SMART SKILLS

2021-2022

CLASS 10

CHEMISTRY

INDEX

SYLLABUS – 2021-2022

CHEMISTRY

CLASS – X

March –April

Chapter1: Chemical reactions and equations

Types of chemical reactions: Combination, decomposition, displacement, double displacement, oxidation and reduction in terms of gain and loss of oxygen, corrosion, rancidity.

Activities:

To demonstrate different types of reactions in the class.

Practical

Experiment – 1

To perform and observe the following reactions and classify them into:

- Combination reaction
- Decomposition reaction
- Displacement reaction
- Double displacement reaction

(1) Action of water on quick lime.

(2) Action of heat on ferrous sulphate crystals.

(3) Iron nails kept in copper sulphate solution.

(4) Reaction between sodium sulphate and barium chloride solutions.

MAY

Chapter2: Acids, bases and Salts

Understanding the chemical properties of acids and bases: how do acids and bases react with metals, how do metal carbonates and metal hydrogen carbonates react with acids, how do acids and bases react with each other, reaction of metallic oxides with acids, reaction of a non-metallic oxide with base, what happens to an acid or a base in a water solution .

pH, importance of pH in everyday life, chemicals from common salt, sodium hydroxide, bleaching powder, baking soda, washing soda, plaster of Paris.

Activities:

- Reaction of acids and bases with metal.
- Reaction of HCl with $NaHCO_3$ and Na_2CO_3.
- Neutralization reaction.
- Effect of acid and base on litmus paper.

Practical

Experiment – 2

To find the pH of the following samples:

(i) Dilute HCl solution

(ii) Dilute NaOH Solution

(iii) Dilute ethanoic acid solution

(iv) Lemon juice

(v) Water

(vi) Dilute sodium carbonate solution by using pH paper/ universal indicator.

Experiment – 3

To study the properties of acids (dil HCl) by their reactions with:

(i) Litmus solution (Red/Blue)

(ii) Zinc metal

(iii) Sodium carbonate.

Experiment – 4

To study the properties of bases (dil NaOH) by their reactions with:

(i) Litmus solution

(ii) Zinc metal

(iii) Solid sodium carbonate

(iv) Phenolphthalein.

July

Chapter3: Metals and non-metals

Physical properties of metals and non-metals, chemical properties of metal, reactivity series, properties of ionic compounds, various metallurgical processes, corrosion, prevention of corrosion.

Various metallurgical processes, corrosion, prevention of corrosion.

Activities:

- Reaction of metals with water.
- Rusting of iron.

Practical

Experiment – 5:

(a) To observe the action of Zinc, iron, copper and aluminium on the following salt solutions:

(i) $ZnSO_4$ (aq)

(ii) $FeSO_4$ (aq)

(iii) $CuSO_4$ (aq)

(iv) $Al_2(SO_4)_3$ (aq)

(b) Arrange Zn, Fe, Cu and Al in the decreasing order of reactivity based on the above result.

August

Chapter 4: Carbon and its compounds

Nomenclature of carbon compounds, bonding in carbon- the covalent bond, versatile nature of carbon, saturated and unsaturated carbon compounds.

Chains, branches and rings, homologous series, properties of alcohols and carboxylic acids,

September

Soap-cleansing action of soap.

AIL (Art integrated learning)

Make any two 3-D models of covalently bonded molecules from the following, with the help of dough, colours, toothpicks etc. Click their pictures and upload as a single pdf for assessment.

1. **Ammonia**
2. **Methane**
3. **Ethane**
4. **Ethene**
5. **Ethyne**
6. **Sulphur**
7. **Carbon dioxide**

The criteria of assessment will be
Accuracy - 2 Marks
Neatness - 2 Marks
Timely submission - 1 Mark

Practical

Experiment – 6 To study the following properties of acetic acid:

(i) Colour

(ii) Solubility in water

(iii) Effect on litmus

(iv) Reaction with sodium carbonate

Experiment – 7

Testing the behaviour of soap with hard and soft water and other properties.

October

Chapter 5: Periodic classification of elements

Early attempts at the classification of elements: Dobereiner'striads, Newland's law of octaves, Mendeleev's periodic table, achievements of Mendeleev's periodic table, limitation of Mendeleev's classification, Modern periodic table, position of elements in the modern periodic table, trends in the modern periodic table: valency, atomic size, metallic and non-metallic properties.

November

Chapter 14: Sources of energy

Conventional sources of energy: fossil fuels, thermal power plant, hydro power plant, biomass and wind energy.

Revision

PRACTICALS

1) Observation of following and classifying into kind of reaction

(i) Action of water on Quick lime

(ii) Action of heat on $FeSO_4$ crystals

(iii) Iron nails kept in $CuSO_4$ solution.

(iv) Reaction between Na_2SO_4 and $BaCl_2$ solutions

2) Finding pH of Dil .HCl solution, Dil. NaOHsolution, Dil. Ethanoic acid solution, lemon juice, water, dil. Sodium carbonate solution

3) Study the reaction of dil. HCl with litmus solution (Red/ Blue), Zinc metal, Sodium carbonate

4) Study the properties of bases with litmus solution, zinc metal, sodium carbonate, and phenolphthalein.

5) Observing the action of Zn, Fe, Cu and Al on $ZnSO_4$, $FeSO_4$, $CuSO_4$ and $Al_2(SO_4)_3$ solutions. Based on these, arrange the metals in the reactivity series.

6) To study the following properties of acetic acid:
Colour
Solubility in water
Effect on litmus
Reaction with sodium carbonate

7) Testing of soap on following parameters
Lather formation with hard and soft water and its comparison.

The changes for classes IX-XII (2021-22) internal year-end/Board Examination are as under:

Year-end Examination/ Board Examination (Theory)	(2020-21) Existing	(2021-22) Modified
Composition	• Objective type Questions including Multiple Choice Question-20% • Case-based/Source- based Integrated Questions-20% • Short Answer/ Long Answer Questions- Remaining 60%	• Competency Based Questions would be minimum 30%, these can be in the form of Multiple Choice Questions, Case- Based Questions, Source Based Integrated Questions or any other types • Objective Questions will be 20 % • Remaining 50% Short Answer/ Long Answer Questions- (as per existing

Chapter No. 1

Chemical Reactions and equations

Learning Objectives : The students will be able to

- Identify and explain different types of chemical reactions.
- Write chemical equations from word equations and balance them stepwise.
- Learn to make equations more informative.
- Explain the effects of oxidation in terms of corrosion, rancidity and respiration.
- Do NCERT back questions and assignment questions.
- To develop creativity and application skills.

Expected Learning Outcomes

The students would be able to

1. To identify different types of chemical reactions and study characteristics.
2. To relate chemical equations to the law of conservation of mass and balance the equations to equalise atoms of reactants and products.
3. To relate oxidation reactions to everyday examples like corrosion and rancidity.
4. To find methods to prevent rancidity and corrosion in everyday life.
5. To use scientific conventions to represent units of various quantities/symbols/ formulae/ equations, such as balanced chemical equations by using symbols and physical states of substances.

Assignment

Q1. Write the balanced chemical equations for the following chemical reactions.

a) Aqueous solution of sulphuric acid reacts with sodium hydroxide to form aqueous sodium sulphate and water.

b) Sodium hydroxide solution reacts with hydrochloric acid solution to produce sodium chloride solution and water .

Q2. Balance the following equations :-

1)	$Fe_2O_3 + Al \rightarrow$	$Al_2O_3 + Fe$
2)	$FeSO_4 \rightarrow$	$Fe_2O_3 + SO_2 + SO_3$

Q3. What happens

i) When quicklime is added to water?

ii) Zinc metal is dipped in copper sulphate solution.

Q4. Translate the following into balanced chemical equations :

1) Steam is passed over heated iron to form magnetic oxide of iron (Fe_3O_4) and hydrogen.

2) Carbon disulphide burns in air to give carbon dioxide and sulphur dioxide.

3) Magnesium burns in presence of Nitrogen to form Magnesium nitride.

Q5. With the help of an activity show the displacement reaction of zinc granules and dilute hydrochloric acid.

Q6. A metal is treated with dilute sulphuric acid .The gas evolved is collected by the method shown in the figure. Answer the following

(i) Name the gas.

(ii) Name the method of collection of the gas.

(iii) Is the gas soluble or insoluble in the water?

(iv) Is the gas lighter or heavier than air?

Q7. When hydrogen burns in oxygen, water is formed and when water is electrolysed, then hydrogen and oxygen are produced. What type of reaction takes place

a) In the first case.

b) In the second case.

Give equations.

Q8. Give one example of a redox reaction which is also

1) A combination reaction.

2) A displacement reaction.

Q9. Identify the component oxidised in the following reactions

a) $ZnO + C \longrightarrow Zn + CO$

b) $H_2S + Cl_2 \longrightarrow S + 2HCl$

Q10 What is Rancidity? Suggest methods which can be used to prevent food from getting rancid.

Q11. Decomposition reactions require energy in the form of heat , light or electricity for breaking down of reactants . Write one equation each for decomposition reactions where energy is supplied in the form of heat , light and electricity .

Q12. Write chemical equations for the following reactions :

i) When zinc carbonate is calcined ?

ii) When manganese dioxide is heated with aluminium powder .

iii) When magnesium is treated with very dilute nitric acid.

Q13. A substance 'X' which is an oxide of a group 2 element , is used intensively in the cement industry . This element is present in bones also .On treatment with water it forms a solution which turns red litmus blue . Identify 'X' and also write the chemical reactions involved .

Q14. A magnesium ribbon is burnt in oxygen to give a white compound X accompanied by emission of light . If the burning ribbon is now placed in an atmosphere of nitrogen , it continues to burn and form a compound Y

a) Write the chemical formulae of X and Y .

b) Write a balanced chemical equation , when X is dissolved in water .

Q15. Why do we store silver chloride in dark coloured bottles ?

Multiple Choice Questions

1 . Before burning in air, the magnesium ribbon is cleaned by rubbing with a sand paper to:

a. Make the ribbon surface shinier

b. Remove the layer of magnesium oxide from the ribbon surface

c. Remove the layer of magnesium carbonate from the ribbon surface

d. Remove the moisture from the ribbon surface

2. The respiration process during which glucose undergoes slow combustion by combining with oxygen in the cells of our body to produce energy, is a kind of:

a. Exothermic process

b. Endothermic process

c. Reversible process

d. Physical process

3. A chemical reaction does not involve:

a. Formation of new substances having entirely different properties than that of the reactants

b. Breaking of old chemical bonds and formation of new chemical bonds

c. Rearrangement of the atoms of reactants to form new products

d. Changing of the atoms of an element into those of another element to form new products

4. One of the following processes does not involve a chemical reaction. That is:

a. Melting of candle wax when heated

b. Burning of candle wax when heated

c. Digestion of food in our stomach

d. Ripening of banana

5. 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

6. You are given the following chemical reaction:

$$CuO + H_2 \xrightarrow{Heat} Cu + H_2O$$

This reaction represents:

a. Combination reaction as well as double displacement reaction

b. Redox reaction as well as displacement reaction

c. Double displacement reaction as well as redox reaction

d. Decomposition reaction as well as displacement reaction

7. Which of the following gases is used in the storage of fat and oil containing foods for a long time?

a. Carbon Dioxide gas

b. Nitrogen gas

c. Oxygen gas

d. Neon gas

8. The neutralization reaction between an acid and a base is a type of:

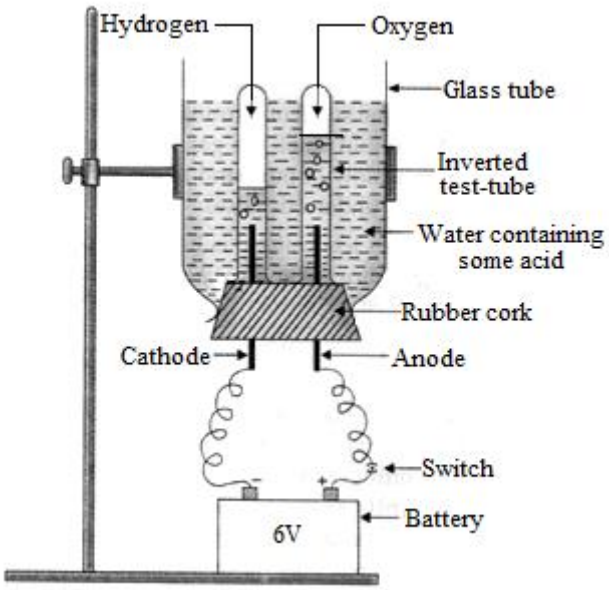
a. Double displacement reaction

b. Displacement reaction

c. Addition reaction

d. Decomposition reaction

9. Following is given a diagram showing an experimental set-up:



The given set-up is used to carry out:

a. Distillation of water

b. Purification of water

c. Electrolysis of water

d. Hydrolysis

10. White silver chloride in sunlight turns to

a)Grey

b)Yellow

c)Remain white

d)Red

11. What happens chemically when quick lime is added to water?

12. What is an oxidation reaction? Is it exothermic or endothermic?

13. Give an example of photochemical reaction.

14.A substance 'X' is used in white-washing and is obtained by heating limestone in the absence of air . Identify 'X' .

15. Fill in the blanks –

1. The addition of O_2 to a substance is called _____ whereas removal of oxygen is called _____ .
2. The colour of magnesium oxide is _____ .
3. Precipitation reaction produces insoluble _____ .
4. A reaction in which an element displaces another element from its compound is called _____ .

16. Identify whether the statement is true or false ;

1. Antioxidants are used to prevent oxidation of food containing fats and oils.
2. A chemical change occurs by chemical reaction .
3. In a chemical equation, Reactants are written on the right hand side .

ARCHEMR3

Types of chemical reaction

Scientists classify chemical reactions into different types, such as neutralisation, combination, redox, double displacement (precipitation), decomposition and displacement. This exercise provides the equations for a number of chemical reactions.

For each reaction, you are given a word equation and a balanced chemical equation:

magnesium	+	**steam**	→	**magnesium oxide**	+	**hydrogen**
Mg(s)	+	$H_2O(g)$	→	MgO(s)	+	$H_2(g)$

You should try to classify each of the examples given.

- ☐ Type of reaction:
- ☐ Displacement
- ☐ Neutralisation
- ☐ Redox
- ☐ Combination
- ☐ Decomposition
- ☐ Double displacement (precipitation)
- ☐ None of the above

For each reaction tick (✓) the box, or boxes, that describe the type of reaction. Some of the reactions may be examples of more than one type of reaction and some of the reactions may only occur when energy is provided (by heating or electrolysing), but this is not shown in the questions.

Tick (✓) "None of the above" if the reaction does not seem to fit any of the suggestions.

Explain why you have classified the reaction the way you have.

3. **lead nitrate solution** + **sodium iodide solution** → **lead iodide solid** + **sodium nitrate solution**

$Pb(NO_3)_2(aq) + 2NaI(aq) \rightarrow PbI_2(s) + 2NaNO_3(aq)$

Type of reaction	I made this classification because…
☐ Displacement	_____
☐ Neutralisation	_____
☐ Redox	_____
☐ Combination	_____
☐ Decomposition	_____
☐ Double displacement (precipitation)	_____
☐ None of the above	_____

4. **sodium** + **water** → **sodium hydroxide** + **hydrogen gas**

$2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$

Type of reaction	I made this classification because…
☐ Displacement	_____
☐ Neutralisation	_____
☐ Redox	_____
☐ Combination	_____
☐ Decomposition	_____
☐ Double displacement (precipitation)	_____
☐ None of the above	_____

5.

zinc	+	**copper sulfate solution**	→	**zinc sulfate solution**	+	**copper**
$Zn(s)$	+	$CuSO_4(aq)$	→	$ZnSO(aq)$	+	$Cu(s)$

Type of reaction	I made this classification because…
☐ Displacement	_____
☐ Neutralisation	_____
☐ Redox	_____
☐ Combination	_____
☐ Decomposition	_____
☐ Double displacement (precipitation)	_____
☐ None of the above	_____

6.

copper carbonate	→	**copper oxide**	+	**carbon dioxide**
$CuCO_3(s)$	→	$CuO(s)$	+	$CO_2(g)$

Type of reaction	I made this classification because…
☐ Displacement	_____
☐ Neutralisation	_____
☐ Redox	_____
☐ Combination	_____
☐ Decomposition	_____
☐ Double displacement (precipitation)	_____
☐ None of the above	_____

ARCHEMR9

Dominoes: Chemical changes and equations

Double displacement	aluminium (s) + iodine (s) → aluminium iodide (s)
Combination	magnesium (s) + sulfuric acid (aq) → magnesium sulfate (aq) + hydrogen (g)
Displacement	copper oxide (s) + hydrochloric acid (aq) → copper chloride (aq) + water
Neutralisation	lead nitrate(aq) + sodium iodide(aq) → lead iodide(s) + sodium nitrate(aq)
Double displacement	copper carbonate (s) → copper oxide (s) + carbon dioxide
Decomposition	butane (g) + oxygen(g) → carbon dioxide (g) + water (l)
Redox	potassium hydroxide (s) + nitric acid (aq) → potassium nitrate (aq) + water (l)

ARCHEMR9

Neutralisation	magnesium carbonate (s) ↓ magnesium oxide (s) + carbon dioxide (g)
Decomposition	methane (g) + oxygen(g) ↓ carbon dioxide (g) + water (g)
Redox	zinc (s) + sulfur (s) ↓ zinc sulfide (s)
Combination	iron (s) + copper sulfate(aq) ↓ copper(s) + iron sulfate(aq)
Displacement	magnesium oxide (s) + nitric acid (aq) ↓ magnesium nitrate (aq) + water (l)
Neutralisation	nitrogen (g) + hydrogen (g) ↓ ammonia (g)
Combination	silver nitrate(aq) + zinc chloride(aq) ↓ silver chloride(s) + zinc nitrate(aq)

Chapter No. 2

Acids, bases and salts

Learning Objectives

The students will be able to-

- Define and differentiate the physical and chemical properties of acids, bases and salts.
- know about pH and its importance in everyday life.
- Acquire knowledge about preparation properties of materials of daily use like bleaching powder, baking soda washing soda and plaster of paris.
- Know about the concept of Water of crystallization.
- Do NCERT back questions and assignment questions.
- To develop creativity and application skills.
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Expected Learning Outcomes

1. To differentiate between physical and chemical properties of acids, bases and salts.
2. To understand what all acids and bases have in common.
3. Observation of experiments to observe regularities and patterns Logical reasoning for the observations to develop critical thinking and problem solving.
4. Deducing conclusions to develop competency through qualitative and quantitative assessment Conducting and recording practical Numerical ability to hone practical applicability of concepts in everyday life.
5. To draw labelled diagrams/ flow charts/ concept map/graphs, such as electrolysis of water, electron dot structure of atoms and molecules, flow chart for extraction of metals from ores.

Assignment

Q1. A gas produced in the lab is highly soluble in water. Its colourless solution turns pink by adding a few drops of indicator. Name the indicator and the nature of this gas?

Q2. Crystals of a substance changed their colour on heating in a closed vessel but regained it after some time when they were allowed to cool down .Name one such substance that shows this property.

Q3. Identify the compound of calcium which is yellowish white powder and is used for disinfecting drinking water. How is it manufactured? Write chemical equations for the reactions involved. What happens when it is left exposed to air?

Q4. With the help of an activity show that hydrochloric acid solution conducts electric current.

Q5. A student dropped a few pieces of marble in dilute hydrochloric acid contained in a test tube . The evolved gas was passed through lime water . What change would be observed in lime water ? Write the balanced chemical equations for both the changes observed .

Q6. Give reasons;

a) Acid must be added to water and not vice versa during dilution.
b) Solution of sulphuric acid conducts electricity whereas alcohol does not.
c) Cake rises on adding baking powder.
d) Dry ammonia gas has no action on litmus paper, but a solution of ammonia in water turns red litmus blue.
e) Tartaric acid is an important ingredient of baking powder.

Q7. Identify the compound of calcium which is used for plastering of fractured bones. With the help of chemical equations, show how it is prepared. What special precautions should be taken during the preparation of this compound?

Q8. Write balanced equations for the following reactions ;

1) Dilute sulphuric acid reacts with aluminium powder.
2) Dilute hydrochloric acid reacts with iron fillings.
3) Dilute sulphuric acid is added to solid sodium carbonate.

Q9. Baking soda is used in small amounts in making bread and cake. It helps to make these soft and spongy. An aqueous solution of baking soda turns red litmus blue. It is also used in soda – acid fire extinguisher.

1) How does baking soda help to make cakes and bread soft and spongy?

2) How does it help in extinguishing fire?

3) Is the pH of baking soda solution less than or greater than 7.

Q10. Write balanced equations for the preparation of the following salts -

1) $NaNO_3$

2) K_2SO_4

3) $Al(NO_3)_3$

Q11. Write the action on litmus of :

a) Dry ammonia gas (b) Solution of ammonia gas in water

Q12. Which three chemical substances are obtained when electricity is passed through an aqueous solution of brine ? Write an industrial use of each .

Q13. State the number of water molecules present in the crystals of washing soda and Plaster of Paris . What are these molecules called as ?

Q14. Write the terms defined by the following sentences :

(a) A soluble base

(b) The insoluble solid formed when two solutions are mixed together .

(c) An acidic solution in which there is only partial ionization of the solute molecules .

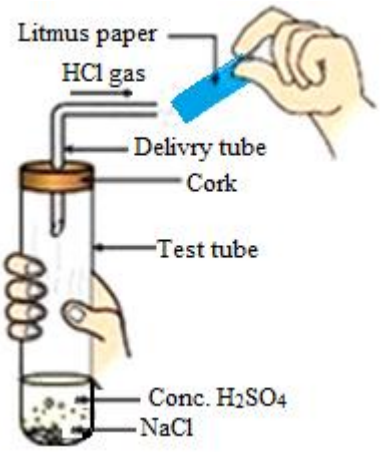
Q15. Name the acid present in ant sting and give its chemical formula . Also give the common method to get relief from the discomfort caused by the ant sting .

MCQ

Q1.Some fruits like mango, lemon, raw grapes, orange, etc., have a sour taste due to the presence of:
a. Acetic acid
b. Citric acid
c. Lactic acid
d. Oxalic acid

Q2.Zinc granules on treating with an acid X, form the zinc sulphate ($ZnSO_4$) salt along with the evolution of a gas Y which burns with a pop sound when brought near to a burning candle. Identify the acid X and gas evolved Y.
a. X- Sulphuric acid and Y- Oxygen gas
b. X- Hydrochloric acid and Y- Oxygen gas
c. X- Sulphuric acid and Y- Hydrogen gas
d. X- Hydrochloric acid and Y- Hydrogen gas

3. The figure given below represents the experiment carried out between conc. sulphuric acid and sodium chloride, which react with each other to form HCl gas.



Blue litmus paper is brought near the mouth of the delivery tube to check the presence of HCl acid but no change is observed in the color of litmus paper because:

a. The litmus paper used is dry
b. The litmus paper used is moist
c. Blue litmus paper does not change its color with an acid
d. The litmus paper is kept very close to the mouth of the delivery tube

4. Which of the following phenomena occur, when a small amount of acid is added to water?
i. Ionisation
ii. Neutralisation
iii. Dilution
iv. Salt formation

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

d. (ii) and (iv)

5. Which of the following indicators turn red in an acidic solution?
i. Phenolphthalein
ii. Litmus
iii. Turmeric
iv. Methyl orange
Choose the correct option:
a. (i) and (ii)
b. (ii) and (iii)
c. Only (ii)
d. (ii) and (iv)

6. Dilute acid does not produce carbon dioxide on being treated with:
a. Marble
b. Lime
c. Baking soda
d. Limestone

7. The sample of soil from a particular place was tested for its pH value. It came out to be 5. Which one of the following should be added to the soil to make it suitable for the plant growth?
i. Calcium chloride
ii. Calcium Hydroxide
iii. Calcium oxide
Choose the correct option:
a. Both (i) and (ii)
b. Both (ii) and (iii)
c. Only (i)
d. Only (iii)

8. Identify the products of the following reaction:
$CaCO_3 + 2HCl \rightarrow$ .....+.....

a. Calcium hydrogencarbonate and chlorine gas
b. Calcium chloride and water
c. Calcium oxide, carbon dioxide and water
d. Calcium chloride, carbon dioxide and water

9. An ant's sting can be treated with ……which will neutralise the effect of the chemical injected by the ant's sting into our skin.
Choose the correct option from the following to be filled in the blank space:
a. Methanoic acid
b. formic acid
c. Baking soda
d. Caustic soda
10. In the following reaction, identify the salt formed

$NH_4OH\ (aq) + H_2SO_4\ (aq) \rightarrow$ _____ + $2H_2O\ (l)$
a. NH_4NO_3
b. $(NH_4)_2SO_4$
c. $(NH_4)_3PO_4$

d. $(NH_4)_2S$

Chapter No. 3

Metals and Non Metals

Learning Objectives

The students will be able to-

- Differentiate between metals and non metals physically and chemically.
- They will know the reactivity series of metals.
- Concepts of bonding will be introduced and ionic compounds will be done in detail.They will be able to identify the ionic compounds on the basis of their properties.
- Students will know about metallurgy and the various steps involved in metallurgical processes, like enrichment of ores, roasting, calcinations, reduction and refining of metals.
- To investigate the conditions under which iron rusts and the various methods to prevent corrosion.

Expected Learning Outcomes

1. To classify materials as metals and non- metals on the basis of their physical and chemical properties.
2. To investigate conditions necessary for rusting.
3. share their findings of the activities/projects/ experiments, such as extraction of metals from their ores.
4. To understand the corrosion of metals in everyday life and methods to prevent them.

Assignment

Q1. An element on burning in air forms an oxide XO_2 which when dissolved in water turns blue litmus red. Identify if 'X' is a metal or a non-metal. Justify your answer.

Q2. Name the reducing agent in the reaction

$$3MnO_2 + 4Al \rightarrow 3Mn + 2Al_2O_3$$

For the reduction of metal oxide to metal, suggest a reducing agent cheaper than aluminium

Q3. Give reason:

(i) Metals are regarded as electropositive metals.

(ii) Aluminium which is more reactive than iron does not corrode like iron.

(iii) When a piece of copper metal is added to a solution of zinc sulphate , no change takes place, but the blue colour of copper sulphate fades away when a piece of zinc is placed in its solution.

(iv) Aluminium cannot be extracted by using carbon as a reducing agent.

(v) Ionic compounds in solid state do not conduct electricity but they do so in molten state.

(vi) When calcium is added to water, the gas evolved does not catch fire but the same gas evolved on adding sodium metal to wire catches fire.

Q4. Name a metal which does not react with cold water as well as hot water but reacts with steam. Give the reaction involved.

Q5. Describe with the help of a labelled diagram the method of refining of copper by electrolytic method

Q6. How are the less reactive metals extracted? Explain with the help of an example.

Q7. An ore on heating in the absence of air gives carbon dioxide. Which method will you use to convert the ore into oxide form? Explain.

Q8. What are amphoteric oxides? Show by giving equations that Aluminium oxide is an amphoteric oxide.

Q9. What are alloys? What properties of alloys make it useful over pure metals? Explain with examples.

Q10. Show the formation of Al_2O_3 by the transfer of electrons between the combining atoms

Q11. A white powder having an odour of chlorine is used to remove yellowness of white clothes in laundries .Name this powder. How is it prepared ? Write the chemical equation for the reaction involved in the preparation .

Q12. An alkali metal A gives a compound B on reacting with water . The compound B gives a soluble compound C on treatment with aluminium oxide . Identify A , B and C and give the reaction involved .

Q13. A metal M does not liberate hydrogen from acids but reacts with oxygen to give a black colour product and also explain the reaction of M with oxygen .

Q14. Explain why zinc metal can displace copper from copper sulphate solution but copper cannot displace zinc from zinc sulphate solution .

Q15. Why are metals called electropositive elements whereas non- metals are called electronegative elements?

MCQ

Q1.The metal which is liquid at room temperature is
a) Bromine
b) Mercury
c) Iodine
d) Potassium

Q2. The sulphide ores are converted into oxides by heating strongly in the presence of excess air. This process is known as

a) Roasting
b) Smelting
c) Calcination
d) Refining

Q3.In electrolytic refining, the cathode is made up of
a) Pure metal
b) Impure metal
c) Alloy
d) Metallic salt

Q4.In the given reaction, $Al_2O_3 + NaOH \rightarrow$ ……X…… $+ H_2O$
What is element X?

a) $NaAlO_2$
b) Na_3Al
c) Na_2O_3
d) $NaAl_2O_3$

Q5. Which of the following represent the correct order of decreasing reactivity?
a) Mg > Al > Zn > Fe
b) Mg > Zn > Al > Fe
c) Al > Zn > Fe > Mg
d) Mg > Fe > Zn > Al

Q6. An element reacts with oxygen to give a compound with a high melting point. This compound is also soluble in water. The element is likely to be
(a) Ca
(b) C
(c) Si
(d) Fe

Q7. Which of the following pairs will give displacement reactions?
(a) NaCl solution and copper metal

(b) $MgCl_2$ solution and aluminium metal

(c) $FeSO_4$ solution and silver metal
(d) $AgNO_3$ solution and copper metal
Q8. Which among the following is the most abundant metal found in the earth's crust?
(a) Magnesium

(b) Aluminium

(c) Oxygen

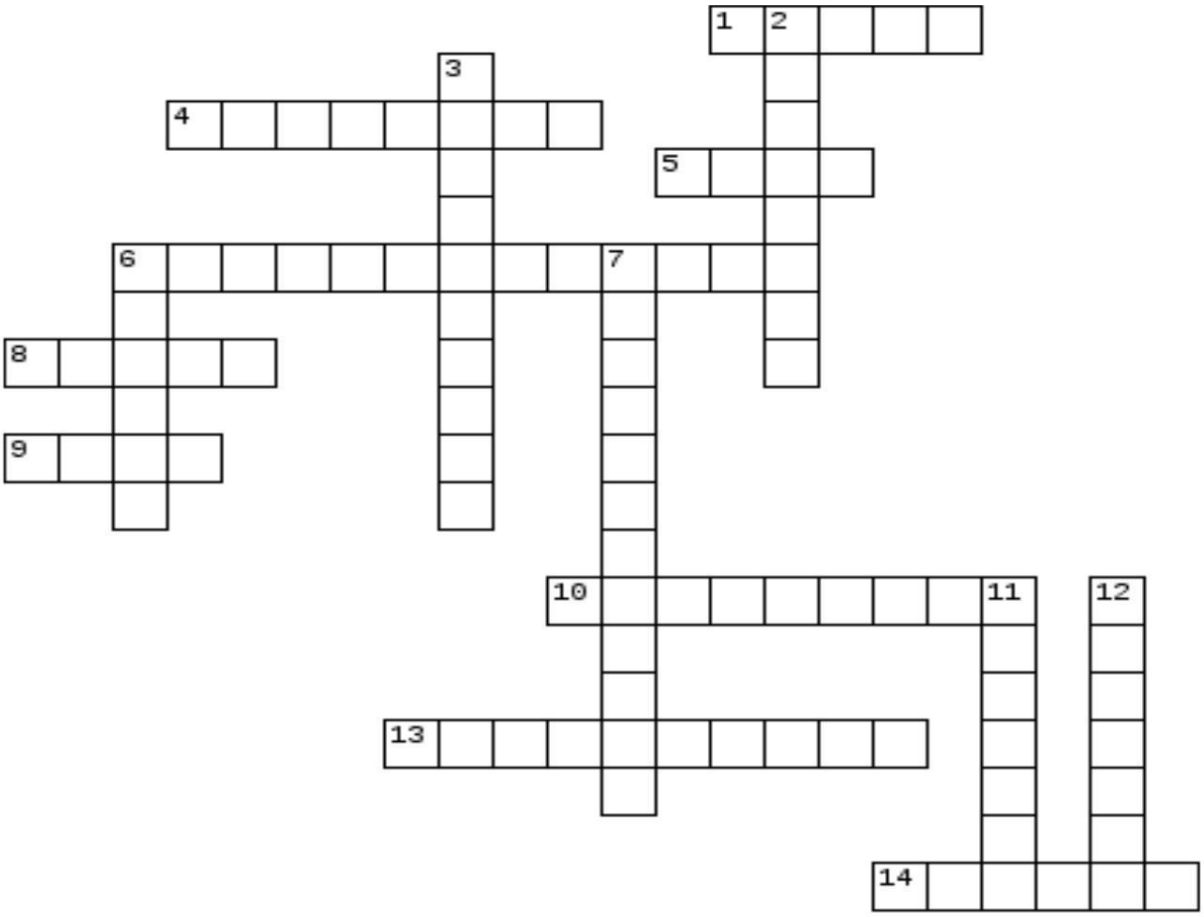
(d) Iron

Q9. Which of the following pairs of reactants will undergo a displacement reaction?

(a) $CuSO_4$ + Fe
(b) $ZnSO_4$ + Fe
(c) $MgSO_4$ + Fe
(d) $Ca(SO_4)_2$ + Fe

Q10. Galvanisation is a method of protecting steel and iron from rusting by coating them with a thin layer of

(a) Copper
(b) Aluminum
(c) Zinc
(d) Bauxite



ENJOY THE CROSSWORD

Across Clues	*Down Clues*
1. One characteristic of metals is that they have?	2. Salt forming elements are also known as?
4. The type of element that is poor conductors of heat and electricity	3. The periodic table is not based on:
	6. I am a horizontal row
5. I have 26 protons	7. What are group one elements known as?
6. I am a list of all known elements	11. I am a metal and a liquid at room temperature.
8. The number of valence electrons that boron has?	12. The vocabulary term used that states: Can be stretched into wire
9. I am the element in period 2, group 18	14. I am a gas with 8 protons
10. I am a metalloid	
13. The type of elements that have characteristics of both metals and non-metals	

Chapter No. 4

Carbon and Its Compounds

Learning Objectives

The students will be able to-

- Know the occurrence of carbon around us in various forms and the possible allotropes.
- Explain the difference between ionic bond and covalent bond with examples.
- Differentiate between saturated and unsaturated hydrocarbons .
- Understand the concept of homologous series with examples.
- Understand the IUPAC rules on the basis of which the nomenclature of hydrocarbons is done.
- Understand the chemical properties of carbon compounds especially ethanol and ethanoic acid.
- Know the cleansing action of soaps and detergents.

Expected Learning Outcomes

The students would be able -

1. To understand the versatile nature of carbon and occurrence of its allotropic forms.
2. To understand the nature of covalent bonding in carbon compounds.
3. To differentiate between saturated and unsaturated hydrocarbons.
4. To understand IUPAC rules on the basis of which carbon compounds are named.

C.W. ASSIGNMENT

Answer the following

Give the molecular formula and IUPAC names of the following organic compounds:

a) An alkyne containing 4 carbon atoms

_____

_____

b) An alcohol containing 3 carbon atoms

_____

_____

c) An aldehyde containing 2 carbon atoms

_____

_____

d) Simplest ketone

_____

_____

e) An alcohol used in cough syrups.

_____

_____

f) A carboxylic acid used as a preservative.

_____

_____

g) A saturated hydrocarbon containing 4 carbon atoms.

_____

_____

h) A cycloalkane with 5 carbon atoms.

_____

_____

i) A compound used as fuel for vehicles.

_____

_____

Carbon and Its Compounds

Assignment

Q1. a) Write the number of covalent bonds in the molecule of ethane.

b) List two reasons why carbon forms a large number of compounds and are poor conductors of electricity?

Q2. Explain with the help of a chemical equation, what happens when sodium hydrogen carbonate reacts with ethanoic acid.

Q3. What is meant by denatured alcohol? What is the need to denature alcohol?

Q4. Name the groups of compounds with the following functional groups

—CHO , — CO , —OH , —COOH

Q5. Give one example each for the following reactions:

a. Dehydration of Ethanol
b. Oxidation of alcohols
c. Combustion
d. Saponification
e. Esterification

Q6.Complete and balance the following reactions:

(i) $CH_3CH_2OH + Na \rightarrow$

(ii) $CH_3COOC_2H_5 + NaOH \longrightarrow$

(iii) $CH_3CH_2OH \xrightarrow[\text{Hot conc. } H_2SO_4]{}$

(iv) $CH_3COOH + C_2H_5OH \xrightarrow[\text{conc. } H_2SO_4]{}$

(v) $CH_3COOH + Na_2CO_3 \rightarrow$

Q7. Show the bond formation in;

(i) Nitrogen gas
(ii) Methane
(iii) Ethanol

Q8. Under what conditions can saturated hydrocarbons produces a sooty flame? Explain.

Q9. Draw the possible structural isomers for hexane. Also write their IUPAC names.

Q10. Write the name and formula of the 2nd member of homologous series having general formula CnH2n

Q11. With the help of an example, explain the process of hydrogenation. Mention the essential conditions for the reaction and state the change in physical property with the formation of product.

Q12. Both soap and detergent are some type of salts . What is the difference between them ? Describe in brief the cleansing action of soap .Why do soaps not form lather in hard water ? List two problems that arise due to the use of detergents instead of soaps .

Q13. Explain why carbon forms compounds mainly by covalent bond. Why does carbon form strong bonds with other elements?

Q14. An organic compound 'X 'is an essential constituent of wine and beer. 'X 'is responsible for intoxication caused by these drinks. Oxidation of 'X' yields an organic acid' Y 'which is present in vinegar. Name the compounds' X 'and 'Y 'and write their formulae.

15. a) Why are most carbon compounds poor conductors of electricity ?

b) Write the name and structure of a saturated compound in which carbon atoms are arranged in a ring . Give the number of single bonds present in this compound

MCQ

Q1.While cooking, if the bottom of the vessel is getting blackened on the outside, it means that:

a) The food is not cooked completely

b) The fuel is not burning completely

c) The fuel is wet

d) The fuel is burning completely

Q2. Cation is formed when:

a) Atom gains electrons

b) Atom loses electrons

c) Proton is lost by the atom

d) Atom shares electrons

Q3. The I.U.P.A.C name of $CH_3CH_2CH=CH_2$ is?

a) 3-Butene

b) Prop-1-ene

c) But-1-ene

d) Butyne

Q4. Which of the following compounds of carbon does not consist of ions?

a) $CHCl_3$

b) $CaCO_3$

c) $NaHCO_3$

d) Ca_2C

Q5. The property of self-linkage among identical atoms to form long chain compounds is known as:

a) Catenation

b) Isomerisation

c) Superposition

d) Halogenation

Q6. Which of the following is the molecular formula of cyclobutane?

a) C_4H_{10}

b) C_4H_6

c) C_4H_8

d) C_4H_4

Q7. Which of the following statements about graphite and diamond is true?

a) They have the same crystal structure

b) They have the same degree of hardness

c) They have the same electrical conductivity

d) They can undergo the same chemical reactions

Q8. How many carbon atoms are joined in a spherical molecule of buckminsterfullerene?

a) 30

b) 60

c) 90

d) 120

Q9. Which of the following is the major constituent of the liquefied petroleum gas?

a) Methane

b) Ethane

c) Propane

d) Butane

Q10. The organic compounds having functional group are known as:

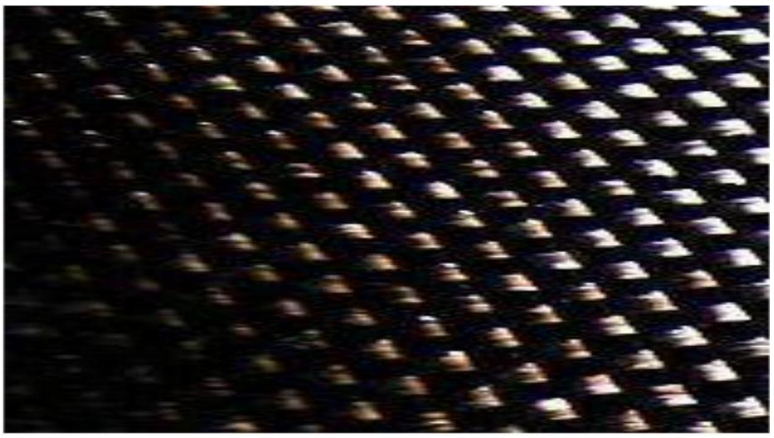
a) Aldehyde

b) Ketone

c) Carboxylic acids

d) Alcohol

A few facts about carbon fibre



Carbon fibre is a lightweight yet strong substance. Many things from sports equipment like golf clubs and tennis racquets to sports cars use carbon fibre. Carbon fibre is easily identifiable by its unique chequered appearance.

What is carbon fibre?

Carbon fibre is a material that is made from very thin fibres having carbon atoms. These are bonded together in microscopic crystals, aligned parallel to the long axis of the fibre. It is this crystal alignment that makes carbon fibre so strong. Carbon fibre is used to make composite materials with plastics resins. Carbon fibre has the strength of steel, yet is lightweight. It also does not expand when heated due to its high heat resistance. When stretched or bent, carbon fibre is very strong, but if you subject it to high shock or compression, such as hitting it with a hammer it will break. Carbon fibre has the best weight to strength ratio.

The first carbon fibres

You might be surprised to know that carbon fibre is by no means a recent discovery.

1. Thomas Edison used carbon fibre filaments in his early light bulb experiments back in 1879. He created these fibres by heating bamboo in a controlled environment. The carbon fibre Edison carbon made was from cellulose-based materials, today it is made from petroleum bases. The carbon fibres that Edison made out of the bamboo fires were fire resistant, making it ideal for his filament for

incandescence.**e carbon fibres that Edison made out of the bamboo fires were fire resistant, making it ideal for his filament for incandescence.**

2. Later in 1958 Roger Bacon would try to make carbon fibres from strands of rayon but these fibres were not very strong. It was only later in 1963 that the Royal Aircraft Establishment at Famborough, Hampshire UK developed strong carbon fibre. Rolls Royce used this in their aeroplane engines.

3. Today carbon fibre is made from the polymer PAN. Once this polymer is produced it is stretched in a manner that it becomes parallel to the axis of the fibre. This polymer is then oxidised at a temperature of 200°C to 300°C to remove hydrogen and add oxygen to the molecule. The polymer is further purified by carbonisation, done by heating it to a temperature of 2500°C in a nitrogen rich environment. The result depends on the quality of the fibre and is a polymer having more than 90% carbon in it. The final step in the manufacture of carbon fibre is called sizing. Here the fibres are weaved into sheets and embedding in an epoxy resin. What you get in the end is the characteristic black carbon fibre sheet which you can use to make a variety of things.

Types of carbon fibre compounds and their uses

Carbon fibre compounds are very expensive compounds. Different types of carbon fibre compounds can be used for a variety of purposes.

For high temperature applications, carbon fibre reinforced graphite is ideal.

Carbon fibre can be used to filter high temperature gases as a corrosion resisting electrode with an anti-static component.

Carbon fibre compounds with metals are avoided as the combination forms metal carbides. The metals in these compounds eventually corrode. Today carbon fibre is even having applications in the field of medicine. Carbon fibres are used for sin grafts.

Chapter No. - 5

Periodic classification of elements

Learning Objectives

The students will be able to-

- Understand the need for classification.
- Understand the principle on which the Modern periodic table is based.
- Know about the position of elements in the periodic table .
- Explain the trends of atomic size , metallic and non-metallic character and valency down the group and across the period in the modern periodic table .

Expected Learning Outcomes

The students would be able to-

1. Develop Observation of experiments to observe regularities and patterns.
2. Develop logical reasoning for the observations to develop critical thinking and problem solving. This would help develop a sense of curiosity and creativity. This will foster critical thinking and problem solving.
3. take initiative to know about scientific discoveries/ inventions, such as Dobereiner for discovering triads of elements, Mendeleev for the development of the periodic table of elements
4. Appreciating others' work and learning from it. Developing integrity and cooperation in student and developing team work.

(Notes)

At present 114 elements are known to us all these have different properties. To make the study of elements easy and systematic they have been classified in based on their properties. Scientists made several attempts to classify elements to obtain an orderly arrangement out of chaos.

Early attempts at the classification of elements.

1 Döbereiner‘s Triads

In the year 1817, Johann Wolfgang Döbereiner, a Germanchemist, tried to arrange the elements with similar properties into groups. He identified some groups having three elements each. So he called these groups _triads‘.

Döbereiner showed that when the three elements in a triad were written in the order of increasing atomic masses; the atomic mass of the middle element was roughly the average of the atomic masses of the other two elements.

For example, take the triad consisting of lithium (Li), sodium (Na) and potassium (K) with the respective atomic masses 6.9, 23.0 and 39.0. What is the average of the atomic masses of Li and K? How does this compare with the atomic mass of Na?Given below (Table 5.1) are some groups of three elements. These elements are arranged downwards in order of increasing atomic masses. Can you find out which of these groups form Döbereiner triads?

Group A element	Atomic mass	*Group B Element*	Atomic mass	Group C elements	Atomic mass
N	14.0	*Ca*	40.1	Cl	35. 5
P	31.0	*Sr*	87.6	Br	79.9
As	74.9	*Ba*	137.3	I	126.9

You will find that groups B and C form Döbereiner triads. Döbereiner could identify only three triads from the elements known at that timehence, this system of classification into triads was not found to be useful. As it could not be applied to all the elements known at that time.

Newlands' Law of Octaves

In 1866, John Newlands, an English scientist, arranged the then known elements in the order of increasing atomic masses. He started with the element having the lowest atomic mass (hydrogen) and ended at thorium which was the 56th element. He found that every eighth element has properties similar to that of the first. He compared this to the octaves found in music. Therefore, he called it the 'Law of Octaves'. It is known as Newlands' Law of Octaves'. In Newlands' Octaves, the properties of lithium and sodium were found to be the same. Sodium is the eighth element after lithium. Similarly, beryllium and magnesium resemble each other

Sa	re	ga	Ma	pa	da	ni
(do)	(re)	(mi)	(fa)	(so)	(la)	(ti)
H	Li	Be	B	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca	Cr	Ti	Mn	Fe
Co and Ni	Cu	Zn	Y	In	As	Se

Br	Rb	Sr	Ce and La	Zr	–	–

Limitations:

1. It was found that the Law of Octaves was applicable only up to calcium, as after calcium every eighth element did not possess properties similar to that of the first.

2. When more elements were discovered their properties did not fit into the law of octaves.

3. He placed some unlike elements like Co and Ni with Fand Cl and Fe is placed separately.

MENDELÉEV'S PERIODIC TABLE

The main credit for classifying elements goes to Dmitri Ivanovich Mendeléev, a Russian chemist. He was the most important contributor to the early development of a Periodic Table of elements wherein the elements were arranged on the basis of their fundamental property, the atomic mass, and also on the similarity of chemical properties. Among chemical properties, Mendeléev concentrated on the compounds formed by elements with oxygen and hydrogen. He selected hydrogen and oxygen as they are very reactive and formed compounds with most elements. The formulae of the hydrides and oxides formed by an element were treated as one of the basic properties of an element for its classification.

On this basis, Mendeléev formulated a ***Periodic Law, which states that 'the properties of elements are the periodic function of their atomic masses'.***
Mendeleev's Periodic Table contains vertical columns called _groups' and horizontal rows called _periods'

Achievements

1. Mendeléev left some gaps in his Periodic Table. Instead of looking upon these gaps as defects, Mendeléev boldly predicted the existence of some elements that had not been discovered at that time. Mendeléev named them by prefixing a Sanskrit numeral, *Eka* (one) to the name of preceding element in the same group. For instance, scandium, gallium and germanium, discovered later, have

Group	I	II	III	IV	V	VI	VII	VIII
Oxide Hydride	R_2O RH	RO RH_2	R_2O_3 RH_3	RO_2 RH_4	R_2O_5 RH_3	RO_3 RH_2	R_2O_7 RH	RO_4
Periods ↓	A B	A B	A B	A B	A B	A B	A B	Transition series
1	H 1.008							
2	Li 6.939	Be 9.012	B 10.81	C 12.011	N 14.007	O 15.999	F 18.998	
3	Na 22.99	Mg 24.31	Al 29.98	Si 28.09	P 30.974	S 32.06	Cl 35.453	
4 First series:	K 39.102	Ca 40.08	Sc 44.96	Ti 47.90	V 50.94	Cr 50.20	Mn 54.94	Fe Co Ni 55.85 58.93 58.71
Second series:	Cu 63.54	Zn 65.37	Ga 69.72	Ge 72.59	As 74.92	Se 78.96	Br 79.909	
5 First series:	Rb 85.47	Sr 87.62	Y 88.91	Zr 91.22	Nb 92.91	Mo 95.94	Tc 99	Ru Rh Pd 101.07 102.91 106.4
Second series:	Ag 107.87	Cd 112.40	In 114.82	Sn 118.69	Sb 121.75	Te 127.60	I 126.90	
6 First series:	Cs 132.90	Ba 137.34	La 138.91	Hf 178.49	Ta 180.95	W 183.85		Os Ir Pt 190.2 192.2 195.09
Second series:	Au 196.97	Hg 200.59	Tl 204.37	Pb 207.19	Bi 208.98			

properties similar to *Eka*–boron, *Eka*–aluminium and *Eka*–silicon, respectively.

2. When Noble gases were discovered, they could be placed in a new group without disturbing the existing order.

Limitations:

1. He could not assign a correct position to hydrogen in his Table.

2.Isotopes of all elements posed a challenge to Mendeleev's Periodic Law

3. Another problem was that the atomic masses do not increase in a regular manner in going from one element to the next. So it was not possible to predict how many elements could be discovered between two elements — especially when we consider the heavier elements.

THE MODERN PERIODIC TABLE

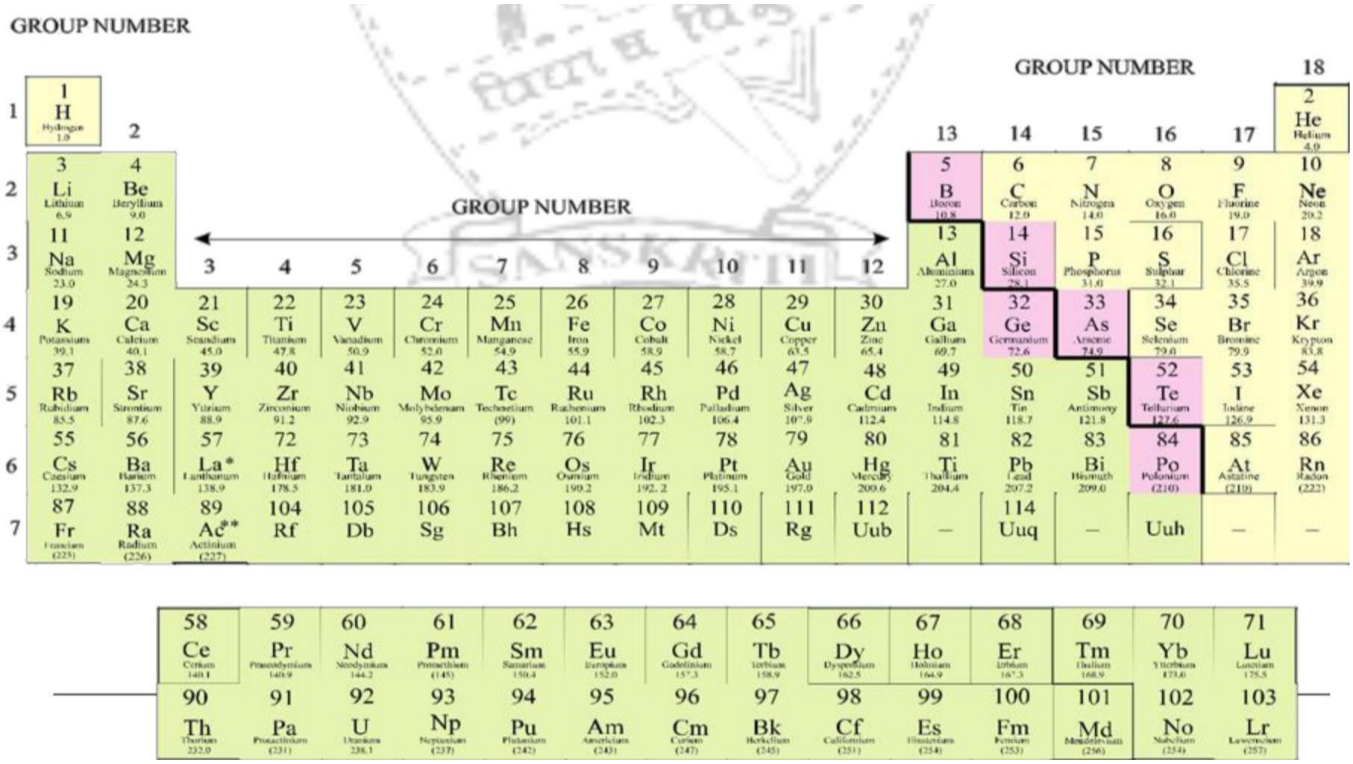
In 1913, Henry Moseley showed that the atomic number of an element is a more fundamental property than its atomic mass . Accordingly, Mendeléev's Periodic Law was modified and atomic number was adopted as the basis of the Modern Periodic Table and the Modern Periodic Law can be stated as 'Properties of elements are a periodic function of their atomic number.'

Let us recall that the atomic number gives us the number of protons in the nucleus of an atom and this number increases by one in going from one element to the next.

Elements, when arranged in order of increasing atomic number Z, lead us to the classification known as the Modern Periodic Table .Prediction of properties of elements could be made with more precision when elements were arranged on the basis of increasing atomic number.

1. There are 18 vertical columns called Groups.
   - First group is called Alkali metals.
   - Second group is called Alkaline earth metals.
   - 17 groups are of Halogens.
   - 18 group is of Noble metals.

2. There are 7 horizontal rows of elements called periods.



Trends in the modern periodic table

3. **Valency :** The valency of an element is determined by the number of valence electrons present in the outermost shell of its atom.

As we move in a period the valency first increases from 1 to 4 and then decreases from 4 to 1.

As we go down the group valency remains the same as no. of valence electrons remain same.

Atomic size: The term atomic size refers to the radius of an atom. The Atomic size may be visualised as the distance between the centre of the nucleus and the outermost shell of an isolated atom.

4. The atomic radius decreases in moving from left to right along a period. This is due to an increase in nuclear charge which tends to pull the electrons closer to the nucleus and reduces the size of the atom.

The atomic size increases down the group. This is because new shells are being added as we go down the group. This increases the distance between the outermost electrons and the nucleus so that the atomic size increases in spite of the increase in nuclear charge.

Metallic and Non-metallic Properties

Metals tend to lose electrons while forming bonds, that is, they are electropositive in nature.

The effective nuclear charge acting on the valence shell electrons increases across a period, the tendency to lose electrons will decrease. Down the group, the effective nuclear charge experienced by valence electrons is decreasing because the outermost electrons are farther away from the nucleus. Therefore, these can be lost easily. Hence metallic character decreases across a period and increases down a group.
Non-metals, on the other hand, are electronegative. They tend to form bonds by gaining electrons.

These trends also help us to predict the nature of oxides formed by the elements because it is known to you that the oxides of metals are basic and that non-metals are acidic in general.

Periodic classification of elements

(C.W. ASSIGNMENT)

Q1. The reactivity of non-metals _____ down the group.

Q2. Non-metallic character _____ from left to right in a period.

Q3. Size of Na^+ is _____ than Na atom.

Q4. Atomic size _____ from left to right in a period.

Q5. Group 2 elements are known as _____ .

Q6. Which one of the metals has the highest metallic character?

Q7. Group 17 elements are called _____ .

Q8. Group 18 elements are _____ valent .

Q9. Name two elements whose valences are equal to their group number.

Q10. An element belongs to 2^{nd} period and group 14. Is it a metal or a non-metal? Why?

(C.W. Assignment)

Q1. What are periods and groups?

Q2. State modern periodic law.

Q3. Name the first and last member of the third period

Q4. Name the following

a. The sum of the number of protons and neutrons in the atoms.

b. Most electronegative element.

c. Most electropositive element.

Q5. Given below is a list of elements that form the periodic table:

S, Al, C, Ar, Mg, F, O and B

Choose from the above list,

1)the most metallic element

2)the most electronegative element

3)elements of period 3 of the periodic table

4)elements of group 16 of the periodic table

Q6. An element has atomic no 17. Predict its

a) Valency

b) Group number

c) Whether it is a metal or non-metal

d) Nature of the oxide found

e) Name of the element

Q7. Two elements with symbol X (atomic no. 11) and Y (atomic no. 13) are placed in the III period of the modern periodic table -
(i) Which amongst the two has a more metallic character?

(ii) Calculate the valency of each element.

(iii) Element _Y' is smaller than _X' in terms of atomic size. Is the Statement true, justify?

Q8. a) What happens to the size of the atom down the group.

b) Classify the following elements as metal, nonmetal and metalloid :

(i) Calcium

(ii) Sulphur

c) Explain how the tendency to form electropositive ions change on moving down a group ?

Q9. In the table given below some of the elements are placed in their correct positions and others are represented by hypothetical letters.

1	2	13	14	15	16	17	18
Li	A	B	Carbon	C	D	E	F
I			G		Sulphur	L	argon
J			H			M	
K						N	

a) Which of these has the smallest radius?
b) Which of these has electronic configuration (2, 8, 4)?

c) What is the electronic arrangement of J?

d) Name the family of the elements represented by E, L, M, and N.

e) Which of these is an alkaline earth metal?

Q10. Two elements 'P' and 'Q' belong to the same period of the modern periodic table and are in Group-1and Group – 2, respectively .Compare their following characteristics in tabular form

(a) The number of electrons in their atoms.

(b) The sizes of their atoms.

(c) Their metallic characters.

(d) The formula of their oxides.

(e) The formula of their chlorides.

Q11. The elements Be , Mg and Ca each having two electrons in their outermost shells are in period 2,3 and 4 respectively of the modern periodic table . Answer the following questions , giving justification in each case :

(1) Write the groups to which these elements belong .

(2) Name the least reactive element .

(3) Name the element having the largest atomic radius .

Q12 . Taking the example of an element of atomic number 16 , explain how the electronic configuration of the atom of an element relates to its position in the periodic table and how Valency of an element is calculated on the basis of atomic number .

Q13. a) The modern periodic table has been evolved through the early attempts of Dobereiner , Newland and Mendeleev's . List one advantage and one limitation of all the three attempts .

a) Name the scientist who first of all showed that atomic number of an element is a ,more fundamental property than its atomic mass .

Q14. What is periodicity in properties of elements with reference to the Modern Periodic Table? Why do elements of the same group have similar properties? How does the tendency of elements to gain electrons change as we move from left to right in a period? State the reason of this change ?

ASSIGNMENT

Q1. While classifying the elements Mendeleev was guided by two factors. What were these two factors?

_____

_____

Q2. Name three elements for which Mendeleev left a gap in his periodic table.

_____

Q3. State Modern periodic law.

_____

Q4. Name an element which has 2 electrons in the N shell.

Q5. Amongst elements with atomic number 11 and atomic number 14 , which has a bigger size atom and why?

_____

_____

Q6.Element M is in the first group of the periodic table. Write the formula of its Oxide.

Q7.An element X has configuration 2,8,8,1, while element Y has electronic configuration 2,8,7. Which of these is a metal? Write the formula of the compound formed between X and Y.

Q8.Why does Lithium, Sodium and Potassium show resemblance on the basis of dobereiner's law of triads?

_____

Q9. What are the names of group 2 elements?

_____

Q10. The formula of a compound is M_2O_3. Predict the valency of element M.

_____

Q11. What does the word period signify in the periodic table?

_____

Q12. An element X readily accepts an electron from another element Y. Predict the nature of the element X.

_____

Q13. What do you understand by periodicity in properties?

_____

Q14. What is the reason for placing Ar before K in the Mendeleev's periodic table?

_____

_____

Q15. Why are metals called electropositive elements?

MCQ

1. How many periods and groups are present in the periodic table?

a) 7 periods and 18 groups

b) 8 periods and 7 groups

c) 7 periods and 7 groups

d) 8 periods and 8 groups

2. Which of the following forms the basis of the modern periodic table?

a) Atomic mass

b) Atomic number

c) Number of nucleons

d) All of these

3. What happens to the electropositive character of elements on moving from left to right in a periodic table?

a) Increase

b) Decreases

c) First increases then decreases

d) First decreases then increases

4. The electronic configuration of an element M is 2, 8, 4. In modern periodic table, the element M is placed in

a) 4^{th} group

b) 2^{nd} group

c) 14^{th} group

d) 18^{th} group

5. Which of the following is the correct order of the atomic radii of the elements oxygen, fluorine and nitrogen?

a) O < F < N

b) N < F < O

c) O < N < F

d) F < O < N

6. What is the other name for group 18^{th} elements?

a) Noble gases

b) Alkali metals

c) Alkali earth metals

d) Halogens

7. Which of the following is the most reactive element of the group 17?

a) Oxygen

b) Sodium

c) Fluorine

d) Magnesium

8. Element X forms a chloride with the formula XCl_2, which is a solid with a high melting point. X would most likely be in the same group of the Periodic Table as

a) Na

b) Mg

c) Al

d) Si

9. Which group elements are called transition metals?

a) Group number 1 to 2

b) Group number 13 to 18

c) Group number 3 to 12

d) Group number 1 to 8

10. Which of the following elements has 2 shells and both are completely filled?

a) Helium

b) Neon

c) Calcium

d) Boron

Chapter 14

Sources of energy (conventional sources)

Learning Objectives

The students will be able to-

1) Tell the characteristics of a good fuel and good source of energy.
2) Explain the conventional sources of energy along with their advantages and disadvantages.
3) Understand how technology has helped in improvement of conventional sources of energy.
4) Answer NCERT and smart skills questions.

Expected Learning Outcomes

The students would be able -

1) To know characteristics of good sources of energy.
2) To know advantages and disadvantages of conventional sources of energy.
3) To understand how technology has helped in improvement of conventional sources of energy.
4) To advocate use of fuels which produces less pollutants, uses energy efficient electric devices, uses fossil fuels judiciously, etc.

Assignment

Q1. Firewood is our conventional fuel. List any four reasons for replacing it by the alternate sources of energy.

Q2. Name the process for obtaining charcoal from wood. What are the advantages and disadvantages of burning charcoal over wood?

Q3. Why fossil fuels are called non-renewable sources of energy

Q4. Distinguish between renewable and non-renewable sources of energy.

Q5.What steps would you suggest to minimise environmental pollution caused by burning of fossil fuels?

Q6. Explain how a thermal power plant produces electricity.

Q7. Mention advantages and disadvantages of producing hydroelectricity by building dams on rivers.

Q8. What is biomass? Explain the principle and working of a biogas plant using a labelled schematic diagram.

Q9. Give the limitations of wind energy.

Q10. Name the different constituents of bio gas. Why is biogas a better fuel than animal dung cakes?

QUESTION BANK

Q1. Explain Thermal Decomposition and Photolytic decomposition reactions with example.

.

Q2. Identify the substance oxidized and substance reduced in the following reactions-

1) $ZnO + C \rightarrow Zn + CO$

2) $MnO_2(s) + 4HCl(aq) \rightarrow MnCl_2(s) + 2H_2O(l) + Cl_2(g)$

3) $Cu(s) + 2AgNO_3(aq) \rightarrow Cu(NO_3)_2(aq) + 2Ag(s)$

Q3. Balance the following equations -:

i) $Al + HCl \rightarrow AlCl_3 + H_2$

ii) $KMnO_4 \rightarrow K_2MnO_4 + MnO_2 + O_2$

Q4. a) Define a combination reaction.

b) Give one example of a combination reaction which is also an endothermic reaction.

c) Give one example of a combination reaction which is also an exothermic reaction.

Q5. What types of reactions are represented by the following equations –:

i) $A + B2+ \rightarrow A2+ + B$

ii) $A + BC \rightarrow AC + B$

iii) $A \rightarrow B + C$

iv) $A + B \rightarrow AB$

v) $AB + CD \rightarrow AD + CB$

Q6. When the solutions of lead (II) nitrate and potassium iodide are mixed, what type of reaction occurs? Write a balanced equation for this reaction.

Q7. Give an example of decomposition reaction carried out with the help of electricity.

Q8. Name the products obtained on strong heating of lead nitrate. Write chemical equation for the reaction. What type of chemical reaction occurs in the change?

Q9. Which of the following reactions are possible and why?

i) $Cu(s) + 2AgNO_3(aq) \rightarrow Cu(NO_3)_2(aq) + 2Ag(s)$

ii) $Cu(s) + ZnSO_4(aq) \rightarrow Zn(s) + CuSO_4(aq)$

Q10. What is corrosion? List two methods which can prevent the corrosion of metals.

Q11. What is an acid base indicator? Give two examples of synthetic acid base indicators.

Q12. What is an indicator? Name three common indicators and their effect on acids and bases.

Q13. How is plaster of Paris obtained from gypsum? Give chemical reaction.

Plaster of Paris should be stored in a moisture proof container. Explain why.

Q14. What happens when electricity is passed through brine? Give reaction.

Q15. Sweet tooth may lead to tooth decay. Explain why? What is the role of toothpaste in preventing cavities?

Q16. A compound 'X' of sodium is used in the kitchen for making crispy pakoras. It is also used for curing acidity in the stomach. Identify 'X' .What is its chemical formula? State the reactions that take place when it is heated on cooking.

Q17. There are some substances which give different odour in different mediums.

a) What is the name given to such substances?

b) Give an example of such a substance.

Q18. Why is plaster of Paris written as $CaSO_4.½\ H_2O$? How is it possible to have half a molecule of water attached to $CaSO_4$.

Q19. Black colour of copper oxide changes to bluish green if reacted with dilute hydrochloric acid .why?

Q20. A white powder is used for decolorizing wood pulp in the paper industry.

a) Give its chemical name and formula.

b) Give the chemical equation to show its preparation

Q21 .Write the chemical equation for the reaction of hot aluminium with steam.

Q22. Holes are observed in a zinc plate immersed in copper sulphate solution. Explain why?

Q23. State two properties of carbon which are not expected from its classification as Non-metal.

Q24. What happens when basic oxides like Na_2O or K_2O are dissolved in water? Write the balanced chemical reactions.

Q25. What do you understand about thermite reactions?

Q26. Which is more metallic Sodium or Aluminium? Why?

Q27. Give reasons for the following:

1) Hydrogen is not metal but it has been assigned a place in the activity series of Metals.

2) Aluminium is found in a combined state whereas gold is found free in nature.

3) An alloy solder is used for soldering wires.

4) Electric wires are coated with polyvinyl chloride.

Q28. A metal is found in nature as its carbonate ore. It is used in galvanization of iron articles. Identify the metal M and name its ore, MCO_3. How will you convert this carbonate ore into free metal? Explain with equations.

Q29. Out of copper and iron, which one is more reactive? How can you justify it?

Q30. Silver metal does not combine with oxygen easily but silver jewellery tarnishes after some time. Why?

Q31. What happens when limestone reacts with dil. HCl.

Q32. Name two synthetic indicators which are used to test acids and bases.

Q33. What are strong acids? Give two examples.

Q34. What happens when HCl reacts with ammonium hydroxide? Give a chemical equation for the reaction.

Q35. Do alkalis also react with metals? Give any two examples.

Q36. Which acid and base can be used to prepare sodium bicarbonate and sodium hydrogen sulphate?

Q37. On eating spicy food we feel a burning sensation in our stomach,why? Which medicine will you take as a remedy?

Q38. When concentrated acid is diluted does the pH get higher or lower? Give reason.

Q39. How are acids and bases similar?

Q40. Name one chemical used to remove permanent hardness of water.

Q41. What is the role of tartaric acid in baking powder?

Q42. How is plaster of Paris obtained? Give a chemical equation.

Q43. What happens when electricity is passed through an aqueous solution of sodium chloride?

Q44. Why does blue vitriol lose its colour on heating? Write the reaction.

Q45. The molecular formula C_3H_6O can represent an aldehyde as well as ketone. Write their structures and name them.

Q46. List two tests for experimentally distinguishing between an alcohol and a carboxylic acid .

Q47. What is a functional group in a carbon compound? Write the formulation for the functional groups of alcohols and carboxylic acids.

Q48.Saturated hydrocarbons take part in substitution reactions while unsaturated hydrocarbons in addition reactions .Explain.

Q49. Give reasons for the following observations:

a) Air holes of a gas burner have to be adjusted when the heated vessels get blackened by the flame.

b) Use of synthetic detergents causes pollution of water.

c) Soaps are ineffective in hard water.

Q50. An organic compound 'A' which is sometimes used as an antifreeze and has the molecular formula C_2H_6O .Upon reaction with alkaline $KMnO_4$, the compound 'A' is oxidized to another compound 'B 'with formula $C_2H_4O_2$ .identify the compounds 'A' and 'B' .Write the chemical equation for the reaction which leads to the formation of 'B' .

Q51. Two carbon compounds A and B have the molecular formula C_3H_8 and C_3H_6 respectively. Which one of the two is more likely to show an addition reaction ? Justify your answer .Explain with the help of chemical reaction .How an addition reaction is useful in the vegetable ghee industry?

Q52.An organic compound 'A' is widely used as a preservative in pickles and has molecular formula $C_2H_4O_2$. This compound reacts with ethanol to form a sweet smelling compound 'B'.

a) Identify the compound 'A'.

b) Write the chemical equation for its reaction with ethanol to form compound 'B'.

c) How can we get compound 'A' back from 'B'.

d) Name the process and write the corresponding chemical equation.

e) Which gas is produced when compound 'A' reacts with washing soda? Write the chemical equation.

Q53. Define soap. With the help of well-labeled diagram of micelle, explain the cleansing action of soap

Q54. State how would you distinguish between Acetic acid and Ethanol in your laboratory. Give a chemical equation of the reactions shown by them. Write the chemical equations involved .

Q55.Complete the reaction(s) given below and classify them as Combustion / Oxidation / Addition / Substitution reaction.

(i) $CH_3\,CH_2CH_2\,OH \xrightarrow{\text{alk.KMn04}}$

(ii) $C_2H_4 + H_2 \xrightarrow{\text{Ni catalyst}}$

Q.56 Draw the electron dot structure of the gas molecule which is liberated when zinc metal is treated with aqueous NaOH solution.

Q57. What do you understand by periodicity? Are the properties of elements placed in a group the same? Illustrate.

Q58. Why is atomic number more important than atomic weight in determining chemical properties?

Q59.How does electronic configuration of an atom relate to its position in the modern periodic table?

Q60.Explain the variation in atomic size in a group and a period in the periodic table, Giving examples.

Q61.What will happen to the electron releasing tendency of the elements in a group?

Q62.Why could no fixed position be given to hydrogen in Mendeleev's periodic table.

Q63.Explain why sodium is an active metal while neon is inert?

Q64.What physical and chemical properties were used by Mendeleev in creating his periodic table? List two observations which posed a challenge to Mendeleev‘s periodic law.

Q65.What is meant by group in a periodic table? Within a group where would you find an element with (a) most metallic character (b) the largest atomic size? Q66. How does the tendency to gain electrons change on moving left to right in a period of the periodic table.

Q67. How does the tendency to lose electrons change on moving left to right in a period of the periodic table.

Q68.How does the nature of oxide change on moving left to right in a period of the periodic table.

Assertion- Reasoning Questions

Assertion (A) : Iron articles get coated with reddish brown powder when left for sometime in the open.

Reason(R) : Iron is attacked by substances around it such as moisture , acids, etc.

A. Both A and R are true and R is correct explanation of A.
B. Both A and R are true and Ris not the correct explanation of A .
C. A is true but R is false
D. A is false but R is true

Assertion (A) : Fat/ Oil containing food substances become rancid and their smell and taste changes
Reason(R) : We keep such food in airtight containers .

A. Both A and R are true and R is correct explanation of A.
B. Both A and R are true and Ris not the correct explanation of A .
C. A is true but R is false
D. A is false but R is true

Assertion (A) : White silver chloride turns grey in sunlight .

Reason(R) : Copper reacts with zinc sulphate to form copper sulphate and zinc is deposited

A. Both A and R are true and R is correct explanation of A.
B. Both A and R are true and Ris not the correct explanation of A .
C. A is true but R is false
D. A is false but R is true

Assertion (A) : A complete chemical equation represents the reactants and products and their physical states symbolically .
Reason(R) : In a combination reaction, two or more substances combine to form a new single substance .

A. Both A and R are true and R is correct explanation of A.
B. Both A and R are true and Ris not the correct explanation of A .
C. A is true but R is false
D. A is false but R is true

Assertion (A) : Antacids are used to get rid of pain caused by indigestion .

Reason(R) : Antacids neutralise the excess acid produced in the stomach.

A. Both A and R are true and R is correct explanation of A.
B. Both A and R are true and Ris not the correct explanation of A .
C. A is true but R is false
D. A is false but R is true

Assertion (A) : Tooth decay starts when the p H of the mouth is lower than 5.5
Reason(R) : Bee- sting leaves an acid which causes pain and irritation

A. Both A and R are true and R is correct explanation of A.
B. Both A and R are true and Ris not the correct explanation of A .
C.A is true but R is false
D. A is false but R is true

Q7.Assertion (A) : Soap gives a red colour with blue litmus solution
Reason(R) : Hydrogen gas is not formed when sodium metal reacts with ethyl alcohol

A. Both A and R are true and R is the correct explanation of A.
B. Both A and R are true and Ris not the correct explanation of A .
C. A is true but R is false
D. A is false but R is true

Q8.Assertion (A) : Atomic radius decreases in moving from left to right in the periodic table
Reason(R) : As we move from L.H.S to R.H.S, the nuclear charge increases which tends to pull the electrons closer to the nucleus.

A. Both A and R are true and R is correct explanation of A.
B. Both A and R are true and Ris not the correct explanation of A .
C. A is true but R is false
D. A is false but R is true

Q9.Assertion (A) : Acetic acid is also called glacial acetic acid.
Reason(R) : Acetic acid oftenfreezes during winters as its freezing point is 290 K

A. Both A and R are true and R is correct explanation of A.
B. Both A and R are true and Ris not the correct explanation of A .
C. A is true but R is false
D. A is false but R is true

Q10.Assertion (A) : The electrical conductivity and melting point of an alloy is less than that of pure metals.
Reason(R) : Galvanisation is a method of protecting steel and iron from rusting

A. Both A and R are true and R is correct explanation of A.
B. Both A and R are true and Ris not the correct explanation of A .
C. A is true but R is false
D. A is false but R is true

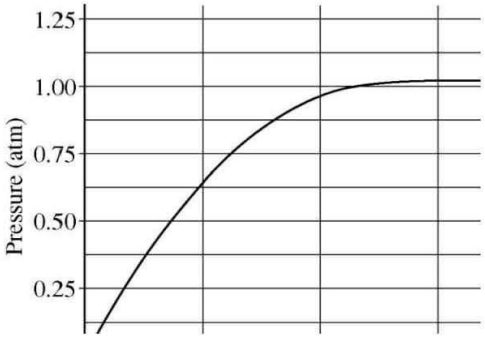
SCIENCE- Class X
Sample Case Studies

1. Read the following and answer any four questions from 1.1 to 1.5:

Marble's popularity began in ancient Rome and Greece, where white and off-white marble were used to construct a variety of structures, from hand-held sculptures to massive pillars and buildings.

1.1 The substance not likely to contain $CaCO_3$ is
- a) Dolomite
- b) A marble statue
- c) Calcined gypsum
- d) Sea shells.

1.2 A student added 10g of calcium carbonate in a rigid container, secured it tightly and started to heat it. After some time, an increase in pressure was observed, the pressure reading was then noted at intervals of 5 mins and plotted against time, in a graph as shown below. During which time interval did maximum decomposition took place?



- a) 15-20 min
- b) 10-15 min
- c) 5-10 min
- d) 0-5 min

1.3 Gas A, obtained above is a reactant for a very important biochemical process which occurs in the presence of sunlight. Identify the name of the process -
- a) Respiration
- b) Photosynthesis
- c) Transpiration
- d) sphotolysis

1.4 Marble statues are corroded or stained when they repeatedly come into contact with polluted rain water. Identify the main reason.

a) decomposition of calcium carbonate to calcium oxide
b) polluted water is basic in nature hence it reacts with calcium carbonate
c) polluted water is acidic in nature hence it reacts with calciumcarbonate
d) calcium carbonate dissolves in water to give calcium hydroxide.

1.5 Calcium oxide can be reduced to calcium, by heating with sodium metal. Which compound would act as an oxidizing agent in the above process?
a) Sodium
b) sodium oxide
c) calcium
d) calcium oxide

Answer Key	1.1 white precipitate is obtained 1.2 0-5 min 1.3 photosynthesis 1.4 polluted water is acidic in nature hence it reacts with calcium carbonate 1.5 calcium oxide

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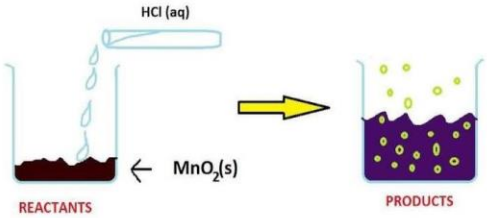
2. Read the following and answer any **four** questions from 2.1 to 2.5:

The reaction between MnO_2 with HCl is depicted in the following diagram. It was observed that a gas with bleaching abilities was released .



2.1 The chemical reaction between MnO_2 and HCl is an example of:
a) displacement reaction
b) combination reaction
c) redox reaction
d) decomposition reaction.

2.2 Chlorine gas reacts with _____ to form bleaching powder.
a) dry $Ca(OH)_2$
b) dil. solution of $Ca(OH)_2$
c) conc. solution of $Ca(OH)_2$
d) dry CaO

2.3 Identify the correct statement from the following:
MnO_2 is getting reduced whereas HCl is getting oxidized
a) MnO_2 is getting oxidized whereas HCl is getting reduced.
b) MnO_2 and HCl both are getting reduced.
c) MnO_2 and HCl both are getting oxidized.

2.4 In the above discussed reaction, what is the nature of MnO_2 ?
a) Acidic oxide
b) Basic oxide
c) Neutral oxide
d) Amphoteric oxide

2.5 What will happen if we take dry HCl gas instead of aqueous solution of HCl?
a) Reaction will occur faster.
b) Reaction will not occur.
c) Reaction rate will be slow
d) Reaction rate will remain the same.

Answer Key	2.1(c) redox reaction 2.2(a) dry $Ca(OH)_2$ 2.3(a)MnO_2 is getting reduced whereas HCl is getting oxidized 2.4(b) Basic oxide 2.5(b) Reaction will not occur

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3. Read the following and answer any **four** questions from 3.1 to 3.5:

Chemistry in Automobiles:

Foran internalcombustion enginetomoveavehicledowntheroad,itmustconvertthe energy stored in the fuel into mechanical energy to drive the wheels. In your car,the distributor and battery provide this starting energy by creating an electrical "spark",which helps in combustion of fuels like gasoline. Below is the reactiondepictingcomplete combustionof gasolineinfullsupplyof air:

$$2\,C_8H_{18}(l) + 25\,O_2(g) \longrightarrow 16\,'X' + \dots$$

3.1 Which of the following are the products obtained from the reaction mentioned in the above case?

	Product 'X'	Product 'Y'
a)	CO_2	H_2O_2
b)	H_2O	CO
c)	CH_3OH	H_2O
d)	CO_2	H_2O

3.2 Identify the types of chemical reaction occurring during the combustion of fuel:
a) Oxidation & Endothermic reaction
b) Decomposition & Exothermic reaction
c) Oxidation & Exothermic reaction
d) Combination & Endothermic reaction

3.3 On the basis of evolution/absorption of energy, which of the following processes are similar to combustion of fuel?

a) Photosynthesis in plants
b) Respiration in the human body
c) Decomposition of vegetable matter
d) Decomposition of ferrous sulphate.

(a) (ii) & (iii)
(b) (i) & (ii)
(c) (iii) & (iv)
(d) (ii) & (i)

3.4 'A student while walking on the road observed that a cloud of black smoke belched out from the exhaust stack of moving trucks on the road.' Choose the correct reason for the production of black smoke:

a) Limited supply of air leads to incomplete combustion of fuel.
b) Rich supply of air leads to complete combustion of fuel.
c) Rich supply of air leads to a combination reaction.
d) Limited supply of air leads to complete combustion of fuel.

3.5 'Although nitrogen is the most abundant gas in the atmosphere, it does not take part in combustion'. Identify the correct reason for this statement.

a) Nitrogen is a reactive gas
b) Nitrogen is an inert gas
c) Nitrogen is an explosive gas
d) Only hydrocarbons can take part in combustion

Answer Key	3.1-(d) 3.2-(c) 3.3-(a) 3.4-(a) 3.5-(b)

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4. Read the following and answer any four questions from 4.1 to 4.5:

Frothing in Yamuna:

The primary reason behind the formation of the toxic foam is high phosphate content in the wastewater because of detergents used in dyeing industries, dhobi ghats and households. Yamuna's pollution level is so bad that parts of it have been labelled 'dead' as there is no oxygen in it for aquatic life to survive.

4

4.1 Predict the pH value of the water of river Yamuna if the reason for froth is high content of detergents dissolved in it.

a) 10-11
b) 5-7
c) 2-5
d) 7

4.2 Which of the following statements is correct for the water with detergents dissolved in it?

a) low concentration of hydroxide ion (OH^-)and high concentration of hydronium ion (H_3O^+)
b) high concentration of hydroxide ion (OH^-)and low concentration of hydronium ion (H_3O^+)
c) high concentration of hydroxide ion (OH^-) as well as hydronium ion (H_3O^+)
d) equal concentration of both hydroxide ion (OH^-) and hydronium ion (H_3O^+).

4.3 The table provides the pH value of four solutions P, Q, R and S

Solution	pH value
P	2
Q	9
R	5
S	11

Which of the following correctly represents the solutions in increasing order of their hydronium ion concentration?

a) P>Q>R>S
b) P>S>Q>R
c) S<Q<R<P
d) S<P<Q<R

4.4 High content of phosphate ion in river Yamuna may lead to:

a) decreased level of dissolved oxygen and increased growth of algae
b) decreased level of dissolved oxygen and no effect of growth of algae
c) increased level of dissolved oxygen and increased growth of algae
d) decreased level of dissolved oxygen and decreased growth of algae

4.5 If a sample of water containing detergents is provided to you, which of the following methods will you adopt to neutralize it?

a) Treating the water with baking soda
b) Treating the water with vinegar
c) Treating the water with caustic soda
d) Treating the water with washing soda

Answer Key	4.1 (a) 4.2 (b) 4.3 (c) 4.4 (a) 4.5 (b)

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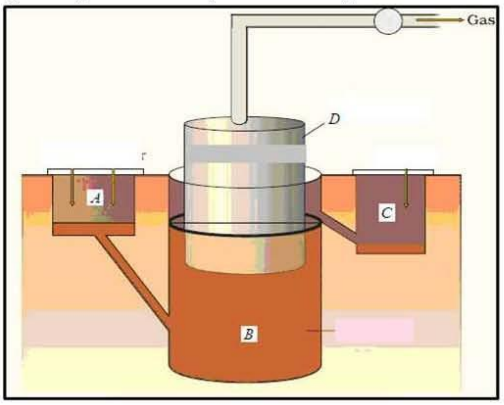
5. Read the following and answer any FOUR questions from 5.1 to 5.5 that follow on the basis of information provided and studied concepts.

A biogas plant is where biogas is produced by fermenting biomass.



5.1 In which of the parts would you find anaerobic bacteria ?

a) A
b) B
c) C
d) D

5.2 Which one of the following is NOT correct for biogas -

a) its carbon neutral
b) its non-renewable
c) it depends on micro-organisms
d) yields rich manure

5.3 Which of the following best indicates the steps of anaerobic digestion?

a) Waste watezr feed → biogas storage → generator → biogas
b) Waste water feed → digester → biogas → biogas storage → generator
c) Generator → waste water feed → digester → biogas → biogas storage
d) Waste water feed → biogas → digester → biogas storage → generator

5.4 Biogas is a better fuel than animal dung cake because

a) Biogas is a renewable source of energy
b) Animal dung cake has higher calorific value
c) Biogas has high heating capacity
d) Biogas burns without smoke.

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

5.5 Biogas is formed in the

a) presence of air only
b) presence of water only
c) presence of air and absence of water
d) presence of water and absence of air.

6

Answer Key	5.1 b) B 5.2 b) its non-renewable 5.3 (b) Waste water feed → digester → biogas → biogas storage → generator 5.4 (c) (iii) and (iv) 5.5 (d) presence of water and absence of air

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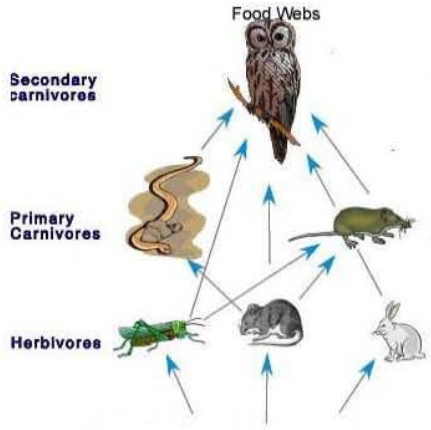
6. Read the following and answer the questions any four from (i) to (v)
Food chains are very important for the survival of most species.



6.1 If 10,000 J solar energy falls on green plants in a terrestrial ecosystem, what percentage of solar energy will be converted into food energy?
a) 10,000 J
b) 100 J
c) 1000 J
d) It will depend on the type of the terrestrial plant.

6.2 If Ravi is consuming curd/yogurt for lunch , which trophic level in a food chain he should be considered as occupying ?
a) First trophic level
b) Second trophic level
c) Third trophic level
d) Fourth trophic level

6.3 The decomposers are not included in the food chain.The correct reason for the same is because decomposers:
a) Act at every trophic level of the food chain
b) Do not breakdown organic compounds
c) Convert organic material to inorganic forms
d) Release enzymes outside their body to convert organic material to inorganic forms

6.4 Matter and energy are two fundamental inputs of an ecosystem. Movement of
a) Energy is bidirectional and matter is repeatedly circulating.
b) Energy is repeatedly circulation and matter is unidirectional.
c) Energy is unidirectional and matter is repeatedly circulating.
d) Energy is multidirectional and matter is bidirectional.

6.5 Which of the following limits the number of trophic levels in a food chain?

a) Decrease in energy at higher trophic levels
b) Less availability of food
c) Polluted air
d) Water

Answer Key	6.1 b) 100 J 6.2 c) Third Trophic level 6.3 a) Act at every trophic level of the food chain 6.4 c) Energy is unidirectional and matter is repeatedly circulating 6.5 a) Decrease in energy at higher trophic level

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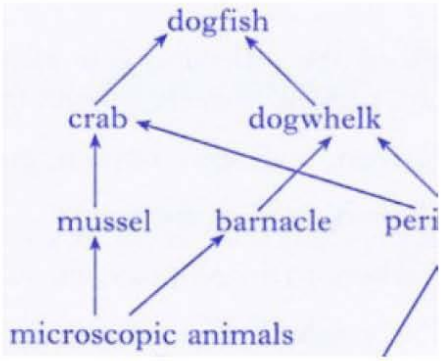
7. Read the following and answer the questions any four from (i) to (v)
Observe the food web and answer the questions given below -



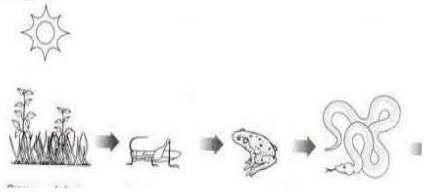
7.1 The mussel can be described as

a) Producer
b) Primary consumer
c) Secondary consumer
d) decomposer

7.2 Which trophic level is incorrectly defined?

a) Carnivores – secondary or tertiary consumers
b) Decomposers – microbial heterotrophs
c) Herbivores – primary consumers
d) Omnivores – molds, yeast and mushrooms

7.3 The given figure best represents:



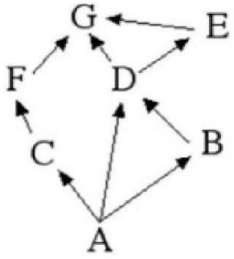
a) Grassland food chain
b) Parasitic food chain
c) Forest food chain
d) Aquatic food chain

8

7.4 Why do all food chains start with plants?

a) Because plants are easily grown
b) Because plants are nutritious
c) Because plants can produce its own energy
d) Because plants do not require energy

7.5 In the food web, what two organisms are competing for food?



a) A and B c) A and C

b) D and F d) B and D

Answer Key	7.1 c)Secondary consumer 7.2 d) Omnivores – molds, yeast and mushrooms 7.3 a) Grassland food chain 7.4 c) Because plants can produce its own energy 7.5 d) B and D

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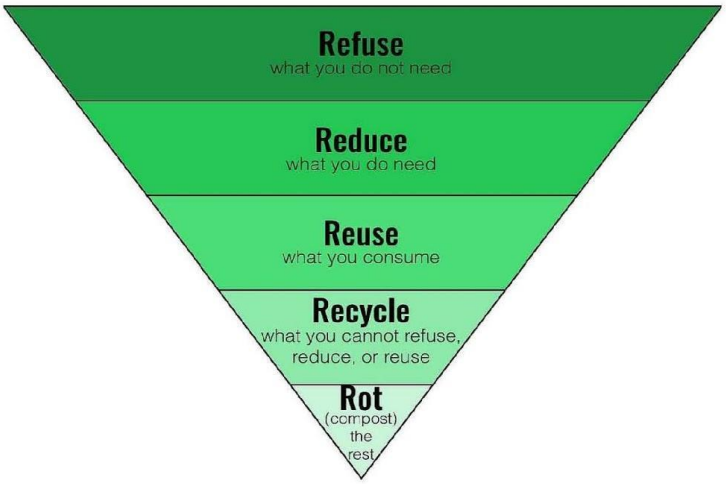
8. Observe the following diagram and answer the questions **<u>any four</u>** from (i) to (v)



8.1 Choose the waste management strategy that is matched with correct example.

a)	Refuse	Choose products that use less packaging
b)	Reduce	Give unwanted toys and books to hospitals or schools
c)	Reuse	Not using single use plastic
d)	Repurpose	Making flower pot from used plastic bottle

8.2 Recycling of paper is a good practice but recycled paper should not be used as food packaging because

a) recycled papers may release color /dyes on food items
b) recycled papers are not absorbent
c) recycled papers can cause infection due to release of methane
d) recycled papers are costly

8.3 According to the 'Solid Waste Management Rule 2016', the waste should be segregated into three categories. Observe the table below and select the row that has correct information

	Wet waste	Dry waste	Hazardous waste
a)	Cooked food, vegetable peels	Used bulbs, fluorescent lamps	Plastic carry bags, bottles, newspaper, cardboard
b)	Coffee and tea powder, garden waste	Plastic carry bags, bottles, newspaper, cardboard	Expired medicines, razors, paint cans
c)	Leftover food, vegetable peels	Coffee and tea powder, garden waste	Insect repellents, cleaning solutions
d)	Uncooked food, tea leaves	Old crockery, frying pans	Coffee and tea powder, garden waste

8.4 Effective segregation of wastes at the point of generation is very important. Select the appropriate statements giving the importance of waste segregation.

i) less waste goes to the landfills
ii) better for public health and the environment
iii) help in reducing the waste
iv) resulting in deterioration of a waste picker's health

a) both i) and ii)
b) both i) and iii)
c) both ii) and iii)
d) both i) and iv)

8.5 When recycling a plastic water bottle, what should you do with the cap?

a) The cap goes into a garbage can and the bottle goes in a recycling bin
b) Screw the cap back on the bottle, then put the bottle and cap in a recycling bin
c) Screw the cap back on the bottle, then put the bottle and cap in the garbage can
d) Recycle the cap separately.

Answer Key	8.1 – d 8.2 -c 8.3 -b 8.4 -a 8.5 -.a

******

9. Read the following and answer any FOUR questions from 9.1 to 9.5 that follow on the basis of information provided and studied concepts.

In Kunjpura village, located in Karnal district, Haryana, AdityaAggarwal and his older brother AmitAggarwal run Tee Cee Industries, a steel plant set up by their ancestors in 1984. Along with this, they also run a gaushala that houses 1,200 cows that can no longer produce milk.

The cow shelter was manageable but running the steel plant was turning out to be expensive because they spent a whopping Rs 5 lakh every month on electricity.
The brothers struck upon an idea. Why not run the factory with the biogas produced from cow dung from the shelter and other gaushalas, along with bio and agri-waste like sewage, farm waste, etcThis led Aditya and Amit to start AmritFertilisers, a biogas project, in 2014, without any government support.

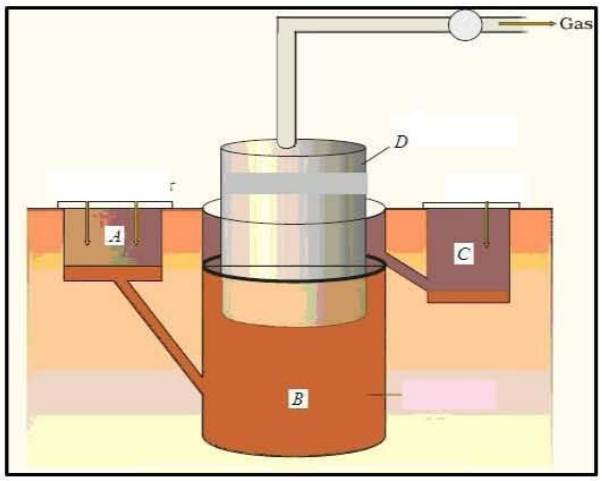
9.1 Biogas is a mixture of the following gases.

(a) Ethane,Carbon monoxide, Nitrogen and Butane
(b) Methane,Hydrogen,Carbon dioxide and Nitrogen
(c) Butane,Carbon monoxide,Propane and Hydrogen
(d) Carbon monoxide,Sulphur dioxide and Hydrogen

9.2 Raw material used in bio gas plant is

(a) Animal dung
(b) crop residue
(c) Food waste
(d) All of the above

9.3 The correct labelling in a biogas plant is given in



(a) A- Manure	B- slurry	C-Gas tank	D-Digester
(b)A- Slurry	B-Digester	C-Manure	D- Gas tank
(c) A-Gas tank	B-Manure	C-Digester	D- Slurry
(d) A- Digester	B-Gas tank	C-Slurry	D-Manure.

9.4 Biogas is a better fuel than animal dung cake because

(i) Biogas has lower calorific value.
(ii) Animal dung cake has higher calorific value.
(iii) Biogas has high heating capacity.
(iv) Biogas burns without smoke.

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

11

9.5 Biogas is formed in the

(a) presence of air only.
(b) presence of water only.
(c) absence of air only.
(d) presence of water and absence of air.

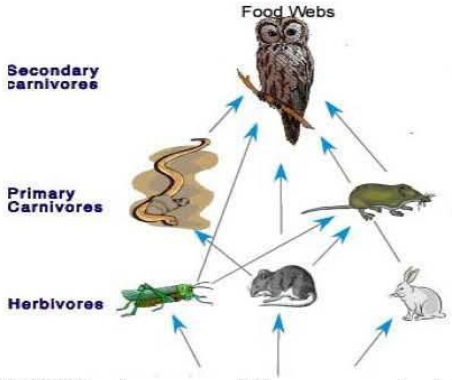
Answer Key	9.1 : (b) 9.2: (d) 9.3: (b) 9.4: (c) 9.5: (d)

******

10. Read the following and answer the questions any four from (i) to (v)

Food chains are very important for the survival of most species. When only one element is removed from the food chain it can result in extinction of a species in some cases. The foundation of the food chain consists of primary producers.

Primary producers, or autotrophs, can use either solar energy or chemical energy to create complex organic compounds, whereas species at higher trophic levels cannot and so must consume producers or other life that itself consumes producers. Because the sun's light is necessary for photosynthesis, most life could not exist if the sun disappeared. Even so, it has recently been discovered that there are some forms of life, chemotrophs, that appear to gain all their metabolic energy from chemosythesis driven by hydrothermal vents, thus showing that some life may not require solar energy to thrive.



10.1 If 10,000 J solar energy falls on green plants in a terrestrial ecosystem, what percentage of solar energy will be converted into food energy?

a) 10,000 J
b) 100 J
c) 1000 J
d) It will depend on the type of the terrestrial plant.

10.2 Mr. X is eating curd/yogurt. For this food intake in a food chain he should be considered as occupying

a) First trophic level
b) Second trophic level
c) Third trophic level
d) Fourth trophic level

10.3 The decomposers are not included in the food chain.
The correct reason for the same is because decomposers:
a) Act at every trophic level of the food chain
b) Do not breakdown organic compounds
c) Convert organic material to inorganic forms
d) Release enzymes outside their body to convert organic material to inorganic forms

10.4 Matter and energy are two fundamental inputs of an ecosystem. Movement of
a) Energy is bidirectional and matter is repeatedly circulating.
b) Energy is repeatedly circulation and matter is unidirectional.
c) Energy is unidirectional and matter is repeatedly circulating.
d) Energy is multidirectional and matter is bidirectional.

10.5 Which of the following limits the number of trophic levels in a food chain?
a) Decrease in energy at higher trophic levels
b) Less availability of food
c) Polluted air
d) Water

Answer Key	10.1	b) 100 J
	10.2	c) Third Trophic level
	10.3	a) Act at every trophic level of the food chain
	10.4	c) Energy is unidirectional and matter is repeatedly circulating
	10.5	a) Decrease in energy at higher trophic level

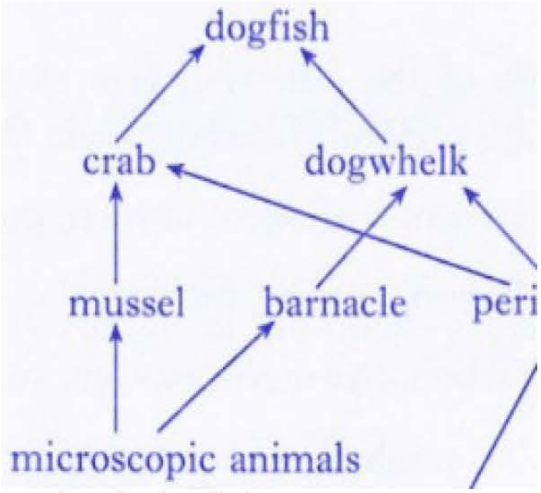
******

11. Read the following and answer the questions any four from (i) to (v)

Biosphere is a global ecosystem composed of living organisms and abiotic factors from which they derive energy and nutrients. And ecosystem is defined as structural and functional unit of the biosphere comprising of living and non-living environment that interact by means of food chains and chemical cycles resulting in energy flow, biotic diversity and material cycling to form a stable, self-supporting system

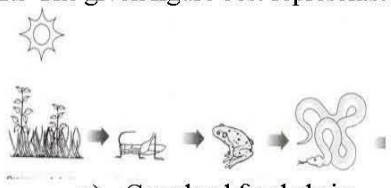
11.1 Which trophic level is incorrectly defined?
a) Carnivores – secondary or tertiary consumers
b) Decomposers – microbial heterotrophs
c) Herbivores – primary consumers
d) Omnivores – molds, yeast and mushrooms

11.2 The diagram below shows a food web from the sea shore



The mussel can be described as
a) Producer
b) Primary consumer
c) Secondary consumer
d) Decomposer

11.3 The given figure best represents:



a) Grassland food chain
b) Parasitic food chain
c) Forest food chain
d) Aquatic food chain

11.4 Consider the following statements concerning food chains:
(i) Removal of 80% tigers from an area resulted in greatly increased growth of vegetation
(ii) Removal of most of the carnivores resulted in an increased population of herbivores.
(iii) The length of the food chains is generally limited to 3 – 4 trophic levels due to energy loss
(iv) The length of the food chains may vary from 2 to 8 trophic levels

Which two of the above statements are correct?
a) (i), (iv)
b) (i), (ii)
c) (ii), (iii)
d) (iii), (iv)

11.5 Which of the following group of organisms are not included in ecological food chain?
a) Carnivores
b) Saprophytes
c) Herbivores
d) Predators

Answer Key	11.1	d) Omnivores – molds, yeast and mushrooms
	11.2	c)Secondary consumer
	11.3	a) Grassland food chain
	11.4	c) (ii), (iii)
	11.5	b) Saprophytes

******

14

12. Waste management is essential in today's society. Due to an increase in population, the generation of waste is getting doubled day by day. Moreover, the increase in waste is affecting the lives of many people.
Waste management is the managing of waste by disposal and recycling of it. Moreover, waste management needs proper techniques keeping in mind the environmental situations. For instance, there are various methods and techniques by which the waste is disposed of. You must have come across 5 R's to save the environment: refuse, reduce, reuse, repurpose and recycle.

12.1 Choose the waste management strategy that is matched with correct example.

a)	Refuse	Choose products that use less packaging
b)	Reduce	Give unwanted toys and books to hospitals or schools
c)	Reuse	Not using single use plastic
d)	Repurpose	Making flower pot from used plastic bottle

12.2 Recycling of paper is a good practice but recycled paper should not be used as food packaging because
a) recycled papers take lots of space
b) recycled papers can't cover food properly
c) recycled papers can cause infection
d) recycled papers are costly

12.3 According to the 'Solid Waste Management Rule 2016', the waste should be segregated into three categories. Observe the table below and select the row that has correct information

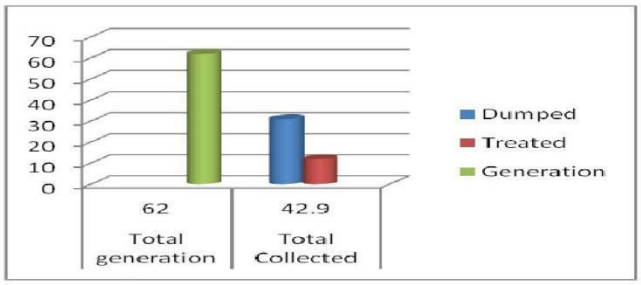
	Wet waste	Dry waste	Hazardous waste
a)	Cooked food, vegetable peels	Used bulbs, fluorescent lamps	Plastic carry bags, bottles, newspaper, cardboard
b)	Coffee and tea powder, garden waste	Plastic carry bags, bottles, newspaper, cardboard	Expired medicines, razors, paint cans
c)	Leftover food, vegetable peels	Coffee and tea powder, garden waste	Insect repellents, cleaning solutions
d)	Uncooked food, tea leaves	Old crockery, frying pans	Coffee and tea powder, garden waste

12.4 Effective segregation of wastes at the point of generation is very important. Select the appropriate statements giving the importance of waste segregation.

i) less waste goes to the landfills
ii) better for public health and the environment
iii) help in reducing the waste
iv) resulting in deterioration of a waste picker's health

a) both i) and ii)
b) both i) and iii)
c) both ii) and iii)
d) both i) and iv)

12.5 The given graph shows the amount of waste generated, dumped and treated in percentage. Identify the reason of low success rate of waste management process.



a) only 15% of urban India's waste is processed
b) less than 60% of waste is collected from households
c) more than 60% of waste is collected from households
d) both a and b

Answer Key	12.1 (d) 12.2 (c) 12.3 (b) 12.4 (a) 12.5 (d)

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Competency based MCQ's

Q1. A solution of a substance in water is denoted by-

i) (*l*) ii) (s) iii) (aq) iv) (w)

Q2. x Cl2 (g) + ykI (aq) → zKCl (aq) + I2 (s) What are x, y and z respectively?

i) 1,2,3 ii) 1,2,1 iii) 1,2,2 iv) 1,1,2

Q3. 2 H Cl + Zn → ZnCl2 + H2 is an example of _____ reaction.

i) Oxidation ii) Reduction iii) Combination iv) Displacement

Q4. Which of the following metals do not corrode in moist air?

i) Copper ii) Iron iii) Gold iv) Silver

Q5. The removal of oxygen from a substance is called

1) oxidation
2) Corrosion
3) reduction
4) rancidity

Q6. What happens when dilute hydrochloric acid is added to iron fillings?

1) Hydrogen gas and iron chloride is produced.
2) Chlorine gas and iron hydroxide are produced.
3) No reaction takes place.
4) Iron salt and water are produced.

Q7 Oxidation of fatty substances in food is prevented by

1) Galvanisation
2) Electroplating
3) Antioxidants
4) Oxidation

Q8 An iron nail is kept immersed in a solution of copper sulphate for three hours. When it was taken out of the copper sulphate solution, it was found to acquire a brown colour. This brown colour is

1. due to the rusting of the iron nail.
2. oxidation of iron due to iron oxide.
3. due to deposition of copper metal on iron nail.
4. due to conversion of iron to iron sulphate.

Q9 Fe_2O_3 (s) + 2Al (s) → 2Fe (s) + Al_2O_3 (s) .This reaction is an example of

1) combination reaction
2) double decomposition reaction
3) decomposition reaction
4) displacement reaction

Q10 Mg (s)+ CuO (s) →MgO (s) + Cu(s)

The equation represents

1) Decomposition reaction as well as displacement reaction.
2) Redox reaction as well as displacement reaction.
3) double displacement reaction as well as redox reaction
4) Combination reaction as well as double displacement reaction.

Q11. Which amongst the following can be used as an antacid?

1) Vinegar
2) Milk of magnesia
3) Calcium hydroxide
4) Sodium hydroxide

Q12. Tooth decay starts when the pH of the mouth is lower than

1) 10
2) 8
3) 7
4) 5.5

Q13. When a base is dissolved in water

1) Concentration of OH- ions per unit volume increases.
2) Concentration of OH- ions per unit volume decreases.
3) Concentration of OH- ions per unit volume may increase or decrease depending upon the nature of the base.
4) No change in concentration of OH- ions per unit volume occurs.

Q14. Wasp stings can be treated with

1) vinegar
2) clove oil
3) baking soda solution
4) Washing soda

Q15. The sting of ants and bees contains

1) formic acid
2) acetic acid
3) slaked lime
4) sodium hydroxide

Q16. The oxides of metals are

i) Neutral ii) Basic 3) Acidic iv) none of the these

Q17. Large deposits of sodium chloride in the form of brown crystals is called

1) salt petre 2)alum 3) soda 4) rock salt

Q18. The salt whose aqueous solution will turn blue litmus red

a) Ammonium sulphate b) sodium acetate
c) sodium chloride d) Potassium carbonate

Q19. Solutions A, B, C and D have pH 3, 4, 6 and 8. The solution with highest acidic strength is

1) A 2) B 3) C 4) D

Q20. Methyl orange is

1) Yellow in acidic medium and red in basic medium
2) Red in acidic medium and yellow in basic medium
3) Colourless in acidic medium and red in basic medium
4) Red in acidic medium and Colourless in basic medium

Q21. Which of the following metal forms amphoteric oxides?

1) Copper
2) Silver
3) Aluminium
4) Iron

Q22. Aqua regia is a mixture of

1) HNO_3 and HCl in the ratio of 1:3 by volume
2) HNO_3 and HCl in the ratio of 3:1 by volume
3) HNO_3 and HCl in the ratio of 1:1 by volume
4) H_2SO_4 and HCl in the ratio of 1:3 by volume

Q23. A basic oxide will be formed by the element

1) Aluminium
2) Sulphur
3) Krypton
4) Nitrogen

Q24. Which of the following metals is protected from oxygen and moisture by immersing in kerosene oil?

1) Potassium
2) Aluminium
3) Magnesium
4) silver

Q25. Which of the following metal will not displace H_2 gas from dilute H_2SO_4?

1) zinc
2) iron
3) copper
4) aluminium

Q26. Among the metals poorest conductor of heat is

1) Lead
2) Tin
3) Bismuth
4) Mercury

Q27. The common method for the extraction of metals from the oxide ore is

1) Reduction with carbon
2) Electrolytic method
3) Reduction with aluminium
4) All of these

Q28. The best conductor of electricity is

1) Copper
2) Aluminium
3) Silver
4) All are equal

Q29. Stainless steel in addition to iron contains

2) nickel and chromium
3) copper and tin
4) aluminium and magnesium
5) carbon and manganese

Q30. Which of the following oxide cannot be reduced with carbon to obtain metal?

1) MnO_2
2) Cr_2O_3
3) Al_2O_3
4) All of these

Q31. Detergents are sodium or potassium salts of long chain

1) Aldehydes
2) Ketones
3) Carboxylic acids
4) Sulphonic acids

Q32. Which of the following compounds have a triple bond?

1) C2H6
2) C3H8
3) C3H4
4) C3H6

Q33.The difference in the formula and molecular masses of CH3OH and C2H5OH is

1) CH3 and 16u
2) CH2 and 14u
3) CH4 and 18u
4) CH3 and 16u

Q34. The number of covalent bonds in C4H10 is

1) 10
2) 8
3) 13
4) 12

Q35. Which of the following is added to denature ethanol?

1) Methanol
2) Pyridine
3) Copper sulphate
4) All of these

Q36. Ethene is produced when

1) Ethanol reacts with ethanoic acid in the presence of a few drops of conc. H2SO4
2) Ethanol is oxidized with acidified potassium dichromate
3) Ethanol is heated with excess of conc.H2SO4 at 443K
4) Ethanol reacts with Na metal

Q37. The difference between molecular mass of any two adjacent homologues is _____

1. 14 u 2. 12 u 3. 16 u 4 3 u

Q38. The general formula of alcohols is

1) CnH2n+2
2) CnH2n+1OH
3) CnH2n
4) CnH2n+2COOH

Q39. The allotrope of carbon containing 60 carbon atoms is

1) fullerene
2) graphite
3) diamond
4) coal

Q41. Which of the following decreases across the period?

(1) Electronegativity (2) Atomic radius
(3) Non – metallic character (4) None of these

Q42. The atomic radius decreases as we move across a period because

1) atomic mass increases
2) atomic number increases
3) effective nuclear charge increases
4) additive electrons are accommodated in the new electron level

Q43. Which of the following remain unchanged on moving down the group in a periodic table

1) Valence electrons
2) Atomic size
3) Density
4) Metallic nature

Q44. The two elements for which Mendeleev left blank places in his original periodic table were:

(1) Si, Ti (2) Ga, Ge (3) Al, Ga (4) As, Sb

Q45. Which of the following is a metalloid?

(1) Sulphur (2) Silicon (3) Sodium (4) Aluminium

Q46. _____ element has electronic configuration of 2, 8, 2.

(1) Calcium (2) Beryllium (3) Strontium (4) Magnesium

Q47. Elements A, B and C form a Dobereiner's triad. If the atomic mass of A is 7 and that of C is 39. What is the atomic mass of the element B?

1) 23 2) 46 3) 32 4 |) 22

Q48. The noble gas having duplet electrons is

(1) Helium (2) Neon (3) Argon (4) Xenon

Q49. Atomic number is a more fundamental property than atomic mass. This was emphasized by

1) Doberenier
2) Bohr
3) Moseley
4) Mendeleev

Sample Question Paper 2020-21
Class X
Science (086) Theory

Time: 3 Hours **Maximum Marks: 80**

General Instructions:

(i) The question paper comprises four sections A, B, C and D. There are 36 questions in the question paper. All questions are compulsory.

(ii) Section–A - question no. 1 to 20 - all questions and parts thereof are of one mark each. These questions contain multiple choice questions (MCQs), very short answer questions and assertion - reason type questions. Answers to these should be given in one word or one sentence.

(iii) Section–B - question no. 21 to 26 are short answer type questions, carrying 2 marks each. Answers to these questions should be in the range of 30 to 50 words.

(iv) Section–C - question no. 27 to 33 are short answer type questions, carrying 3 marks each. Answers to these questions should be in the range of 50 to 80 words.

(v) Section–D – question no. - 34 to 36 are long answer type questions carrying 5 marks each. Answers to these questions should be in the range of 80 to 120 words.

(vi) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions. (vii) Wherever necessary, neat and properly labeled diagrams should be drawn.

SECTION A

S. No.	Questions	Marks
1	List any two observations when Ferrous Sulphate is heated in a dry test tube? **OR** Identify the products formed when 1 mL of dil. Hydrochloric acid is added to 1g of Sodium metal?	1
2	Write the chemical name and chemical formula of the salt used to remove permanent hardness of water.	1
3	Which of the following is **not** observed in a homologous series? Give reason for your choice. a) Change in chemical properties b) Difference in -CH_2 and 14u molecular mass c) Gradation in physical properties d) Same functional group	1

4. Why does the Sun appear white at noon? 1

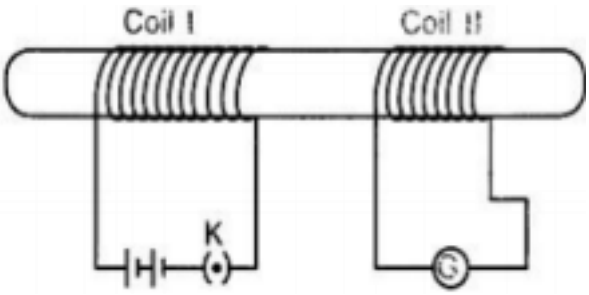
5 Both a spherical mirror and a thin spherical lens have a focal length of **(-)15 cm**. What type of mirror and lens are these? 1

6 The image formed by a concave mirror is observed to be real, inverted and larger than the object. Where is the object placed? 1

OR

Name the part of a lens through which a ray of light passes without suffering any deviation.

7 In the arrangement shown in figure there are two coils wound on a non-conducting cylindrical rod. Initially the key is not inserted in the circuit. Later the key is inserted and then removed shortly after. 1



What are the two observations that can be noted from the galvanometer reading?

8 Draw the magnetic field lines around a straight current carrying conductor. 1

9 Two unequal resistances are connected in parallel. If you are not provided with any other parameters (eg. numerical values of I and R), what can be said about the voltage drop across the two resistors? 1

OR

Some work is done to move a charge Q from infinity to a point A in space. The potential of the point A is given as V. What is the work done to move this charge from infinity in terms of Q and V?

10 Veins are thin walled and have valves. Justify. 1

11 How is the wall of small intestine adapted for performing the function of absorption of food? 1

OR

Out of a goat and a tiger, which one will have a longer small intestine? Justify your answer.

12 Explain how ozone being a deadly poison can still perform an essential function for our environment. 1

OR

Give reason why a food chain cannot have more than four trophic levels.

13 State the role of pancreas in digestion of food. 1

For question numbers **14, 15** and **16**, two statements are given- one labeled **Assertion (A)** and the other labeled **Reason (R)**. Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

a) Both A and R are true, and R is correct explanation of the assertion.

b) Both A and R are true, but R is not the correct explanation of the assertion. c) A is true, but R is false.

d) A is false, but R is true.

14 **Assertion**: After white washing the walls, a shiny white finish on walls is obtained after two to three days. 1

Reason: Calcium Oxide reacts with Carbon dioxide to form Calcium Hydrogen Carbonate which gives shiny white finish.

15 **Assertion:** Food chain is responsible for the entry of harmful chemicals in our bodies. 1

Reason: The length and complexity of food chains vary greatly. **OR**

Assertion: Greater number of individuals are present in lower trophic levels. **Reason:** The flow of energy is unidirectional.

16 **Assertion:** A geneticist crossed a pea plant having violet flowers with a pea plant with white flowers, he got all violet flowers in first generation. 1

Reason: White colour gene is not passed on to next generation.

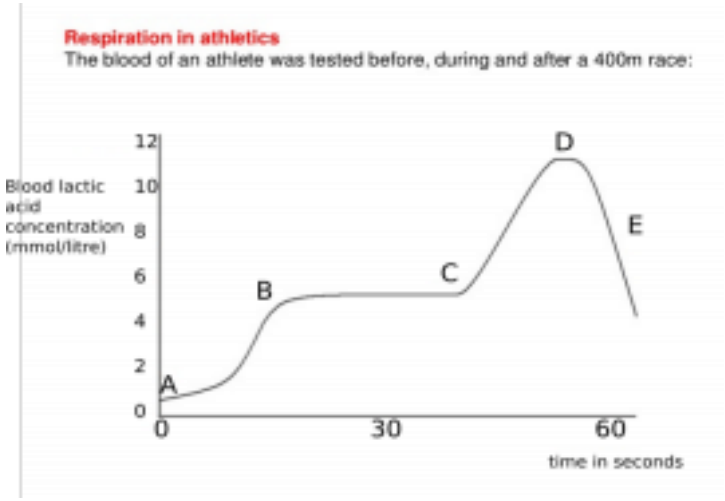
Answer Q. No 17 - 20 contain five sub-parts each. You are expected to answer <u>any four</u> sub parts in these questions.

17 <u>Read the following and answer any **four** questions from 17 (i) to 17 (v)</u> 1x4

All living cells require energy for various activities. This energy is available by the breakdown of simple carbohydrates either using oxygen or without using oxygen.

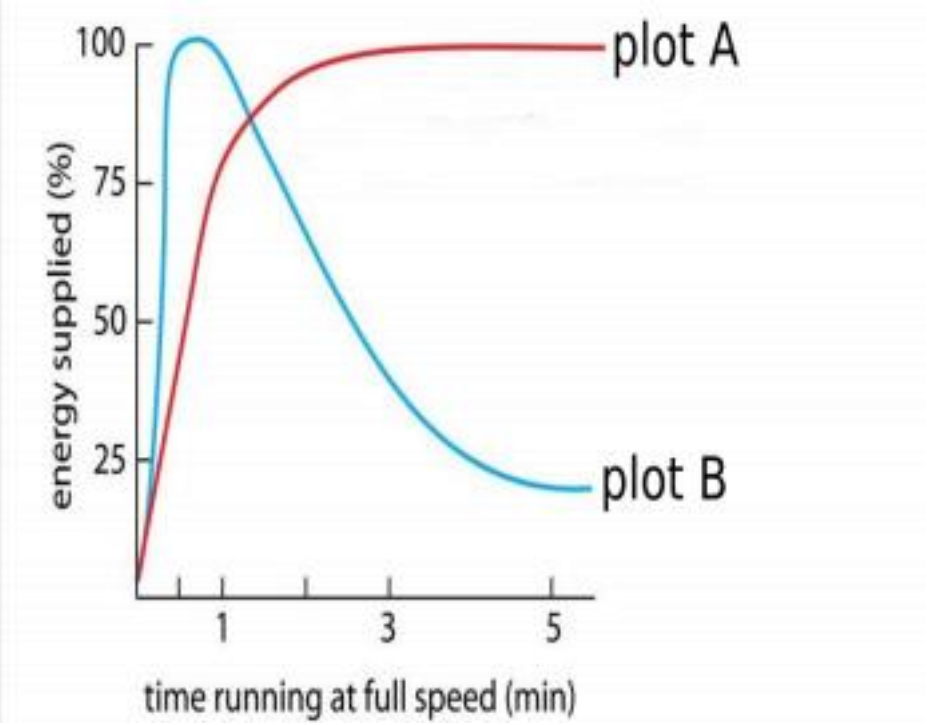
(i) Energy in the case of higher plants and animals is obtained by a) Breathing
b) Tissue respiration
c) Organ respiration
d) Digestion of food

(ii) The graph below represents the blood lactic acid concentration of an athlete during a race of 400 m and shows a peak at point D.



Lactic acid production has occurred in the athlete while running in the 400 m race. Which of the following processes explains this event? a) Aerobic respiration
b) Anaerobic respiration
c) Fermentation
d) Breathing

(iii) Study the graph below that represents the amount of energy supplied with respect to the time while an athlete is running at full speed.



Choose the correct combination of plots and justification provided in the following table.

	Plot A	Plot B	Justification
a)	Aerobic	Anaerobic	Amount of energy is low and inconsistent in aerobic and high in anaerobic
b)	Aerobic	Anaerobic	Amount of energy is high and consistent in aerobic and low in anaerobic
c)	Anaerobic	Aerobic	Amount of energy is high and consistent in aerobic and low in anaerobic
d)	Anaerobic	Aerobic	Amount of energy is high and inconsistent in anaerobic and low in aerobic

(iv) The characteristic processes observed in anaerobic respiration are i) presence of oxygen
ii) release of carbon dioxide
iii) release of energy
iv) release of lactic acid

a) i) ,ii) only
b) i), ii), iii) only
c) ii), iii), iv) only
d) iv) only

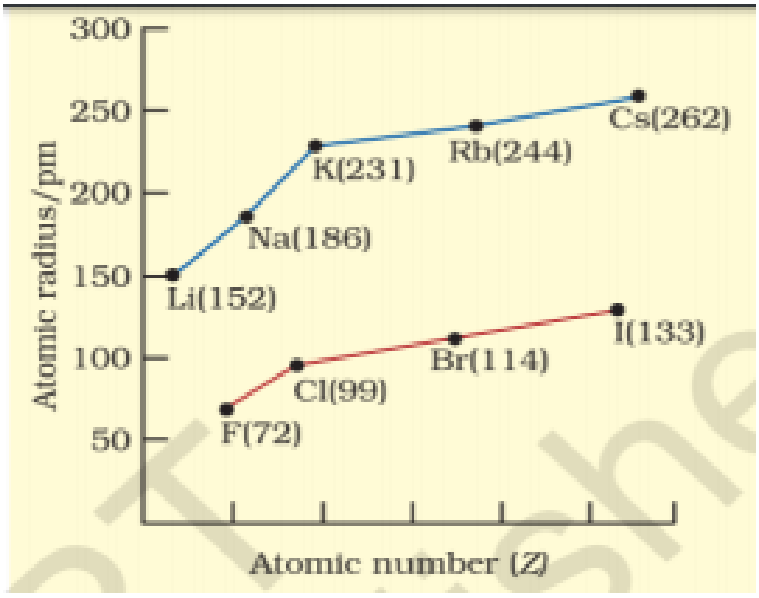
(v) Study the table below and select the row that has the incorrect information.

	Aerobic	**Anaerobic**
a) **Location**	Cytoplasm	Mitochondria
b) **End Product**	CO_2 and H_20	Ethanol and CO_2
c) **Amount of ATP**	High	Low
d) **Oxygen**	Needed	Not needed

18 Read the following and answer any **four** questions from 18 (i) to 18 (v). **Metallic Character** 1x 4

The ability of an atom to donate electrons and form positive ion (cation) is known as electropositivity or metallic character. Down the group, metallic character increases due to increase in atomic size and across the period, from left to right electropositivity decreases due to decrease in atomic size. **Non-Metallic Character**

The ability of an atom to accept electrons to form a negative ion (anion) is called non-metallic character or electronegativity. The elements having high electro-negativity have a higher tendency to gain electrons and form anion. Down the group, electronegativity decreases due to increase in atomic size and across the period, from left to right electronegativity increases due to decrease in atomic size.



18 (i) Which of the following correctly represents the decreasing order of metallic character of Alkali metals plotted in the graph?

a) Cs>Rb>Li>Na>K
b) K>Rb>Li>Na>Cs
c) Cs>Rb>K>Na>Li
d) Cs>K>Rb>Na>Li

18 (ii) Hydrogen is placed along with Alkali metals in the modern periodic table though it shows non-metallic character

a) as Hydrogen has one electron & readily loses electron to form negative ion
b) as Hydrogen can easily lose one electron like alkali metals to form positive ion
c) as Hydrogen can gain one electron easily like Halogens to form negative ion
d) as Hydrogen shows the properties of nonmetals

18 (iii) Which of the following has highest electronegativity?

a) F
b) Cl
c) Br
d) I

18 (iv) Identify the reason for the gradual change in electronegativity in halogens down the group.

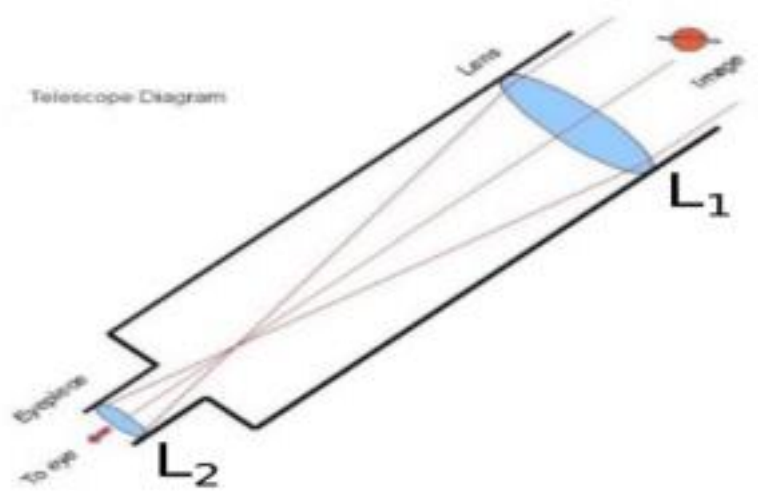
a) Electronegativity increases down the group due to decrease in atomic size
b) Electronegativity decreases down the group due to decrease in tendency to lose electrons
c) Electronegativity decreases down the group due to increase in atomic radius/ tendency to gain electron decreases
d) Electronegativity increases down the group due to increase in forces of attractions between nucleus & valence electrons

18 (v) Which of the following reasons correctly justifies that "Fluorine (72pm) has a smaller atomic radius than Lithium (152pm)"?

a) F and Li are in the same group. Atomic size increases down the group
b) F and Li are in the same period. Atomic size increases across the period due to increase in number of shells
c) F and Li are in the same group. Atomic size decreases down the group
d) F and Li are in the same period and across the period atomic size/radius decreases from left to right.

19 Read the following and answer any **four** questions from 19 (i) to 19 (v) 1x 4

Sumati wanted to see the stars of the night sky. She knows that she needs a telescope to see those distant stars. She finds out that the telescopes, which are made of lenses, are called refracting telescopes and the ones which are made of mirrors are called reflecting telescopes.



So she decided to make a refracting telescope. She bought two lenses, L_1 and L2. out of which L_1 was bigger and L_2 was smaller. The larger lens gathers and bends the light, while the smaller lens magnifies the image. Big, thick lenses are more powerful. So to see far away, she needed a big powerful lens. Unfortunately, she realized that a big lens is very heavy.

Heavy lenses are hard to make and difficult to hold in the right place. Also since the light is passing through the lens, the surface of the lens has to be extremely smooth. Any flaws in the lens will change the image. It would be like looking through a dirty window.

19 (i) Based on the diagram shown, what kind of lenses would Sumati need to make the telescope?

a) Concave lenses
b) Convex lenses
c) Bifocal lenses
d) Flat lenses

19 (ii) If the powers of the lenses L_1 and L_2 are in the ratio of 4:1, what would be the ratio of the focal length of L_1 and L_2?

a) 4:1
b) 1:4
c) 2:1
d) 1:1

19 (iii) What is the formula for magnification obtained with a lens?

a) Ratio of height of image to height of object

b) Double the focal length.

c) Inverse of the radius of curvature.

d) Inverse of the object distance.

19 (iv) Sumati did some preliminary experiment with the lenses and found out that the magnification of the eyepiece (L_2) is 3. If in her experiment with L_2 she found an image at 24 cm from the lens, at what distance did she put the object? a) 72 cm

b) 12 cm

c) 8 cm

d) 6 cm

19 (v) Sumati bought not-so-thick lenses for the telescope and polished them. What advantages, if any, would she have with her choice of lenses? a) She will not have any advantage as even thicker lenses would give clearer images.

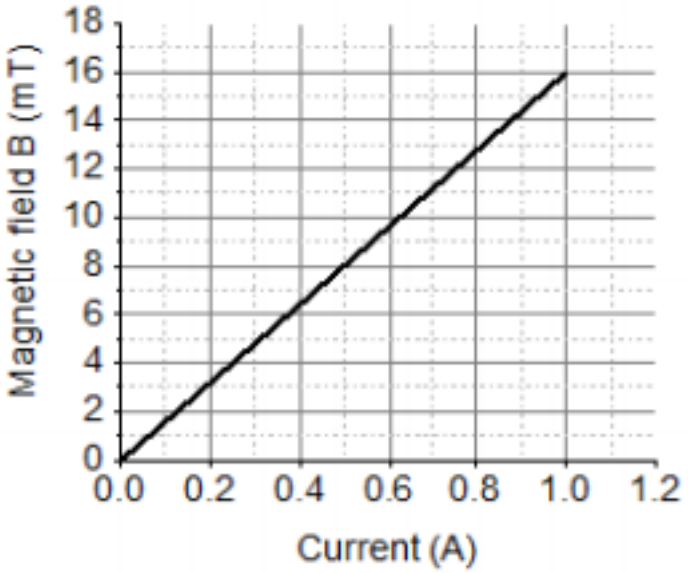
b) Thicker lenses would have made the telescope easier to handle. c) Not-so-thick lenses would not make the telescope very heavy and also allow a considerable amount of light to pass.

d) Not-so-thick lenses will give her more magnification.

20 <u>Read the following and answer any 4 questions from 20 (i) to 20 (v).</u> A solenoid is a long helical coil of wire through which a current is run in order to create a magnetic field. The magnetic field of the solenoid is the superposition of the fields due to the current through each coil. It is nearly uniform inside the solenoid and close to zero outside and is similar to the field of a bar magnet having a north pole at one end and a south pole at the other depending upon the direction of current flow. The magnetic field produced in the solenoid is dependent on a few factors such as, the current in the coil, number of turns per unit length etc. 4

The following graph is obtained by a researcher while doing an experiment to see the variation of the magnetic field with respect to the current in the solenoid.

The unit of magnetic field as given in the graph attached is in milli-Tesla (mT) and the current is given in Ampere.



20 (i) What type of energy conversion is observed in a linear solenoid? a. Mechanical to Magnetic

b. Electrical to Magnetic

c. Electrical to Mechanical

d. Magnetic to Mechanical

20 (ii) What will happen if a soft iron bar is placed inside the solenoid? a. The bar will be electrocuted resulting in short-circuit.

b. The bar will be magnetised as long as there is current in the circuit. c. The bar will be magnetised permanently.

d. The bar will not be affected by any means.

20 (iii) The magnetic field lines produced inside the solenoid are similar to that of … a.
a bar magnet

b. a straight current carrying conductor

c. a circular current carrying loop

d. electromagnet of any shape

20 (iv) After analysing the graph a student writes the following statements.

I. The magnetic field produced by the solenoid is inversely proportional to the current.

II. The magnetic field produced by the solenoid is directly proportional to the current.

III. The magnetic field produced by the solenoid is directly proportional to square of the current.

IV. The magnetic field produced by the solenoid is independent of the current.

Choose from the following which of the following would be the correct statement(s).

a. Only IV
b. I and III and IV
c. I and II
d. Only II

20 (v) From the graph deduce which of the following statements is correct.

a. For a current of 0.8A the magnetic field is 13 mT
b. For larger currents, the magnetic field increases non-linearly.
c. For a current of 0.8A the magnetic field is 1.3 mT
d. There is not enough information to find the magnetic field corresponding to 0.8A current.

SECTION B

21 Bile juice does not have any digestive enzyme but still plays a significant role in the process of digestion. Justify the statement. 2

OR

In birds and mammals the left and right side of the heart are separated. Give reasons.

22 State the events occurring during the process of photosynthesis. Is it essential that these steps take place one after the other immediately? 2

23 Give a test that can be used to confirm the presence of carbon in a compound. With a valency of 4, how is carbon able to attain noble gas configuration in its compounds? 2

OR

The number of carbon compounds is more than those formed by all other elements put together. Justify the statement by giving two reasons.

24 The following observations were made by a student on treating four metals P, Q, R and S with the given salt solutions: 2

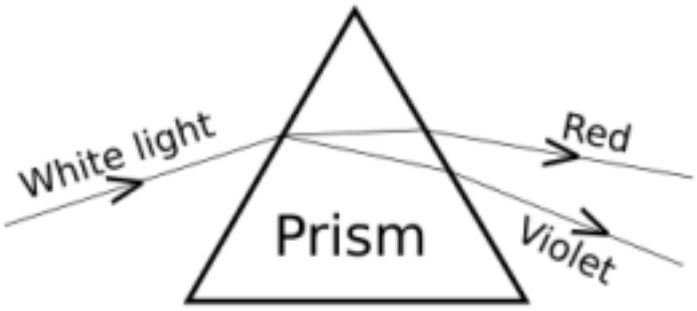
Sample	**$MgSO_4$(aq)**	**$Zn(NO_3)_2$(aq)**	**$CaSO_4$(aq)**	**Na_2SO_4(aq)**
P	No reaction	Reaction occurs	Reaction occurs	No reaction
Q	Reaction occurs	Reaction occurs	Reaction occurs	Reaction occurs
R	No Reaction	Reaction Occurs	No Reaction	No Reaction
S	No Reaction	No Reaction	No Reaction	No Reaction

Based on the above observations:

(a) Arrange the given samples in the increasing order of reactivity

(b) Write the chemical formulae of products formed when Q reacts with $CuSO_4$ solution.

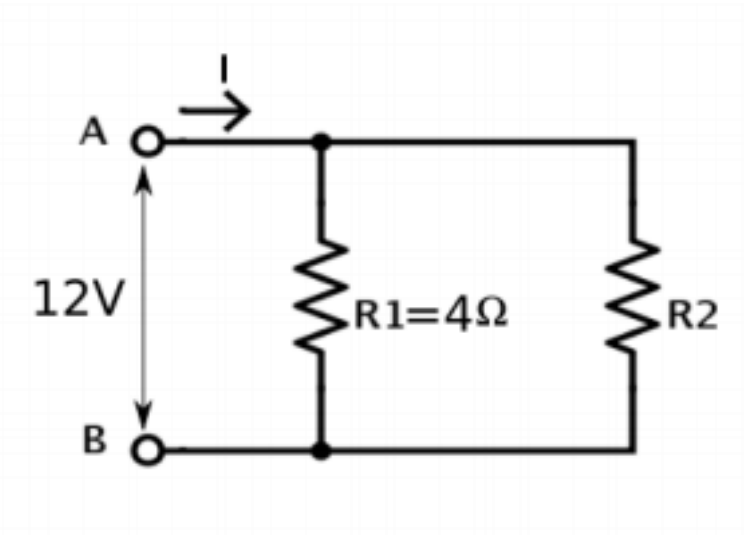
25 2



A student observes the above phenomenon in the lab as a white light passes through a prism. Among many other colours, he observed the position of the two colours Red and Violet.

What is the phenomenon called? What is the reason for the violet light to bend more than the red light?

26 2



A student has two resistors- 2 Ω and 3 Ω. She has to put one of them in place of R2 as shown in the circuit. The current that she needs in the entire circuit is exactly 9A. Show by calculation which of the two resistors she should choose.

Section C

27 After self-pollination in pea plants with round, yellow seeds, following types of seeds were obtained by Mendel: 3

Seeds	Number
Round, yellow	630
Round, green	216
Wrinkled, yellow	202
Wrinkled, green	64

Analyse the result and describe the mechanism of inheritance which explains these results.

OR

In humans, there is a 50% probability of the birth of a boy and 50% probability that a girl will be born. Justify the statement on the basis of the mechanism of sex-determination in human beings.

28 Plastic cups were used to serve tea in trains in early days- these could be returned to the vendors, cleaned and reused. Later, *Kulhads* were used instead of plastic cups. Now, paper cups are used for serving tea. 3
What are the reasons for the shift from Plastic to *Kulhads* and then finally to paper cups?

29 Explain where and how urine is produced? 3

30 a. Which of the following reactions is/ are an *endothermic* reaction(s) where decomposition also happens? 3

- Respiration
- Heating of lead nitrate
- Decomposition of organic matter
- Electrolysis of acidified water

b. Silver chloride when kept in the open turns grey. Illustrate this with a balanced chemical equation.

31 The following table shows the position of five elements A, B, C, D and E in the modern periodic table. 3

Group→ 1 2 3 to 12 13 14 15 16 17 18
Period ↓

2 A B C 3 D E

Answer the following giving reasons:
(i) Which element is a metal with valency two?
(ii) Which element is least reactive?
(iii) Out of D and E which element has a smaller atomic radius?

32 a. Explain the formation of Calcium Chloride with the help of electron dot structure. (At numbers: Ca = 20; Cl = 17) 3
b. Why do ionic compounds not conduct electricity in solid state but conduct electricity in molten and aqueous state?

33 Refractive index of water with respect to air is 1.33 and that of diamond is 2.42. 3

(i) In which medium does the light move faster, water or diamond? (ii) What is the refractive index of diamond with respect to water?

Section D

34 Match the following pH values *1, 7, 10, 13* to the solutions given below: 5

- Milk of magnesia
- Gastric juices
- Brine
- Aqueous Sodium hydroxide.

Amit and Rita decided to bake a cake and added baking soda to the cake batter.

Explain with a balanced reaction, the role of the baking soda. Mention any other use of baking soda.

OR

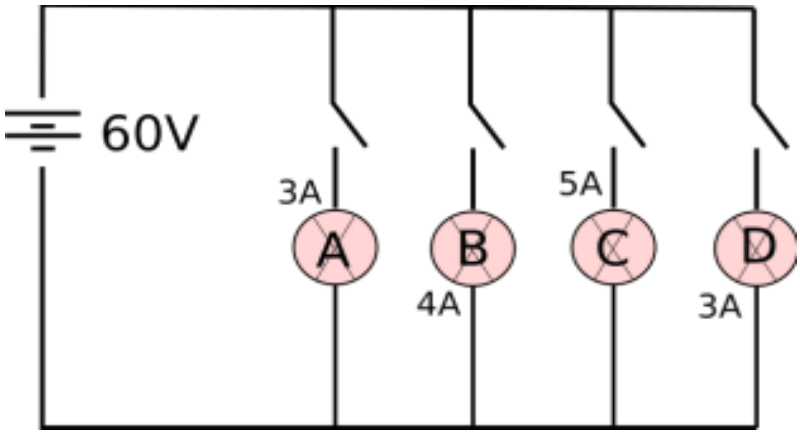
(i) Four samples A, B, C and D change the colour of pH paper or solution to Green, Reddish-pink, Blue and Orange. Their pH was recorded as 7, 2, 10.5 & 6 respectively. Which of the samples has the highest amount of Hydrogen ion concentration? Arrange the four samples in the decreasing order of their pH.

(ii) Rahul found that the Plaster of Paris, which he stored in a container, has become very hard and lost its binding nature. What is the reason for this? Al so, write a chemical equation to represent the reaction taking place.

(iii) Give any one use of Plaster of Paris other than for plastering or smoothening of walls.

35 Trace the changes that take place in a flower from gamete formation to fruit formation. 5

36 In the given circuit, A, B, C and D are four lamps connected with a battery of 60V. 5



Analyse the circuit to answer the following questions.

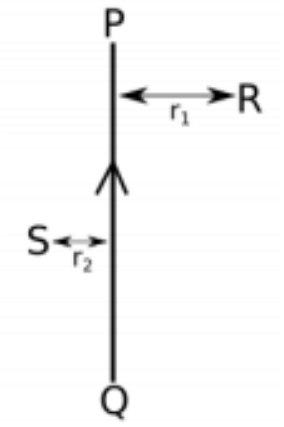
(i) What kind of combination are the lamps arranged in (series or parallel)?

(ii) Explain with reference to your above answer, what are the advantages (any two) of this combination of lamps?

(iii) Explain with proper calculations which lamp glows the brightest? (iv) Find out the total resistance of the circuit.

OR

PQ is a current carrying conductor in the plane of the paper as shown in the figure below.



(i) Find the directions of the magnetic fields produced by it at points R and S?

(ii) Given $r_1 > r_2$, where will the strength of the magnetic field be larger? Give reasons.

(iii) If the polarity of the battery connected to the wire is reversed, how would the direction of the magnetic field be changed?

(iv) Explain the rule that is used to find the direction of the magnetic field for a straight current carrying conductor.

Academic Session: 2020-21
First Term Examination
Subject: Science
Class -X

Time: 2 Hours **Max marks: 30**

General Instructions:

- The reading time is from 7:45 am to 8:00 am.
- The writing time is from 8:00 am to 10:00 am.
- By 10:15am, the pdf file of the answer sheets needs to be created, attached and submitted. Once submitted, it can't be resubmitted.
- Children who avail extra time, may submit the answer sheets by 11:00 am.
- All questions are compulsory.
- Paper has three sections A, B and C and you have to attempt on three separate A-4 size sheets
- The Answer sheets need to be scanned and uploaded as a single pdf file in portrait mode. Make sure that you turn in the work in the time frame assigned.
- No image to be uploaded.
- This paper has __printed sides.

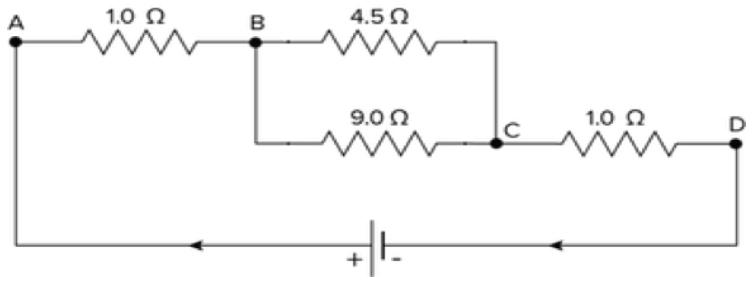
SECTION A -Physics

Q1. I) A torch bulb is rated at 3V and 600mA. Calculate it's 3+2=5
(a) Power b) Resistance c) Energy consumed if it is lighted for 4 Hrs.

II) Nihal wants to make the circuit, shown below, simpler.

a) His brother Saurav claims that he can draw the same current from the cell using only one resistor between the points A and D. What equivalent resistance, R, is Saurav using between A and D

b) If the current through the circuit is 2A find the potential difference of the cell in the circuit.



Q2. **Please note, In this question only part a) has a choice and part b) is compulsory.** 3+2=5

a) The image formed by a converging mirror is real and of the same size, where will you place the Object? Draw a necessary ray diagram to show this

OR

a) The image formed by a converging mirror is virtual and enlarged, where will you place the Object? Draw a necessary ray diagram to show this.

b) Name the type of mirrors used in the following situations:
(Give Reason also)
i) Headlights of a car
ii) Rear-view mirror of vehicle

SECTION B – Chemistry

Q1 Give reasons for the following: 2
(i) Aluminium oxide is considered as an amphoteric oxide.(With chemical equations)

(ii) Hydrogen gas is not released when metals react with nitric acid.

Q2 Explain with electronic configuration about transfer of electron between the atoms in the formation of MgO. Also explain why Ionic compounds conduct electricity in molten state. 3

Q3 Identify the type of reactions taking place in each of the following cases and write the balanced chemical equation for the reactions. 3 Marks 3

(a) Zinc reacts with silver nitrate to produce zinc nitrate and silver.

(b) Potassium iodide reacts with lead nitrate to produce potassium nitrate and lead iodide.

Q4 Identify the compound of calcium which is yellowish white powder and is used for disinfecting drinking water. Write its chemical name and formula. How is it manufactured? Write the chemical equation for the reaction involved. Also list two other uses of the compound. 2

SECTION C – Biology

Q1. Give reason for the following: 2
a. Fine hair and mucous are present in the nasal passage.
b. Rings of cartilage are present in the trachea.

Q2. List in tabular form three differences between arteries and veins. 3

Q3. a. Draw structure of the unit in which the filtration of blood takes place to remove the waste products and label the following parts: 5(3+2)

1. Part that has cluster of capillaries.
2. Part in which filtration occurs.
3. Artery that carries blood for filtration.
4. Part where urine is poured.

b. State the function of ureters.

c. What happens to glucose that enters the nephron along with the initial filtrate?

Academic Session: 2020-21
Pre-board-Examination
Subject: Science
Class -X

Time: 3 Hours **Max marks: 80**

General Instructions:

- The reading time is from 9:25 am to 9:40 am.
- The writing time is from 9:40 am to 12:40 pm.
- By 1:00 pm, the PDF file of the answer sheets needs to be created, attached and submitted. Once submitted, it can't be resubmitted.
- Children who avail extra time, may submit the answer sheets by 2:00 pm.
- The Answer sheets need to be scanned and uploaded as a single PDF file in portrait mode. Make sure that you turn in the work in the time frame assigned.
- No image to be uploaded.
- This paper has _14_ pages.

(i) *The question paper comprises four sections A, B, C and D. There are 36 questions in the question paper. All questions are compulsory.*

(ii) *Section–A - question no. 1 to 20 - all questions and parts thereof are of one mark each. These questions contain multiple choice questions (MCQs), very short answer questions and assertion - reason type questions. Answers to these should be given in one word or one sentence.*

(iii) *Section–B - question no. 21 to 26 are short answer type questions, carrying 2 marks each. Answers to these questions should be in the range of 30 to 50words.*

(iv) *Section–C - question no. 27 to 33 are short answer type questions, carrying 3 marks each. Answers to these questions should be in the range of 50 to 80words.*

Sections–D – question no. - 34 to 36 are long answer type questions carrying 5 marks each. Answers to these questions should be in the range of 80 to 120words.

(v) *There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.*

(vi) *Wherever necessary, neat and properly labeled diagrams should be drawn.*

Q1. 1

Write balanced chemical equations for the following reaction

Sodium metal reacts with water to form sodium hydroxide and hydrogen gas.

OR

What is the colour of ferrous sulphate crystals? Explain with equation, how does this colour change after heating?

Q2. "Sodium hydrogencarbonate is a basic salt". Justify the statement. 1

Q3. What is the difference in the molecular formula of any two consecutive members of a homologous series of organic compounds? Write the second homologue of the Alkane series. 1

Q4. Why are the danger signals Red? 1

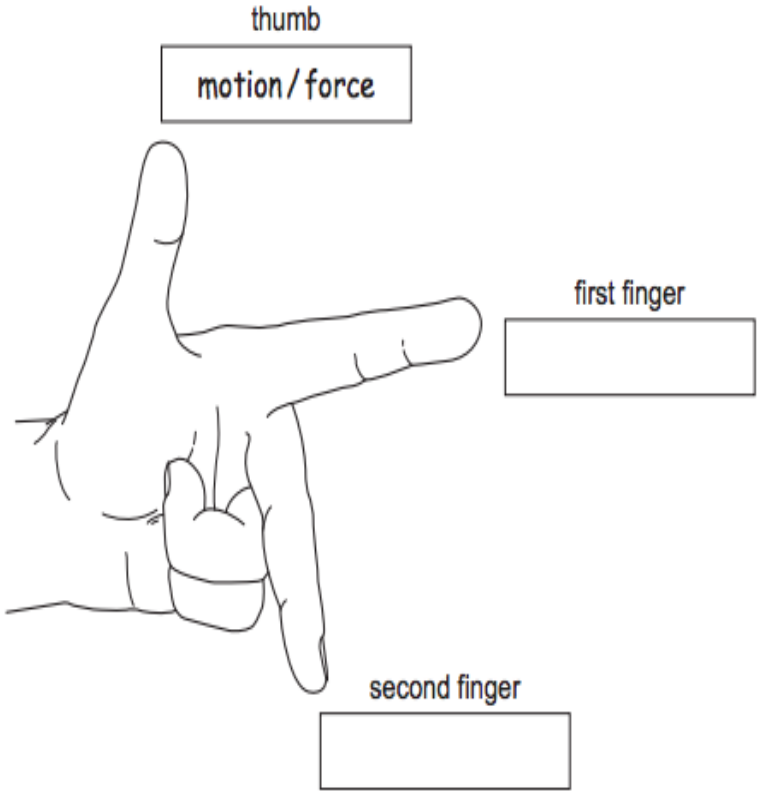
Q5. If the radius of curvature of a convex mirror is 30 cm, find its focal length. 1

Q6. The image formed by a mirror is real inverted and highly enlarged, where will you place the object? Also name the type of the mirror. 1

OR

The Sunrays are converged at a point by a lens. Name the point at which the rays are converged and the type of the lens.

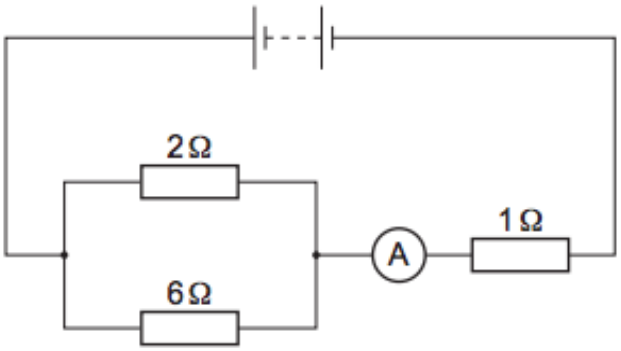
Q7. 1



Observe the above figure and fill in the blanks.
The first finger represents_____ and the second finger represent _____.

Q8. Draw magnetic field lines around a current carrying circular coil. 1

Q9. From the given figure, find the effective resistance of the given circuit. 1



Q10. Why is transpiration important for plants? 1

Q11. How is the wall of small intestine adapted for performing the function of absorption of nutrients? Any two points 1

OR

Out of a rabbit and a tiger, which one will have a longer small intestine? Justify.

Q12. If salivary amylase is lacking in the saliva, which event in the mouth will be affected? 1

Q13. Name two contents of the initial filtrate that are reabsorbed. 1

Directions: For question number 14,15 and 16, one labelled Assertions (A) and the other labeled Reason (R) select the correct answer to these questions from the codes (a), (b),(c), and (d).

(a) Both the A and R are correct and the R is the correct explanation of the assertion

(b) Both A and the R are correct but the R is not the correct explanation of the assertion

(c) A is true but the R is false

(d) A is false but the R is true.

Q14. Assertion: White Silver chloride turns grey in the presence of sunlight. 1

Reason: In the presence of sunlight, silver chloride decomposes into silver metal and chlorine gas.

Q15. Assertion: In the alveoli exchange of gases takes place, oxygen from alveoli diffuses into blood and carbon dioxide from blood diffuses into alveoli. 1
Reason: Alveoli increases surface area for exchange of gases.

a. Both Assertion and Reason are true, and Reason is the correct explanation of the assertion.

b. Both Assertion and Reason are true, but Reason is not the correct explanation of the assertion.
c. Assertion is true, but Reason is false.
d. Assertion is false, but Reason is true.

Q16. Assertion: A geneticist crossed a pea plant having violet flowers with a pea plant with white flowers; he got all violet flowers in first generation. 1
Reason: White colour gene is not passed on to next generation.

a. Both Assertion and Reason are true, and Reason is the correct explanation of the assertion.
b. Both Assertion and Reason are true, but Reason is not the correct explanation of the assertion.
c. Assertion is true, but Reason is false.
d. Assertion is false, but Reason is true.

QUESTION NUMBERS 17-20 CONTAIN 5 SUBPARTS EACH, YOU ARE EXPECTED TO ANSWER ANY 4 SUBPARTS IN EACH 1X4

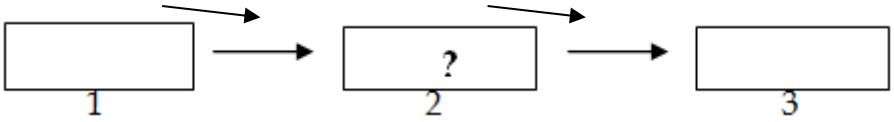
Q17. Read the following and answer any four questions from 17 A to 17 E 1X4

The various components of an ecosystem are interdependent. The producers make the energy from sunlight, which is available to the rest of the ecosystem. There is a flow and loss of energy from one trophic level to the next limits the number of trophic levels in a food-chain. Toxic substances accumulate in the food chain due to the use of several pesticides and other chemicals to protect our crops from diseases and pests. As these chemicals are not degradable, these get accumulated progressively at each trophic level.
Human activities also have an impact on the environment. The use of chemicals like CFCs has endangered the ozone layer, this could damage the environment.

A. Which of the following statements about the autotrophs is incorrect?
a. They synthesize carbohydrates from carbon dioxide and water in the presence of sunlight and chlorophyll
b. They store carbohydrates in the form of starch
c. They convert carbon dioxide and water into carbohydrates in the absence of sunlight
d. They constitute the first trophic level in food chains.

B. In a food chain the second trophic level is occupied by:

?	

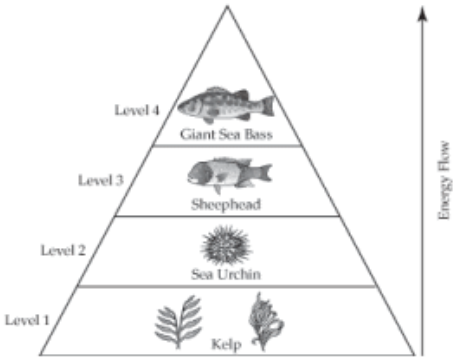


a. Carnivores
b. Autotrophs
c. Herbivores
d. Producers

C. Which of the following may be the conclusions of the excessive exposure of humans to sun's ultraviolet rays?
1 Peptic ulcers
2. Eye disease like cataract
3. Damage to lungs
4. Skin cancer

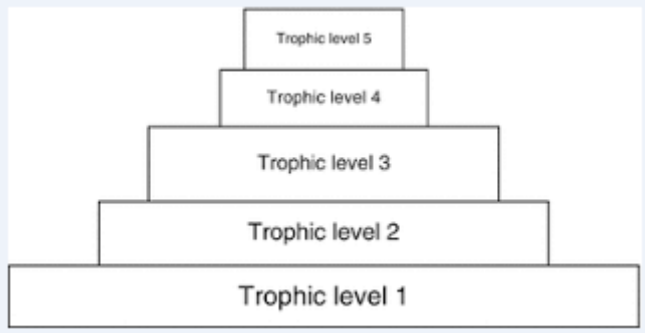
a. 1 and 4
b. 2, 3 and 4
c. 2 and 4
d. Only 4

D. If 100 J energy is available at the producer level in a food chain then the energy available to the secondary consumer will be:



a. 10 J
b. 0.1 J
c. 1 J
d. 0.01 J

E. The process of accumulation of harmful chemical substances like pesticides, in the body of living organisms at each trophic level of a food chain is known as:



a. Biological magnification
b. Biological accumulation
c. Chemical magnification
d. Chemical accumulation

Q18. 1X4

Read the given passage and answer the questions that follow:

Elements are arranged in the Modern Periodic table in increasing order of their atomic numbers. Metals are on the left hand side and middle of the periodic table mainly and nonmetals are on the right hand side. A zig-zag diagonal line divides metals and non-metals. Elements near the zig-zag line are called metalloids. Metals are electropositive whereas non-metals are electronegative.

Elements of the same group have the same number of valence electrons but different number of shells. Elements of the same period have different number of valence electrons but same number of shells. Elements in the middle of periodic tables are called transition metals.

(a) Which one of the following statements is correct

(i) All groups contain both metal and non- metals.

(ii) In group 17, reactivity increases down the group.

(iii) In group 1, reactivity decreases down the group.

(iv) Atoms of the same group have the same number of valence electrons.

(b) How does atomic size change down the group and across the period.

(c) Why group 1 elements are called alkali metals.

(d) How does the reactivity of non- metals change and why?

(i) Decreases down the group

(ii) Increases down the group

(iii) Does not change down the group

(iv) Shows irregular trends down the group.

(e) Out of the alkali metals Sodium and Potassium, which one is more metallic and why?

Q19. Analyze the table given below for a convex lens and answer the following questions 1X4

S.No.	OBJECT DISTANCE (u) cm	IMAGE DISTANCE (v) cm
1.	- 60	+12
2.	- 30	+ 15
3.	- 20	+ 20
4.	- 15	+ 30
5.	-12	+ 60
6.	- 9	+ 90

19 (i) The focal length of the convex lens is
a) – 10 cm+10 cm
b) – 20 cm
c) + 20 cm

19 (ii) For what object distance, the corresponding image distance is incorrect
a) -60 cm
b) – 30 cm
c) -9 cm
d) -12 cm

19 (iii) If a student wants to find the focal length of the this lens where should the object be placed
a) At focus
b) At center of curvature
c) At infinity
d) At the optical center

19 (iv) The magnification of the lens when the object is placed at 15 cm in front of the mirror is
a) -2
b) -1
c) +2
d) +1

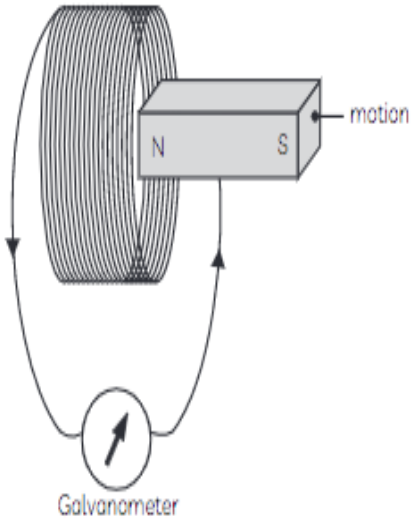
19 (v) A student writes a few statements for convex lens.
a. The convex lens forms only real images
b. The convex lens forms real image of the same size as the object.
c. The convex lens never forms the image on the same side as the object is.

The incorrect statement(s) is/are

a) I only
b) I and II only
c) I and III only
d) All I, II and III

Q20. The space surrounding a magnet in which magnetic force is exerted, is called a magnetic field. The direction of magnetic field lines at a place can be determined by using a compass needle. A compass needle placed near a magnet gets deflected due to the magnetic force exerted by the magnet. 1X4

The north end of the needle of the compass indicates the direction of magnetic field at the point where it is placed. When the magnet shown in the diagram below is moving towards the coil, the galvanometer gives a reading to the right.



20 (I) The direction of induced current is given by

a) Right hand thumb rule
b) Fleming's right hand rule
c) Fleming's left hand rule
d) Maxwell's right hand rule

20 (II) What is the condition of electromagnetic induction?

a) There has be a relative motion between galvanometer and coil
b) There has be a relative motion between galvanometer and magnet
c) There has be a relative motion between magnet and coil
d) None of these

20 (III) The induced current is highest when

a) Direction of magnetic field is perpendicular to the direction of motion of the coil

b) Direction of magnetic field is parallel to the direction of motion of the coil
c) Direction of magnetic field is opposite to the direction of motion of the coil
d) None of these

20(IV) When the magnet is moved towards the coil
a) There is no deflection
b) There is a momentary deflection
c) The galvanometer needle keeps swinging
d) None of these

20 (V) The induced current will be more when
a) A strong magnet is used
b) There is more number of turns per unit length
c) A soft iron core is inserted

a) I only
b) I and II only
c) I, II and III only
d) None of these

SECTION – B

Q21. All plants give out oxygen only during the day but carbon dioxide is given out during the day and night. Do you agree with this statement? Give reason. 2

OR

Bile juice does not have any digestive enzyme but still plays a significant role in the process of digestion. Justify the statement.

Q22. Why binary fission, budding, and fragmentation are considered as asexual types of reproduction? With neat diagrams explain the process of regeneration in *Planaria*. 2

Q23. Give reasons for the following observations: 2

(a) The element carbon forms a very large number of compounds.

(b) The covalent bond between carbon atoms is very strong.

OR

(a)How many covalent bonds are there in a molecule of ethane (C_2H_6)?

(b) Write the electron dot structure of ethane molecule (C_2H_6).

Q24. (a) Define reactivity series of metals. Arrange the metals gold, copper, iron and magnesium in order of their increase in reactivity. 2

(b) What will you observe when:

(i) Some zinc pieces are put in copper sulphate solution.

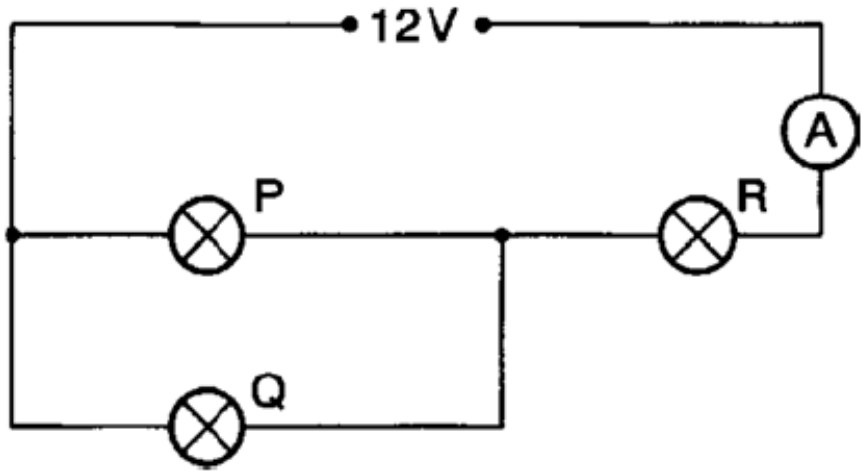
(ii) Some silver pieces are put into green coloured ferrous sulphate solution.

OR

When a metal X is treated with cold water, it gives a base Y with molecular formula XOH (Molecular mass = 40) and liberates a gas Z which easily catches fire. Identify X, Y and Z and write the chemical reactions involved.

Q25. Draw a neat-labeled diagram to show refraction through a glass prism. 2

Q26. 2



From the figure given above

I) Find the effective resistance of the circuit. (All three lamps are identical and having rating 24 W, 12 V)

II) Find the value of current through ammeter.

SECTION – C

Q27. Draw a diagram of the longitudinal section of a bisexual flower and label the following parts: 3

a. Gamete producing organ in female reproductive system

b. Gamete producing organ in male reproductive system
c. Part that attracts insects for pollination
d. Part that protects the buds

OR

Draw a diagram showing the germination of pollen in a flower and Label the following parts:

a. Part of a flower on which the germination of pollen occurs
b. Part that transfers the male germ cell for fertilization
c. Part that forms fruit
d. Part that develops a tough coat and is converted into a seed

Q28. a. Give two points of difference between aerobic respiration and anaerobic respiration. 3(2+1)

b. Give reason, During the breathing cycle, when air is taken in and let out, the lungs always contain a residual volume of air.

Q29. When a tall pea plant is crossed with a dwarf pea plant, F_1 generation plants are obtained, the pea plants of the F_1 generation are then self-crossed. With the help of the Punnett square state the following in the resultant plants. 3

a. Which trait was expressed in F_1 Generation
b. State the Genotype ratio and Phenotype ratio of tall plants to dwarf plants in F_2 Generation.
c. Give reason, the trait that was expressed in F_2 generation did not appear in F1 generation.

Q30. i) When a solution of potassium iodide is added to a solution of lead nitrate in a test tube, a reaction takes place. 3

(a) What type of reaction is this?

(b) Write a balanced chemical equation to represent the above reaction.

ii)Define combination reaction. Give one example of a combination reaction which is also exothermic.

Q31. The elements of the second period of the Periodic Table are given below:Li Be B C N O F 3

(a) Give reason to explain why atomic radii decrease from Li to F.

(b) Identify the most

(i) metallic and

(ii) non-metallic element.

(c) How does the valency change when we move from Li to F

Q32. (a) Write the electron dot structures for potassium and chlorine. 3

(b) Show the formation of KCl by the transfer of electrons.

(c) Name the ions present in the compound, KCl.

Q33. I) Define magnification in terms of spherical mirrors. 3

II) If a converging mirror forms a real image, 40 cm away from the mirror when an object is placed at a distance of 20 cm in front of the pole of the mirror. Find the focal length of the mirror.

SECTION-D

Q34. i) Explain why is hydrochloric acid a strong acid and acetic acid, a weak acid. How can it be verified? 5

(ii) Explain why aqueous solution of an acid conducts electricity.

(iii) You have four solutions A, B, C and D. The pH of solution A is 6, B is 9, C is 12 and D is 7,

(a) Identify the most acidic and most basic solutions.

(b) Arrange the above four solutions in the increasing order of H^+ ion concentration.

(c) State the change in colour of pH paper on dipping it in solution C and D.

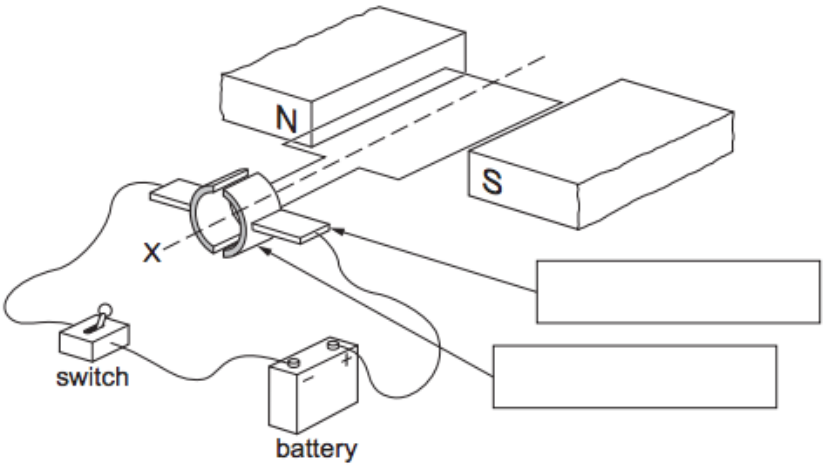
OR

i)A metal compound 'X' reacts with dil. H_2SO_4 to produce effervescence, The gas evolved extinguishes a burning candle. If one of the compounds formed is calcium sulphate, then what is 'X' and the gas evolved? Also, write a balanced chemical equation for the reaction which occurred.

ii)State the chemical name of Plaster of Paris. Write a chemical equation to show the reaction between Plaster of Paris and water.

Q35. a. State any two methods of contraception.What could be the reasons for adopting contraceptive methods.(any two) 5
b. Name one sexually transmitted disease caused due to bacteria and virus.

Q36. 5



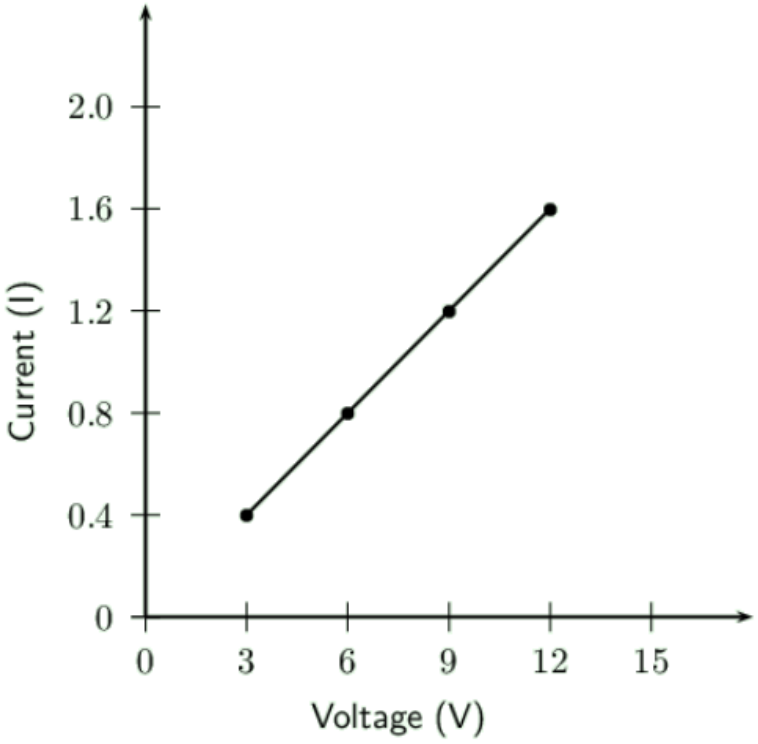
i) Name the device shown in the above figure.

ii) Label the parts indicated by arrows.

iii) State which way the coil will rotate when viewed from position X.

iv) Give two ways to increase the speed of rotation of the coil.

OR



i) Name and state the law depicted by the above figure.

ii) Draw a neat – labeled circuit diagram required to prove this law.

iii) Find the resistance from the figure.

Practicals

Experiment - 1

Aim: To Study the properties of an acid (dilute HCl) on the basis of its reaction with
1. Litmus solutions (blue/red) **2.** Zinc metal **3.** Solid sodium carbonate

Theory:

1. Hydrochloric acid turns blue litmus red, but it does not affect red litmus.

2. Hydrochloric acid reacts vigorously with zinc metal to liberate hydrogen gas.

$$Zn\ (s) + 2HCl\ (aq) \rightarrow ZnCl_2(aq) + H_2\uparrow\ (g)$$

Hydrogen gas burns in oxygen with a blue flame and produces a 'pop' sound.

$$2H_2(g) + O_2(g) \rightarrow 2H_2O\ (l) + \text{heat}$$

3. Hydrochloric acid reacts with sodium carbonate producing a lot of effervescence due to the evolution of carbon dioxide gas (CO_2).

$$Na_2CO_3(aq) + 2HCl\ (aq) \rightarrow 2NaCl\ (aq) + H_2O\ (l) + CO_2\uparrow\ (g)$$

Carbon dioxide gas liberated is a colourless and odourless gas which turns lime water milky due to the formation of calcium carbonate. Carbon dioxide gas also extinguishes a burning wooden splint.

$$Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O\ (l)$$

lime water carbon dioxide calcium carbonate

Apparatus and chemicals required:

Dilute hydrochloric acid solution, litmussolutions(blue and red), small pieces of zinc metal granules, solid sodium carbonate, clear lime water, test tubes, a test tube rack, test tube holder,

Observation Table :

S.NO	Experiment	observation	Inference
1.	**Reaction of HCl with** **a)blue litmus:** **b)red litmus:**		
2.	**Reaction of HCl with zinc metal:**		
3.	**Action of HCl on sodium carbonate:**		

Conclusions

Precautions

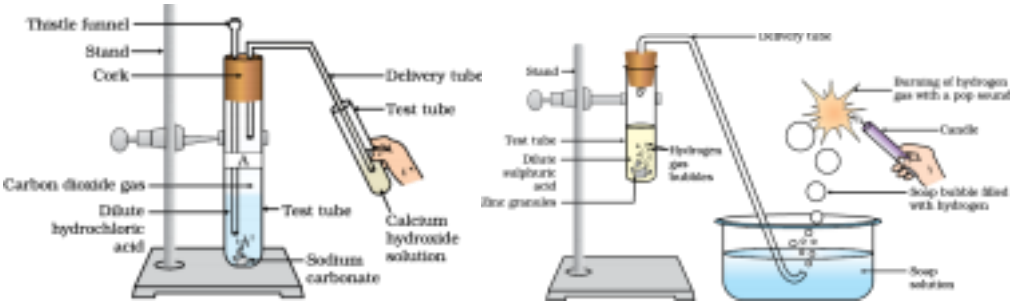
1. Small quantities of chemicals should be used to get best results.

2. Test tubes should be rinsed with distilled water before use.

3. Hydrochloric acid should be handled with care because it can cause burns.

4. Observe the milkiness in the lime water soon. In case you allow carbon dioxide to pass for a long time through lime water, the milkiness may be removed.

Diagrams to be drawn on the Left hand side of the file



Experiment -2

Aim: Studying the properties of a base (dilute solution of NaOH) on the basis of its reaction with

1. Litmus solutions (blue/red) **2.** Zinc metal **3.** Solid sodium carbonate

Theory:

1. Sodium hydroxide (a base) turns red litmus blue but it does not affect blue litmus. Sodium hydroxide is a strong alkali.

2. Sodium hydroxide solution (caustic soda) reacts slowly with zinc metal on heating to liberate hydrogen gas. Sodium zincate is formed as a product.

$$Zn\ (s) + 2NaOH\ (aq) \rightarrow Na_2ZnO_2(aq) + H_{2(g)}\uparrow$$

The hydrogen gas evolved above burns in oxygen with a blue flame. Hydrogen gas forms an explosive mixture with air and so it burns with a 'pop' sound. It can be tested by bringing a burning wooden splint near the mouth of the test tube. The flame of the splint will go off.

$$2H_2(g) + O_2(g) \rightarrow 2H_2O\ (l) + \text{heat}$$

3. Sodium hydroxide does not react with sodium carbonate.

Apparatus and Chemicals required

A dilute solution of sodium hydroxide, test tubes, litmus solutions (blue and red), small pieces of zinc metal granules, solid sodium carbonate test tubes, a test tube rack, a test tube

Observation Table

S.NO	Experiment	observation	Inference
1.	Reaction of NaOH with a)blue litmus:		

	b)red litmus:		
2.	Reaction of NaOH with zinc metal:		
3.	Action of NaOH on sodium carbonate:		

Conclusions

Precautions

1. Sodium hydroxide should be handled with care because it is highly corrosive in nature.

2. Do not heat mixture of zinc and dilute NaOH to boiling point.

3. A small quantity of chemicals should be used to perform the experiment to get best results.

4. Test tubes and droppers should be washed well with distilled water before use.

Experiment No.- 3

Aim: To Perform and observe the following reactions and classifying them into:

A. Combination reaction: Demonstrated by action of water on quicklime.

B. Decomposition reaction: Demonstrated by action of heat on ferrous sulphate crystals.

C. Displacement reaction: Demonstrated by iron nails kept in copper sulphate solution.

D. Double decomposition reaction: Demonstrated by reaction between sodium sulphate and barium chloride solutions.

Theory The following reaction describes the action of water on quicklime.

1. $CaO(s) + H_2O(l) \rightarrow Ca(OH)_{2(aq)} + \text{heat}$

2. $2FeSO_4(s) \longrightarrow Fe_2O_3(s) + SO_2(g) + SO_3(g)$

(Ferrous sulphate) (Ferric oxide)

3. $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$

(Copper sulphate) (Iron sulphate)

4. $Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$

(Sodium sulphate) (Barium chloride) (Barium sulphate) (Sodium chloride)

Observation Table :

S.NO	Experiment	observation	Inference
1.	**Reaction of CaO with water**		
2.	Heating of ferrous sulphate crystals:		
3.	Reaction of Fe with copper sulphate solution		
4.	Reaction between barium chloride and sodium sulphate		

Conclusions

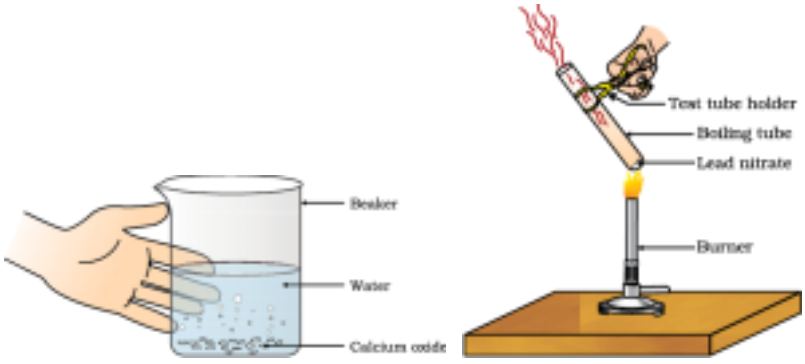
Precautions

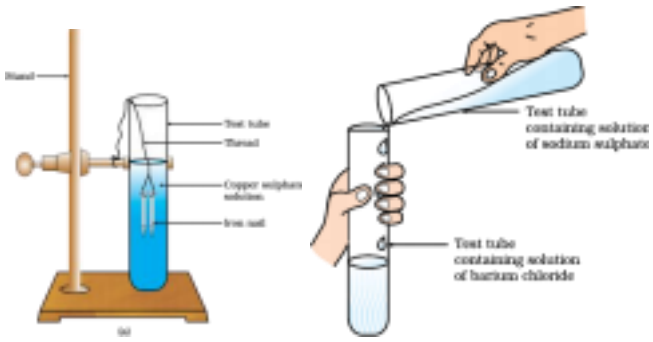
1. Use clean test tubes

2.While heating $FeSO_4 \cdot 7H_2O$ crystals, use a hard glass test tube (boiling tube) which is perfectly dry.

3. Handle the apparatus carefully and do not waste chemicals .

Diagrams to be drawn on left side of file





Experiment no - 4

Aim : To Observe the action of zinc (Zn), iron (Fe), copper (Cu) and aluminium (Al) metals on the following salt solutions: **i.** Zinc sulphate solution [$ZnSO_{4(aq)}$]

ii. Ferrous sulphate solution [$FeSO_{4(aq)}$]

iii. Copper sulphate solution [$CuSO_{4(aq)}$]

iv. Aluminium sulphate solution [$Al_2(SO_4)_{3(aq)}$]

Arranging zinc (Zn), iron (Fe), copper (Cu) and aluminium (Al) metals in the decreasing order of their reactivity, based on the above result.

Apparatus and chemicals required

Four clean test tubes in a test tube rack, four 100 mL beakers, a spare beaker to collect used salt solutions, small pieces (or wires) of clean copper, iron, zinc and aluminium, saturated aqueous solutions of zinc sulphate [$ZnSO_{4(aq)}$], ferrous sulphate [$FeSO_{4(aq)}$], copper sulphate [$CuSO_{4(aq)}$] and aluminium sulphate [$Al_2(SO_4)_{3(aq)}$].

Theory

According to the reactivity series (or activity series) of metals, a more reactive metal displaces a less reactive metal from its aqueous salt solution.

Observation table

S.NO	Experiment	observation	Inference
1.	Add aluminium to : Aluminium sulphate Zinc sulphate Iron sulphate Copper sulphate		

2.	Add Zinc to : Aluminium sulphate Zinc sulphate Iron sulphate Copper sulphate		
3.	Add Iron to : Aluminium sulphate Zinc sulphate Iron sulphate Copper sulphate		
4.	Add Copper to : Aluminium sulphate Zinc sulphate Iron sulphate Copper sulphate		

Conclusion :

Precautions

1. All apparatus should be clean and dry.
2. Do not touch any chemical with bare hands.
3. Label the beakers, containing the four experimental salt solutions and place them in sequence. Keep the beakers covered to prevent anything from falling into them.
4. Use saturated solutions of copper sulphate, iron sulphate, zinc sulphate and aluminium sulphate for this experiment.

Experiment Number 5 :

AIM : To study the following properties of acetic acid (ethanoic acid):

- Odour
- Solubility in water
- Effect on litmus
- Reaction with sodium bicarbonate

Theory :

Properties of acetic acid-

1. Acidic character

2. When dissolved in water, acetic acid undergoes dissociation to form hydrogen (H^+) ion. Because of the release of a proton, acetic acid has an acidic character. It turns blue litmus paper red, indicating that it is acidic in nature. However, it is a weak acid because it does not dissociate completely in aqueous solution.

$$CH_3COOH \rightleftarrows CH_3COO^- + H^+$$

3. Reaction with sodium bicarbonate
4. Acetic acid reacts with sodium bicarbonate to produce carbon dioxide.

$$CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + CO_2(g) + H_2O(l)$$

On passing CO_2 gas through lime water, the lime water turns milky. The milky appearance of lime water is due to the formation of solid calcium carbonate ($CaCO_3$).

$$\underset{\text{Lime water}}{Ca(OH)_2(aq)} + CO_2(g) \rightarrow \underset{\text{Calcium carbonate}}{CaCO_3(s)} + H_2O(l)$$

Procedure:

Try the experiments below and observe the different properties of acetic acid in a real lab:

Experiment	Observation	Inference
Odour:Take a small amount of acetic acid in a test tube and detect its odour by wafting.	Pungent smell.	It has an irritating pungent smell.
Solubility in water: Take a small amount of water in a test tube and add a small amount of acetic acid to it and shake well.	A homogeneous solution is formed.	Acetic acid is soluble in water.
Effect on litmus:Take a small amount of acetic acid in a test tube and dip a strip of blue litmus paper in it.	Blue litmus turns red.	It is acidic in nature.
Reaction with sodium bicarbonate: Take a small quantity of sodium bicarbonate solution in a boiling tube. Cork the tube with a double bore cork and insert a thistle funnel into the tube. Then place a boiling tube containing lime water near the tube containing NaHCO3 solution. Insert one end of the delivery tube into the tube containing NaHCO3 solution and the other end into the tube containing lime water. Now, add acetic acid into NaHCO3 solution through the thistle funnel and observe the change in colour of the lime water.	A gas is evolved which turns lime water milky	The gas produced is carbon dioxide due to the action of CH3COOH on $NaHCO_3$, which turns lime water milky.

Precautions:

1. Never smell acetic acid directly.
2. Keep the mouth of the test tube away from you and your classmates' face.
3. Use the chemicals judiciously.