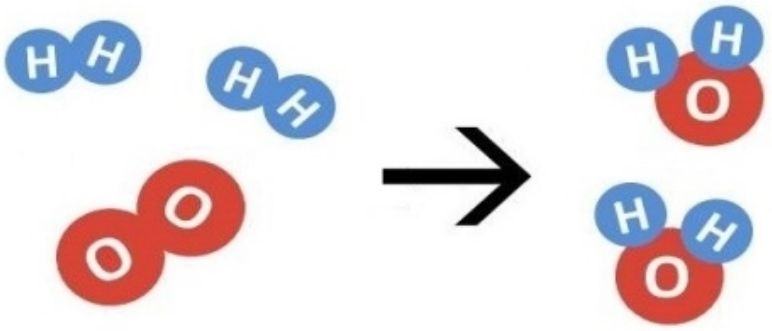
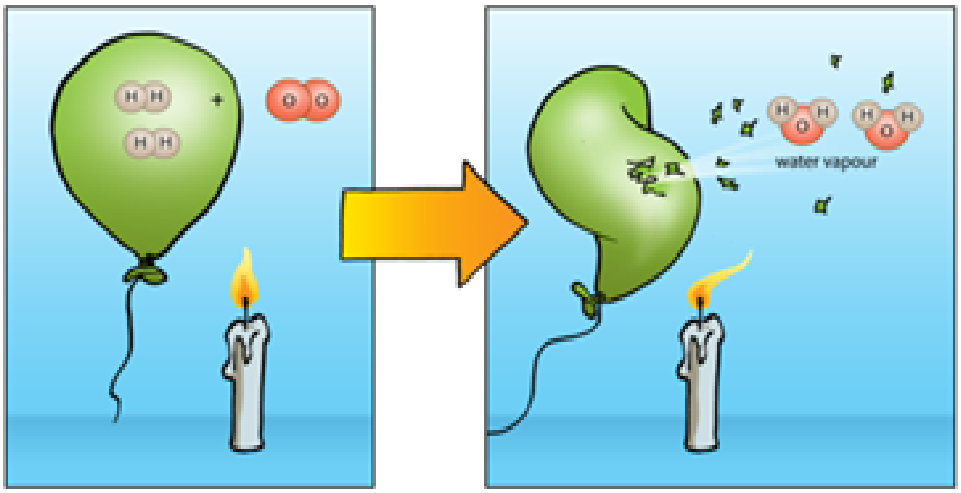


Fig 2



DOMAIN : SCIENTIFIC LITERACY	Theme $H_2 + O_2$	Classes : IX, X Expected time : 10 MIN Total credit : 08
Description of item Image text	Learning outcome Hypothesizing Justifying explanations Communicating explanations with evidence	

Q8.1 Study the given diagrams and read the passages. Which of the following equations given regarding formation of water can be the correct one . Select Yes or No

$2H + 2O \rightarrow 2HO$ Yes / No

$2H_2 + O_2 \rightarrow 2H_2O$ Yes/ No

$4H + 2O \rightarrow H_2O$ YES / No

Framework	**Characteristics**
Competency	**Explaining the phenomena scientifically**

Knowledge system	**Physical systems / Reactions of non-metals**
Context	**Global**
Cognitive demand	**medium**
Item format	**Binary choice type**
Proficiency level	**Level 3**

Description of Answer Key and Credits

Q8.1 Full Credit : No, Yes, No in that order

No credit : other responses and missing

Q8.2The following substances are added to same amount of water separately , wheat flour, lemon juice, potassium permanganate, Dettol . Which properties will change in the correct order.

a. Transparency, taste, colour, odour YES / NO
a. Odour, colour, taste, transparency YES /NO
b. Colour, taste, odour, transparency YES/NO

Framework	**Characteristics**
Competency	**Explaining phenomena scientifically**
Knowledge system	**Physical systems , non metals in daily life**
Context	**Global**
Cognitive demand	**medium**
Item format	**Closed response**
Proficiency level	**L4**

Description of Answer Key and Credits

Q8.2 Full credit: YES, NO, NO in that order
No credit : other responses and missing

Q8.3 If 4 gram of hydrogen is reacted with 40 g of oxygen, after complete reaction, how much oxygen will be left unreacted . Explain your answer.

.....

Framework	Characteristics
Competency	**Explaining scientific phenomena**
Knowledge system	**Physical systems/ mole concept,**
Context	**Individual**
Cognitive demand	**High**
Item format	**Open constructive type**
Proficiency level	**Level 6**

Description of Answer Key and Credits

Q8.3 Full credit : explaining the points such as

* $2H_2 + O_2 \rightarrow 2H_2O$

* According to the chemical equation:

4 gram of Hydrogen + 32 gram of oxygen → 36 gram of water

So the amount of oxygen left is 40 - 32 = 8g

No credit other responses and missing

Question 8.4 :Figure 2 indicate some changes during a chemical reaction . Mark the correct one as agree / disagree

(a) The reactant oxygen is a supporter of burning and the product water vapour is not supporter of burning Agree / Disagree

(b) The physical properties of reactants can change after a chemical reaction Agree / Disagree

(c) Chemical reaction always take place in a definite proportion Agree / Disagree

Framework	Characteristics
Competency	**Explaining phenomena scientifically**
Knowledge system	**Physical systems/ properties of reactions**
Context	**Individual**
Cognitive demand	**Medium**

Item format	**Binary choice**
Proficiency level	**Level 3**

Description of Answer Key and Credits
Q8.4 Full credit : Agree/ Agree/ Agree **No credit :**

……..

TEST ITEM -9
CURIES

DOMAIN : SCIENTIFIC LITERACY	Theme : **CURIES**	Classes IX, X Expected time : 10 MIN Total credit : 06

Description of item Text image	Learning outcome Communicating explanations with evidence , Justifying explanations

Radium was discovered by Marie Sklodowska Curie and her husband Pierre Curie on 21 December 1898 in anuraninite or pitch blende sample. All isotopes of Radium are highly radioactive. When radium decays, ionising radiation is a product, which can excite flouroscent chemicals and cause radioluminescence.

On September 1910 Marie Curie announced that they had isolated radium as pure metal through electrolysis of Radium chloride solution.

The physical and societal aspects of the Curies' work contributed to shaping the world of the twentieth and twenty-first centuries. Cornell University professor L. Pearce Williams observes:

“The result of the Curies' work was epoch-making. Radium's radioactivity was so great that it could not be ignored. On the experimental level the discovery of radium provided men like Ernest Rutherford with sources of radioactivity with which they could probe the structure of the atom. As a result of Rutherford's experiments with alpha radiation, the nuclear atom was first postulated. In medicine, the radioactivity of radium appeared to offer a means by which cancer could be successfully attacked.”

Q9.1 . In the passage it is described that the element discovered by Curies was exhibiting the property of radioluminiscence . It means that

(a) During radioactive decay, radium atoms emit ionizing radiations **Yes / No**
(b) Radioactive emissions were able to excite fluorescent chemicals **Yes / No**

Framework	**Characteristics**
Competency	**Explaining the phenomena scientifically**
Knowledge system	**Physical systems / RADIOACTIVITY**
Context	**Global**
Cognitive demand	**medium**

Item format	**Binary choice type**
Proficiency level	**Level 3**

Description of Answer Key and Credits

Q9.1 Full Credit : YES,YES in that order
No credit : other responses and missing

Q9.2 . The analytical process used by Curie to isolate radium was electrolysis. Explain the process electrolysis.

……

Framework	**Characteristics**
Competency	**Explaining phenomena scientifically**
Knowledge system	**Physical systems/ analytical process/ Methods of separation**
Context	**Individual**
Cognitive demand	**Medium**
Item format	**Open constructive type**
Proficiency level	**Level 4**

Description of Answer Key and Credits

Q9.2 Full credit: Dissociation of compounds into respective ions by passing electricity though the electrolyte
No credit : other responses and missing

Q9.3 Highlight the contribution of Curies to the scientific world .

……

Framework	**Characteristics**
Competency	**Explaining scientific phenomena**
Knowledge system	**Physical systems/ Contribution of scientists**
Context	**global**

Cognitive demand	**medium**
Item format	**Closed constructive type**
Proficiency level	**Level 5**

Description of Answer Key and Credits

Full credit : Any four points such as

(a) The result of the Curies' work was epoch-making.
(b) Radium's radioactivity was so great that it could not be ignored.
(c) On the experimental level the discovery of radium provided men like Ernest Rutherford with sources of radioactivity with which they could probe the structure of the atom.
(d) As a result of Rutherford's experiments with alpha radiation, the nuclear atom was first postulated.
(e) In medicine, the radioactivity of radium appeared to offer a means by which cancer could be successfully attacked

Partial credit: any two points as cited above

No credit other responses and missing

……..

TEST ITEM-10

MIYAWAKI

DOMAIN : SCIENNTIFIC LITERACY	Theme - MIYAWAKI	Classes : IX,X Expected time :10 MIN Total credit : 06
Description of item Image Text	Learning outcome Observing, Hypothesizing	
	Communicating explanations with evidence .Thinking critically	

	to consider and evaluate alternative explanations

Miawaki is technique pioneered by Japanese Botanist Akira Miawaki that helps to build dense native forest. The approach is supposed to ensure that plant growth is ten times faster and the resulting plantation is thirty times denser than usual. It involves planting dozens of native species in the same area and becomes maintenance free after the first three years.	
Step 1: Determine the soil texture and quantify biomass Step 2: Select tree species for plantation Step 3: Design the forest Step 4: Preparing the area Step 5: Plant the trees! Step 6: Look after the forest for three years	

Q10.1. As compared to the traditional forest planting methods:

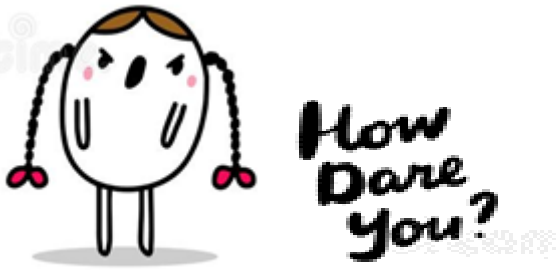
1. MIYAWAKI clearly supports local biodiversity conservation aspects : YES / NO
2. if done in metro cities MIYAWAKI can reduce CO_2 emission : YES / NO
3. Fruitivorous birds and animals can be conserved locally : YES / NO
4. MIYAWAKI ensures people participation in all levels of age group : Yes / NO

Framework	Characteristics
Competency	Explaining the phenomena scientifically
Knowledge system	Biological systems / afforestation
Context	Global
Cognitive demand	medium
Item format	Binary choice type
Proficiency level	Level 3

Description of Answer Key and Credits

Q10.1 Full Credit : YES.YES,YES,YES in that order

No credit : other responses and missing

	OUR HOUSE IS ON FIRE SAVE PLANET EARTH, CLEAN AIR, OUR FUTURE IN YOUR HANDS, NO MORE EXCUSES- **GRETA THUNBERG**

Q10.2. Refer Greta Thunberg's call to SAVE EARTH . How school children can respond in the context of MIYAWAKI. Briefly explain in your own words.

Framework	Characteristics
Competency	Explaining phenomena scientifically
Knowledge system	Biological systems/ afforestation
Context	Individual / social
Cognitive demand	Medium
Item format	Closed constructive type
Proficiency level	Level 5

Description of Answer Key and Credits

Q10.2 Full credit: any two points such as Oraganzing MIYAWAKI in schools

Organizing MIYAWAKI in house premises

Partial credit : any one point as cited above

No credit: other than the above points and missing

Q 10.3 . Compare Van Mahotsava programme and MIYAWAKI forests.

……

Framework	Characteristics
Competency	**Explaining scientific phenomena**
Knowledge system	**Biological systems/ afforestation**
Context	**global**
Cognitive demand	**High**
Item format	**Open constructive type**
Proficiency level	**Level 5**

Description of Answer Key and Credits

Q10.3 Full credit:

Van mahotsava observed once in a year

MIYAWAKI beyond time limit

Van Mahotsava is a government sponsored programme

MIYAWAKI is fully people oriented

Partial credit : any one point as cited above

No credit: other than the above points and missing

……..