Grade 10 Chemistry Kerala 2022

Instructions:

- There is a 'cool-off time' of 15 minutes in addition to the writing time. Use this time to get familiar with questions and to plan your answers.
- Questions with different scores are given as distinct parts.
- Read the instructions carefully before answering the questions.
- Keep in mind, the score and time while answering the questions.
- The maximum score for questions from 1 to 24 will be 40.

Part - I

A. Answer any 4 questions from 1 to 6. Each question carries 1 score. $4 \times 1 = 4$

Q1. Identify the compound which contains a carbon-carbon triple bond.

Solution:

C_2H_2 (Ethylene) contains a carbon-carbon triple bond. $HC \equiv CH$

Q2. Which one of the following subshells has the highest energy? (1s, 3d, 4s, 3p)

Solution:

3d subshell has the highest energy.

Q3. Find the relation and fill up suitably. Magnetic separation : ____ : Bauxite : ____

Solution:

Magnetic separation: Iron ore : Bauxite : Aluminum ore.

Q4. Which gas is produced when metals react with dilute hydrochloric acid?

Solution:

Hydrogen gas (H_2) is produced.

Q5. 1 GMM of a substance contains how many molecules?

Solution:

1 GMM (Grammatical Molecular Mass) of a substance contains 6.022×10^{23} molecules (Avogadro's number).

Q6. What happens to the rates of forward and backward reaction at equilibrium point?

Solution:

At equilibrium, the rates of forward and backward reactions are equal.

B. Answer all questions from 7 to 9. Each question carries 1 score. $3 \times 1 = 3$

Q7. Which metal is deposited at cathode when molten sodium chloride is electrolyzed?

Solution:

Sodium is deposited at the cathode.

Q8. How many electrons are donated by first group elements generally in chemical reactions?

Solution:

1 electron is donated by first group elements generally in chemical reactions.

Q9. In which electrode is aluminium metal produced during the electrolysis of Alumina?

Solution:

Aluminium is produced at the cathode.

Part - II

A. Answer the following question. $1 \times 2 = 2$

Q10. (a) Which are the two compounds formed when Ammonium Chloride (NH_4Cl) is strongly heated?

(b) Write the chemical equation for this reaction.

Solution:

(a) The two compounds are Ammonia (NH_3) and Hydrogen Chloride (HCl).

(b) Chemical Equation: $NH_4Cl_{(s)} \rightarrow NH_3(g) + HCl_{(g)}$.

B. Answer anyone question from 11 and 12 **$1 \times 2 = 2$**

Q11. Question: Find the mass of 44.8 L of NH_3 kept at STP. (Hint: Atomic mass N= 14, H = 1)

Solution:

Mass of NH_3 = 44.8 L × (1 mole/22.4 L) × (17 g/mol) = 34 g.

Q12. (a) What is electroplating?

Solution:

Electroplating is a process that uses electric current to reduce dissolved metal cations so that they form a solid metal coating on an electrode.

(b) Which is the electrolyte used in electroplating of copper on an iron bangle?

Solution:

Copper sulfate solution ($CuSO_4$).

Part - III

A. Answer any three questions from 13 to 16. **$3 \times 3 = 9$**

Q13. (a) Atomic number of an element is 17. Write its subshell electronic configuration.

Solution:

The electronic configuration is $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$.

(b) Find the group number and period number of this element in the periodic table.

Solution:

Group number: 17 (Halogens), Period number: 3.

Q14. (a) Molten iron obtained from the blast furnace contains 4% carbon and other impurities. What is this known as?

Solution:

This is known as cast iron.

(b) Which alloy steel is used for making permanent magnets?

Solution:

Alnico (Aluminium-Nickel-Cobalt) alloy.

(c) Some alloy steels contain the same component. Then how do they possess different properties?

Solution:

They possess different properties due to variations in composition, processing, and heat treatment.

Q15. $N_2(g) + 3H_2(g) = 2NH_3(g) + Heat$.

How do the following changes influence the amount of the product?

(a) Temperature decreases.

Solution:

The amount of NH_3 increases.

(b) Pressure increases.

Solution:

The amount of NH_3 increases.

(c) Ammonia produced is removed continuously from the system.

Solution:

The amount of NH_3 increases.

Q16. (X) $CH_4 + 2O_2 \rightarrow \_\_\_\_ + 2H_2O + Heat$

(Y) $nCF_2 = CF_2 \rightarrow \{CF_2 - CF_2\}_n$

Teflon

(a) Complete the chemical equation for X.

Solution:

X = CH_4 (Methane).

(c) Name the reaction Y.

Solution:

Combustion reaction.

(d) Write any one use of Teflon.

Solution:

Teflon is used as a non-stick coating for cookware.

B. Answer the following questions. **$1 \times 3 = 3$**

Q17. (i) CH_3-CH_2-CH_2-CH_3

(ii) CH_3-CH_2-CH_2-CH_2-OH

(iii) CH_3-CH_2-O-CH_2-CH_3

(iv) CH_3-CH_2-CH_3

(a) Identify the isomer pair in the given compounds.

Solution:

(i) and (iv) are structural isomers.

(b) Name the isomerism.

Solution:

Chain isomerism.

(c) How many isomers are possible for compound (i)?

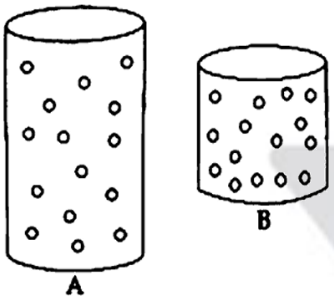
Solution:

2 isomers (n-butane and isobutane).

Part IV

A. Answer any 2 questions from 18 to 20. **$2 \times 4 = 8$**

Q18.



A and B represent two gas cylinders. The gas in cylinder A is completely transferred to cylinder B, keeping the temperature constant.

(a) Compare the gas pressure in cylinder A and cylinder B.

Solution:

If the volume of cylinder B is greater than that of cylinder A, the pressure in cylinder A will be higher than in cylinder B after the transfer. If the volumes are equal, the pressure will be the same.

(b) Which gas law is related to this?

Solution:

This scenario relates to Boyle's Law, which states that the pressure of a gas is inversely proportional to its volume when temperature is constant.

(c) 10 L of a gas is kept in a cylinder at 2 atm pressure. Keeping the temperature constant, the gas is completely transferred to a 20 L cylinder. What is the new pressure of the gas?

Solution:

According to Boyle's Law ($P_1V_1 = P_2V_2$), $P_2 = P_1V_1 / V_2 = 2$ atm $\times$ 10 L / 20 L = 1 atm. Thus, the new pressure of the gas is 1 atm.

Q19. Haematite is converted into iron by reactions taking place in the blast furnace.

(a) Write the molecular formula of Haematite.

Solution:

The molecular formula of Haematite is Fe_2O_3.

(b) Which substance acts as the reducing agent in this process?

Solution:

Carbon (in the form of coke) acts as the reducing agent in the blast furnace process.

(c) Molten iron is produced along with slag from the furnace. What is meant by slag?

Solution:

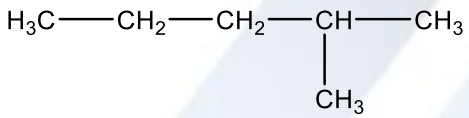
Slag is a byproduct of the metallurgical process, mainly composed of metal oxides and impurities that are removed during the smelting process.

(d) Write the chemical equation that shows the formation of slag.

Solution:

A common reaction that produces slag is: $FeO + SiO_2 \rightarrow FeSiO_3$ (this represents the formation of a typical slag).

Q20.



(a) How many carbon atoms are there in the longest chain of this hydrocarbon?

Solution:

There are 5 carbon atoms in the longest chain.

(b) Give the name of the branch.

Solution:

The branch is a methyl group ($-CH_3$).

(c) What is the position number of the branch?

Solution:

The position number of the branch is 3 (counting from the end of the longest chain closest to the branch).

(d) Write the IUPAC name of the compound.

Solution:

The IUPAC name of the compound is 3-methylpentane.

Q21. (a) The industrial preparation of sulphuric acid is known as _____

Solution:

The industrial preparation of sulphuric acid is known as Contact Process.

(b) Which is the catalyst used in this process?

Solution:

Vanadium(V) oxide (V_2O_5) is used as a catalyst in the Contact Process.

(c) Take some sugar in a watch glass and add a few drops of concentrated sulphuric acid into it. What is your observation? Which chemical property of sulphuric acid is shown here?

Solution:

Upon adding concentrated sulphuric acid, sugar will undergo dehydration, turning black and forming a carbonaceous mass. This demonstrates the dehydrating property of concentrated sulphuric acid.

Q22. Choose the compounds from the box and answer the following questions. Compounds:

CH_3COOH, $CH_3-COO-CH_2-CH_3$, CH_3-CH_2-OH, $C_{12}H_{22}O_{11}$

(a) Which is a Carboxylic acid?

Solution:

CH_3COOH (Acetic acid) is a carboxylic acid.

(b) Which compound is an ester?

Solution:

CH_3-COO-CH_2-CH_3 (Ethyl acetate) is an ester.

(c) Identify ethanol.

Solution:

CH_3-CH_2-OH is ethanol.

(d) Which substance is used in the industrial preparation of ethanol?

Solution:

Ethylene (ethene) or fermentation of sugars can be used for the industrial preparation of ethanol.

SECTION-D

A. Answer any 1 questions from 23 and 24. $1 \times 5 = 5$

Q23. Atomic number of Manganese (Mn) is 25.

(a) Write the subshell electronic configuration of Mn.

Solution:

The subshell electronic configuration of Manganese (Mn) is [Ar] $4s^2$ $3d^5$.

(b) Find the block of Mn in the periodic table.

Solution:

Manganese is in the d-block of the periodic table.

(c) Which category of elements does Mn belong?

Solution:

Manganese belongs to the category of transition elements.

(d) What is the oxidation number of Mn in MnO_2? (Oxidation number of oxygen is -2)

Solution:

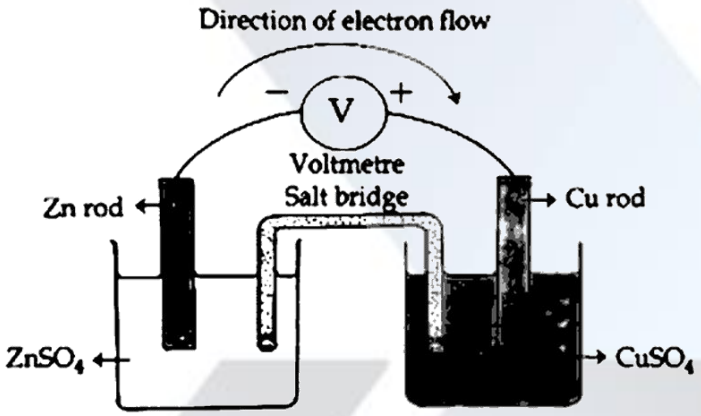
In MnO_2, the oxidation number of Mn is +4.

(e) Write the subshell electronic configuration of Mn^{2+}.

Solution:

The subshell electronic configuration of Mn^{2+} is [Ar] $4s^2$ $3d^5$ → [Ar] $3d^5$ (removing two electrons from the 4s subshell).

Q24. A picture of a galvanic cell is given below:



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

Solution:

In a galvanic cell, chemical energy is converted into electrical energy.

(b) Identify the anode in the given cell.

Solution:

The anode in the given galvanic cell is the Zn rod.

Write the chemical equation of the reaction taking place at the anode.

Solution:

The reaction taking place at the anode is: $Zn \rightarrow Zn^{2+} + 2e^-$.

(c) In which electrode does oxidation take place?

Solution:

Oxidation takes place at the anode.

(d) Write the chemical equation of the redox reaction in the cell.

Solution:

The overall redox reaction in the cell is: $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$.