Grade 10 Chemistry Kerala 2023

Instruction:

- The first 15 minutes is cool-off time.
- You may use the time to read the questions and plan your answers.
- Answer only on the basis of instructions and questions given.
- Consider score and time while answering.

SECTION - A

Q1. The monomer of Polyvinyl Chloride is

Solution: Vinyl chloride is the monomer of polyvinyl chloride.

Q2. In an atom, four electrons are present in **p** subshell of its **M** shell. How is it represented? [$2p^4, 4p^4, 3p^4, 5p^4$]

Solution: M shell has subshells as $3s, 3p$ and $3d$.

As there are four electrons that are present in the p subshell it can be represented as $3p^4$.

Q3. Find the relation and fill up :

C_nH_{2n+2} : Alkane

C_nH_{2n-2} :

Solution:

The general formula C_nH_{2n-2} is of Alkyne.

Q4. Phenolphthalein is pink in colour in the solution of ammonia in water. This shows that ammonia is _____ in nature.

Solution:

Phenolphthalein is colorless in acidic solutions and red or pink in alkaline liquids.

Hence, ammonia is basic in nature.

Q5. Which is the electrolyte used in electroplating copper on an iron ring?

[$FeSO_4, AgNO_3, ZnSO_4, CuSO_4$]

Solution:

The solution of Copper sulphate ($CuSO_4$) is taken as an electrolyte to deposit a layer of copper metal on an iron object.

SECTION – B

Q6. Choose the suitable method in each of the processes from the bracket. [Liquation, Leaching, Froth Floatation, Distillation]

a. Concentration of sulphide ores

b. Refining metal with low boiling point

Solution:

a. Froth Floatation: The froth flotation process works on the principle that sulphide ores are selectively attracted to pine oil or eucalyptus oil, while gangue particles are attracted to water. Hence, the method used for the concentration of sulphide ores is froth flotation.

b. Distillation: The distillation process is employed to isolate components by utilising their varying boiling points, particularly for extracting metals that have low boiling points.

Q7. (a) How many GMM is present in 90 g water [H_2O] ?

(b) Find the number of molecules present in it.

[Hint: Molecular mass of water = 18]

Solution:

(a) Gram molecular mass(GMM) or Number of Mole present in 90 g of water =

$$\frac{\text{Mass of Water}}{\text{Molecular mass of Water}} = \frac{90}{18} = 5 \text{ moles}$$

(b) Number of molecules $= N_A \times$ Number of moles

$$= 6.02 \times 10^{23} \times 5 \text{ molecules}$$
$$= 30.1 \times 10^{23} \text{ molecules of } H_2O.$$

Q8. Ethanol is an alcohol which is extensively used for industrial purposes.

a) What is rectified spirit?

b) How does rectified spirit differ from absolute alcohol?

Solution:

a) Rectified spirit: Rectified spirit, also known as rectified alcohol, is highly concentrated ethanol that has been purified through repeated distillation to increase its alcohol content and remove impurities. It is concentrated on ethanol containing 95 percent of ethanol.

b) Rectified spirit is heated under reflux over quicklime for about 5 to 6 hours and then allowed to stand for 12 hours. On distillation, pure alcohol

($C_2H_5OH = 100\%$) is obtained. Rectified spirit contains a high concentration of alcohol, typically around 95% alcohol by volume. It is purified through repeated distillation to remove impurities.

Q9. Concentrated ores are converted into their oxides by two processes.

(a) Name of the process carried out in the presence of air is .

(b) Which process is used in the case of carbonate ore?

Solution:

(a) Roasting process is carried out in the presence of air.

Roasting: It is the process of heating the concentrated ore strongly in the presence of excess air. This process is used for converting sulphide ores to metal oxide.

$$2ZnS(s) + 3O_2 \rightarrow 2ZnO(s) + 2SO_2(g)$$

(b) In case of carbonate ores Calcination process is used. Calcination is the process of heating concentrated ore in the absence of air.

$$ZnCO_3(s) \rightarrow ZnO(s) + CO_2(g)$$

Q10. Concentrated sulphuric acid forms nitric acid on reaction with nitrates. The chemical equation of this reaction is given below.

$$NaNO_3 + H_2SO_4 \rightarrow NaHSO_4 + HNO_3$$

a) Which sodium salt is used to get hydrochloric acid [HCl] in the same manner?

b) Write down the chemical equation of this reaction.

Solution:

a) Sodium salt that is used to get hydrochloric acid [HCl] is Sodium Chloride.

b) Chemical equation for this reaction is,

$$NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$$

SECTION - C

Q11. Subshell electronic configurations of a few elements are given. One of them is a noble gas. [Symbols are not real]

P- $1s^2 2s^2 2p^6$

Q- $1s^2 2s^2 2p^5$

R- $1s^2 2s^2 2p^6 3s^2 3p^6 3d^2 4s^2$

S- $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

Answer the following questions.

(a) Which element has the highest Ionisation energy?

(b) Which element belongs to s-block?

(c) Which element shows variable oxidation state?

Solution:

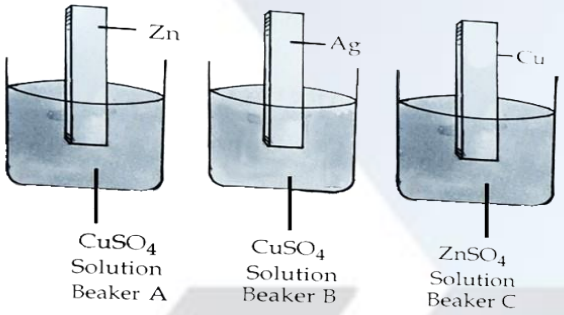
As per the electronic configuration given, the element *P* is Noble gas Neon (Ne), *Q* is Fluorine (F), *R* is Titanium (Ti), and *S* is Calcium (Ca).

(a) Element P i.e. Neon (Ne) has the highest ionisation energy.

(b) Element S i.e. Calcium (Ca) belongs to s-block.

(c) Element R i.e. Titanium (Ti) shows variable oxidation state.

Q12.



a) In which beaker does displacement reaction take place? Give reason.[1 mark]

b) Write down the chemical equation of the oxidation reaction taking place in this beaker.

[Hint: Order of reactivity Zn > Cu > Ag]

Solution:

a) As the reactivity of Zn is more than Cu the reaction will take place in Beaker A.

b) The chemical equation of the oxidation reaction taking place in this beaker is-

$$Zn \rightarrow Zn^{2+} + 2e^{-1}$$

Q13. Chemical equations of the reactions taking place in blast furnace during the industrial production of iron are given below.

(i) $C + O_2 \rightarrow CO_2 + Heat$

(ii) $CO_2 + C + Heat \rightarrow 2CO$

(iii) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

(iv) $CaCO_3 \rightarrow CaO + CO_2$

(v) $CaO + SiO_2 \rightarrow CaSiO_3$

Answer the following questions.

(a) Which compounds act as the reducing agent?

(b) What is the function of CaO in the production of iron?

(c) Which is the slag formed here?

Solution:

(a) In the above given reactions, C (carbon) and CO (carbon monoxide) acts as a reducing agents.

(b) In the production of iron the Calcium oxide (CaO) combines with silica (SiO_2) to form the products as calcium silicate (slag).

(c) Calcium silicate ($CaSiO_3$) is the slag that is formed in the reaction.

Q14. The structural formula of an organic compound is given.

$CH_3 - CH_2 - CH = CH_2$

a) Write down the IUPAC name of this compound.

b) What is its molecular formula?

c) What is the molecular formula of the adjacent homologue coming after it?

Solution:

a) The IUPAC name of the compound $CH_3 - CH_2 - CH = CH_2$ is But-1- ene.

b) Its molecular formula of the compound $CH_3 - CH_2 - CH = CH_2$ is C_4H_8.

c) The adjacent homologue coming after C_4H_8 is C_5H_{10}.

Q15. Complete the tables using names of reactions given in the box.

Polymerisation
Combustion
Addition reaction
Substitution reaction
Thermal Cracking

Chemical equation	Name of reaction
$CH_3 - CH = CH_2 + H_2 \rightarrow CH_3 - CH_3 - CH_3$	… … … …
$CH_3 - CH_3 - Cl_2 \rightarrow CH_3 - CH_2 - Cl + HCl$	… … … ….
$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$	… … … …

Solution:

Addition reaction: It is the formation of a new substance by a union of two or more than two substances

Substitution reaction: In this type of reaction an atom or group of atoms in a molecule is substituted or replaced by different atoms or groups of atoms.

Combustion reaction: A combustion reaction is a type of reaction in which a substance burns or gets oxidised in the presence of air or oxygen.

Chemical equation	Name of reaction
$CH_3 - CH = CH_2 + H_2 \rightarrow CH_3 - CH_3 - CH_3$	Addition reaction
$CH_3 - CH_3 + Cl_2 \rightarrow CH_3 - CH_2 - Cl + HCl$	Substitution reaction
$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$	Combustion

SECTION - D

Q16. The atomic number of element X is 8 .

(a) Write the subshell electronic configuration of X.

(b) Find its group number and period number.

(c) Write the chemical formula of the compound formed when element X reacts with Aluminium Al.

[Hint: Valency of AI = 3]

Solution:

a) As per the atomic number given as 8, the element X is oxygen. Its subshell electronic configuration will be $1s^2, 2s^2, 2p^4$.

b) As per the atomic number given as 8, its group number and period number will be 16 and 2 respectively.

c) When element X reacts with Aluminium (Al) the molecular formula is,

$$4Al + 3O_2 \rightarrow 2Al_2O_3$$

So, the compound formed is Aluminium oxide (Al_2O_3)

Q17. The data given in the table shows the relation between the volume and temperature of a definite mass of gas. [Pressure is kept constant]

Volume (v)	Temperature (T)	$\frac{V}{T}$
600 mL	300 K	(x)
800 mL	(y)	2

(a) Find ' x and ' y.

(b) Which gas law is applied here?

(c) An inflated balloon is kept in Sunlight, it will burst. Give reason.

Solution:

(a) Relation between the volume and temperature of a definite mass of gas represent Charles' law i.e. the volume of an ideal gas is directly proportional to the absolute temperature at constant pressure.

$V \propto T$

$V = kT$ or $\frac{V}{T} = \text{Constant}$

$\frac{600}{300} = 2$

i.e. $x = 2$

Also, $\frac{V}{T} = \text{Constant}$

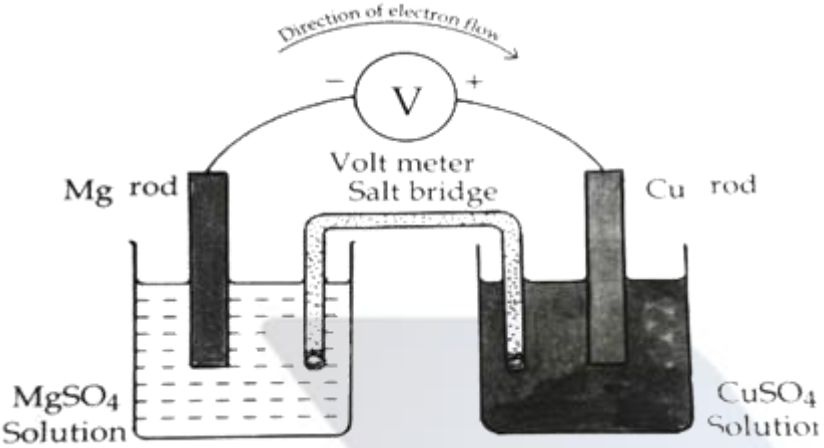
$\frac{800}{y} = 2$

i.e. $y = 400$ K

(b) As per the given data, it represents Charles law.

(c) The primary reason a balloon would burst when placed in sunlight is due to the increase in temperature caused by the sunlight. As the balloon absorbs the sunlight, the air inside the balloon heats up and expands. If the balloon is not able to stretch enough to accommodate the expanding air, the pressure inside the balloon will increase and eventually cause it to burst.

Q18. The given diagram represents a galvanic cell.



[Hint: Order of reactivity: Mg > Cu]

(a) What is the energy change taking place in galvanic cells?

(b) At which electrode does oxidation takes place in galvanic cells?

(c) Identify the cathode in the given cell.

(d) Write down the chemical equation of the reaction taking place at the cathode in the given cell.

Solution:

(a) The galvanic cells converts the chemical energy of a spontaneous redox reaction to electrical energy.

(b) In the given set of galvanic cell, the oxidation occurs at the anode.

(c) In the given cell, Cu rod is made cathode in the Galvanic cell.

(d) Chemical equation of the reaction taking place,

At cathode:

$Cu^{2+} + 2e^{-} \rightarrow Cu$

At anode:

$Mg \rightarrow Mg^{2+} + 2e^{-}$

Q19. A reversible reaction at equilibrium is given

$2NO_{(g)} + O_{2(g)} \rightleftharpoons 2NO_{2(g)} + Heat$

Answer the following

(a) How does increase in temperature influence the amount of product formed?

(b) What change is to be made in pressure to get more product?

(c) How does increase in concentration of oxygen influence the rate of forward reaction?

(d) What is the function of a catalyst in reversible reactions?

Solution:

(a) As the temperature rises in the exothermic reversible reaction, the equilibrium moves towards the reverse direction. (In exothermic reactions, higher temperatures lead to a decrease in product formation, while lower temperatures result in increased product formation. In endothermic reactions, higher temperatures lead to increased product formation, whereas lower temperatures lead to decreased product formation.)

(b) In the provided reaction, the decrease in the number of moles on the product side indicates that increasing pressure will cause the equilibrium to shift towards the forward direction. (An increase in pressure will cause the equilibrium to shift towards the side of the reaction with fewer moles of gas.)

(c) With an increase in the concentration of oxygen, the production of NO_2 will rise, resulting in the reaction shifting towards the forward direction. (An increase in the concentration of a reactant promotes the forward reaction.)

(d) A catalyst can accelerate or slow down the achievement of equilibrium, but it will not disrupt the equilibrium concentrations.

Q20. Examine the organic compounds given below.

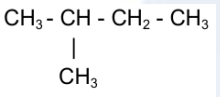
I. $CH_3 - CH_2 - CH_2 - CH_2 - CH_3$

II. $CH_3 - CH_2 - CH_2 - OH$

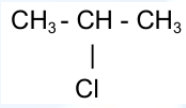
III. $CH_3 - CH_2 - CH_2 - Cl$

IV. $CH_3 - CH_2 - O - CH_3$

V.



VI.



(a) Identify the isomeric pairs.

(b) Which is the functional isomer pair?

Solution:

(a) Compounds with identical molecular formulas but distinct physical and chemical properties are termed isomers, and this phenomenon is referred to as isomerism.

(I, V), (II, IV), and (III, VI) are isomeric pairs.

(b) (II, IV) are functional isomeric pairs where II is Alcohol and IV is the Ether group.