Grade 10 Kerala Chemistry 2021

Instructions:

- **20** minutes is given as cool-off time.
- Use cool-off time to read the questions and plan your answers.
- Attempt the questions according to the instructions.
- Keep in mind the score and time while answering the questions.
- The maximum score for questions from 1 to 32 will be 40.

Each question from 1 to 8 carries 1 score.

Q1. What is the maximum number of electrons that can be electrons that can be accommodated in 'f' subshell?
(2,6,10,14)

Solution:

Maximum of 14 electrons can be accommodated in 'f' subshell.

Q2. Identify the alkene among the given hydrocarbons.
($C_2H_6, C_2H_4, C_2H_2, CH_4$)

Solution:

C_2H_4 is the alkene.

Q3. Metals like gold, platinum are found in the native state in the earth's crust. Why?

Solution:

The metals like gold and platinum are less reactive. So, they do not form compounds and found in the native state i.e. noble state.

Q4. One gram atomic mass (1 GAM) of any element contains _____ atoms.

Solution:

One gram atomic mass (1 GAM) of any element contains 6.023×10^{13} atoms.

Q5. Select the monomer of natural rubber.
[Vinyl Chloride, Ethene, Isoprene, Tetrafluoro ethene]

Solution:

Isoprene is the monomer of natural rubber.

Q6. Which is the drying agent used to remove moisture present in ammonia gas?

Solution:

Quick Lime (Calcium Oxide) is the drying agent used to remove moisture present in ammonia gas.

Q7. Which is the electrolyte used to electroplate silver on an iron bangle?

Solution:

$Na[Ag(CN)_2]$ electrolyte is used to electroplate silver on an iron bangle

Q8. What is the energy change that takes place in galvanic cell?.

Solution:

Chemical Energy is converted to Electrical Energy in galvanic cell.

Each question from 9 to 16 carries 2 scores.

Q9. (a) When molten Sodium Chloride is electrolysed, which is the gas liberated at the anode?
(b) Write the chemical equation of the reaction taking place at the cathode.

Solution:

a. Chlorine gas is liberated.

b. Chemical equation for the reaction taking place at cathode -

$Na^+ + e^- \rightarrow Na$

Q10. (a) From the given subshell electronic configuration, write the correct electronic configuration of Chromium ($_{24}Cr$).
(i) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^4 4s^2$
(ii) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$
(b) What is the reason of this selection?

Solution:

(a) The correct electronic configuration is (ii) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$.
(b) Half-filled orbitals are more stable than incompletely filled ones hence, the last orbital electronic configuration is $3d^5 4s^1$.

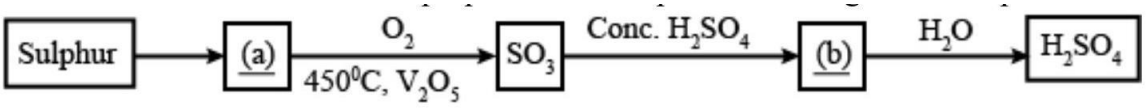
Q11. Given below are two chemical equations.
(a) $CH_2 = CH_2 + H_2 \rightarrow A$
(b) $A + Cl_2 \xrightarrow{\text{sunlight}} B + HCl$

Identify the compounds A and B.

Solution:

a. Compound A: $CH_3 - CH_3$ (Ethane)
b. Compound B: $CH_3 - CH_2Cl$ (Chloroethane)

Q12. The flow chart of the industrial preparation of sulphuric acid is given. Complete it.



Solution:

Compound (a) is SO_2 (Sulphur dioxide).
Compound (b) is $H_2S_2O_7$ (Oleum).

Q13. Some metals are given in the box.

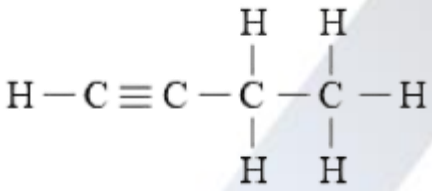
Fe	Mg	Cu	Pb	Zn

(a) Which metal among these react vigorously with dilute HCl ?
(b) Which gas is liberated by this reaction?

Solution:

a. Mg metals reacts vigorously among all given metals with dilute HCl.
b. Hydrogen (H_2) gas is liberated by this reaction.

Q14. The structure are given in the box.



(a) What is the molecular formula of this compound?
(b) Write the IUPAC name.

Solution:

a. The molecular formula of the given compound is C_4H_6.

b. IUPAC name is but-1-yne.

Q15. Two methods are used to convert concentrated ore into this oxide.
(a) Calcination
(b) Roasting

What is the difference between these?

Solution:
a. During Calcination, heating is conducted in the presence of air using carbonate ores, while in roasting, heating takes place in the absence of air using sulfide ores.

Q16. CH_4, C_2H_6, C_3H_6 and C_4H_{10} are the members of a homologous series.
(a) What is the molecular formula of the 6^{th} member of this series?
(b) Write the general formula of this homologous series.

Solution:

a. The molecular formula of the 6^{th} member of this series is C_6H_{14}.
b. the general formula of this homologous series is C_nH_{2n+2}.

Each question from 17 to 24 carries 3 scores.

Q17. The chemical formulae of two different chlorides of iron (Fe) are given below.
(i) Ferrous Chloride - $FeCl_2$
(ii) Ferric Chloride $-FeCl_3$
[Hint : Oxidation State of chlorine atom (Cl) $= -1$, Atomic Number of iron (Fe) $= 26$]
(a) In which compounds iron (Fe) Shows +2 Oxidation state?
(b) Write the Subshell electronic configuration of Fe^{3+}
(c) Why does iron show different oxidation states?

Solution:

a. In Ferrous Chloride - $FeCl_2$, the iron shows +2 oxidation state.
b. Electronic configuration is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5$.
c. The outermost electrons reside in both the 3d and 4s orbitals, and they have comparable energies with the least difference. So, these elements show variable valency because of their valence electrons in two different sets of orbitals, that is (n − 1)d and ns.

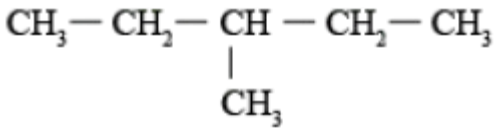
Q18. Different methods are used for the concentration of ores.
(i) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$
(ii) $CaCO_3 \rightarrow CaO + CO_2$
(iii) $CaO + SiO_2 \rightarrow CaSiO_3$

(a) What is the chemical formula of haematite?
(b) Which compound reduces haematite?
(c) Identify the flux used here.

Solution:

a. The chemical formula of haematite is Fe_2O_3.
b. CO - Carbon monoxide reduces haematite.
c. The flux used in this reaction is CaO.

Q19. The structural formula of a hydrocarbon is given.



(a) How many carbon atoms are there in the main chain?
(b) What is the position number of the branch?
(c) Write the IUPAC name of this compound.

Solution:

a. 5 carbon atoms are there in the main chain.
b. 3 is the position number of the branch.
c. The IUPAC name of this compound is 3-methylpentane.

Q20. Some metals and their refining methods are given. Find the appropriate pair.

Metal	Refining Method
Tin	Distillation
Copper	Liquation
Zinc	Electrolytic Refining

Solution:

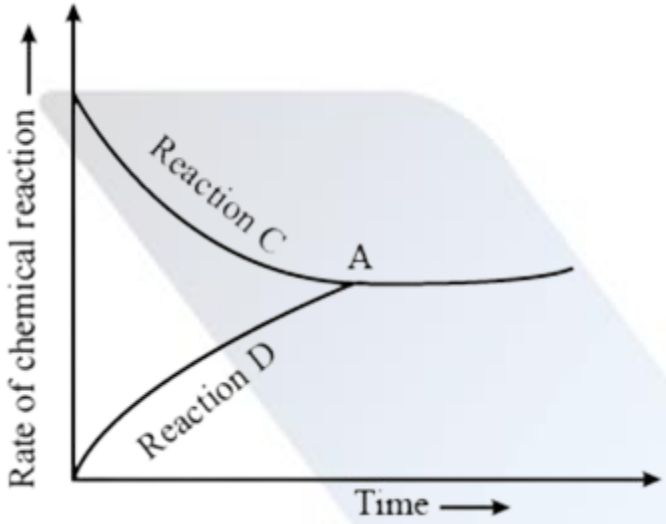
Metals and their refining methods-
Tin - Liquidation
Copper - Electrolytic refining
Zinc - Distillation

Q21. Outermost Subshell electronic configuration of two elements X and Y are given. $X = 3s^2, Y = 3s^2 3p^5$
(Symbols are not real)
(a) What is the valency of the element X? 1
(b) Which element shows metallic character?
(c) Write the chemical formula of the compound formed by the combination of X and Y.

Solution:

a. The valency of the element X is 2.
b. X element shows metallic character.
c. the chemical formula of the compound is XY_2.

Q22. The graph for the reversible reaction $N_2(g) + 3H_2(g) \leftrightarrow 2NH_3(g)$ + Heat is given below.



(a) Identify and write the chemical equation associated with 'Reaction C' and 'Reaction D. 2
(b) What is the peculiarity of point A?

Solution:

Reaction C: $N_2 + 3H_2 \rightarrow 2NH_3$ - Forward reaction

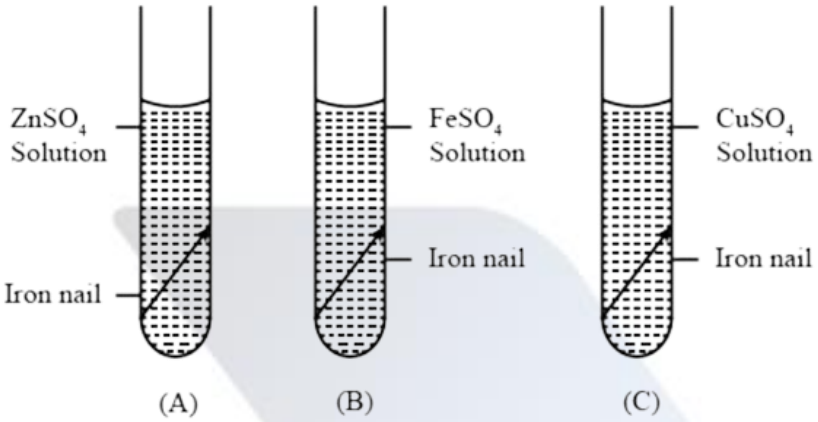
Reaction D: $2NH_3 \rightarrow N_2 + 3H_2$ - Backward reaction
Point *A* is equilibrium point where the rate of forward reaction and backward reaction becomes equal.

Q23. The CO_2 gas kept at STP has volume 112 L
[Hint: Molecular mass - 44]
(a) Find the number of moles of CO_2.
(b) Calculate the mass of 112 L CO_2.
(c) How many molecules of CO_2 are present in it?

Solution:

a. The number of moles of $CO_2 \rightarrow 112/22.4 = 5$ moles
b. The mass of 112 L $CO_2 \rightarrow 5 \times 44 = 220$ g
c. $5 \times 6.023 \times 10^{23}$ molecules of CO_2 are present.

Q24. Analyze the figure and answer the following questions.



(a) In which test tube the iron nail undergoes a color change?
(b) Write the name of the reaction taking place here.
(c) Write the chemical equation of this reaction.

Solution:

a. Iron nail in $CuSO_4$ (Copper sulfate) solution undergoes colour change.
b. Displacement reaction is taking place in the given reaction.
c. Chemical equation for this reaction is-

$$Fe + CuSO_4 \rightarrow FeSO_4 + Cu$$

Q25. The Subshell electronic configuration of an element is given. $1s^2 2s^2 2p^6 3s^2$
(a) Write the atomic number of this element.
(b) To which block this element belongs?
(c) Identify the period number and group number of this element.

Solution:

a. The atomic number of this element 12
b. This element belongs to s block.
c. Period number of this element is 3.

Group number of this element is 2.

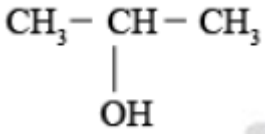
Q26. The structural formulae of two organic compounds are given.
(i) $CH_3 - O - CH_2 - CH_3$
(ii) $CH_3 - CH_2 - CH_2 - OH$
(a) Write the IUPAC name of the first compound.
(b) These two organic compounds are isomers. Why?
(c) Which type of isomerism is exhibited by them?
(d) Write the structural formula of the position isomer of the second compound.

Solution:

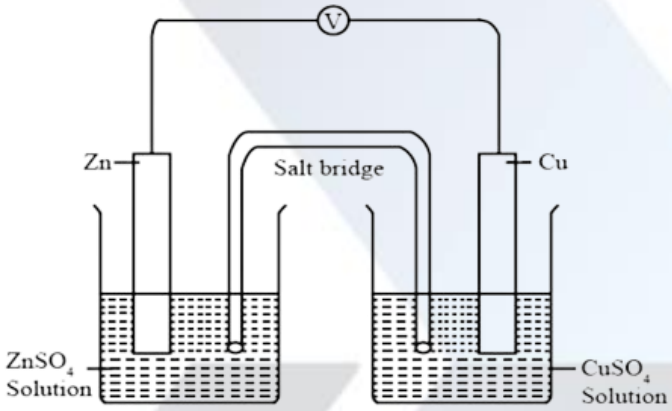
a. Methoxyethane is the IUPAC name of the $CH_3 - O - CH_2 - CH_3$.
b. These two organic compounds are isomers because they have same molecular formula

but different functional groups.
c. Functional isomerism is exhibited by these compounds.

d.



Q27. The figure of a galvanic cell is given.



[Hint: Zinc is more reactive than Copper]
(a) Identify anode and cathode.
(b) What will be the direction of flow of electrons?
(c) Write the chemical equation of the reaction taking place at anode.

Solution:

a. Anode is Zinc (Zn).

Cathode is Copper (Cu).
b. The direction of flow of electrons is from Zinc → Copper (From Anode to Cathode) and this happens through the external circuit.
c. Chemical equation is $Zn \rightarrow Zn^{2+} + 2e^{-}$(Oxidation).

Q28. The chemical equation of the industrial preparation of ammonia is given below.
$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) + \text{Heat}$
How does the following factors influence the rate of forward reaction?
(a) Ammonia is removed from the system.
(b) Temperature is increased.
(c) Pressure is increased.
(d) More nitrogen is added.

Solution:

a. Increases rate of forward reaction.
b. Decreases rate of forward reaction.
c. Increases rate of forward reaction.
d. Increases rate of forward reaction.

Q29. Identify the suitable concentration method from the box and then complete the table.

Leaching, Froth floatation, Magnetic Separation, Levigation.

Properties	Properties of the impurities Present in the ore	The method of Concentration
High density	Low density	(a)
Magnetic in nature	Non-magnetic in nature	(b)
Lighter Sulfide ores	High density	(c)
Aluminum ores that get dissolved in solution	Insoluble in the same solution	(d)

Solution:

(a) Levigation
(b) Magnetic separation
(c) Froth flotation
(d) Leaching

Q30. (a) What happens to the size of air bubble rising from the bottom of an aquarium? What is the reason?
(b) Which gas law is associated with this phenomenon?
(c) State this law.

Solution:

(a) As the water pressure decreases as bubbles rise, the size of the air bubbles coming from the bottom of an aquarium increases with their upward movement.
(b) Boyle's law is associated with this phenomenon.

(c) At a constant temperature, volume of a definite mass of a gas is inversely proportional to its pressure increases.

Q31. From the given statement, write the statements applicable for gasses.
(i) Energy of molecules is very high.
(ii) Attractive force between molecules is very high.
(iii) Distance between molecules is very large.
(iv) Freedom of movement of molecules is very less.
(v) As the collision of molecules are perfectly elastic in nature, there is no loss of energy.
(vi) When compared to total volume, the real volume of molecules is very less.

Solution:

(i) Energy of molecules is very high is gases.
(iii) Distance between molecules is very high in gases.
(v) In gases, as the collisions of molecules are perfectly elastic in nature, there is no loss of energy.
(vi) When compared to the total volume, the real volume of molecules is very less.

Q32. Find out the appropriate reactions and match the column A, B and C suitably.

Reactants (A)	Products (B)	Name of Reaction (C)
$CH_3 - CH_3 + Cl_2$	$CO_2 + H_2O$	Thermal cracking
$C_2H_6 + O_2$	$[CH_2 - CH_2]_n$	Substitution reaction
$nCH_2 = CH_2$	$CH_2 = CH_2 + CH_4$	Combustion
$CH_3 - CH_2 - CH_3$	$CH_3 - CH_2Cl + HCl$	Polymerisation

Solution:

Reactants (A)	Products (B)	Name of Reaction (C)
$CH_3 - CH_3 + Cl_2$	$CH_3 + CH_2Cl + HCl$	Substitution reaction
$C_2H_6 + O_2$	$CO_2 + H_2O$	Combustion
$nCH_2 = CH_2$	$[CH_2 - CH_2]_n$	Polymerisation
$CH_3 - CH_2 - CH_3$	$CH_2 = CH_2 + CH_4$	Thermal cracking