Estd. 1861

BOYS' HIGH SCHOOL AND COLLEGE
PRELIMINARY EXAMINATION (2024-25)
CLASS – X
CHEMISTRY (SCIENCE PAPER-2)

(Two hours)

Section A is compulsory. Attempt **any four** questions from Section II. The intended marks for questions or parts of questions are given in brackets [ ].

Section A (40 marks)
Attempt **all** questions from this section

Question 1

Choose **one** correct answer to the questions given from the given options: [15]

(i) Saturated hydrocarbons undergo:
(a) Redox reaction
(b) Addition reaction
(c) Oxidation reaction
(d) Substitution reaction

(ii) Atomic size decreases from left to right in a given period. But, in the 2nd period the atomic size of Neon is more than that of the previous element Fluorine because:
(a) it has unstable electronic configuration
(b) it easily loses electrons
(c) the outermost orbit is completely filled
(d) it easily accepts electrons

(iii) A metal which is a constituent of the alloy Duralumin:
(a) Tin
(b) Lead
(c) Iron
(d) Aluminium

(iv) The metal hydroxide which is amphoteric in nature:
(a) Lead hydroxide
(b) Zinc hydroxide
(c) Neither (a) nor (b)
(d) Both (a) and (b)

(v) Acetic acid reacts with ethyl alcohol to produce a fruity smell due to the formation of:
(a) an alkane
(b) an aldehyde
(c) an ether
(d) an ester

(vi) Concentrated sulphuric acid is a good dehydrating agent. It dehydrates ethanol to produce:
(a) carbon dioxide
(b) acetylene
(c) ammonia
(d) ethylene

(vii) The conversion of sulphur to sulphuric acid by nitric acid indicates the following property of nitric acid:
(a) Reducing
(b) Redox
(c) Dehydrating
(d) Oxidizing

(viii) Electron affinity is least in:
(a) Sodium
(b) Silicon
(c) Nitrogen
(d) Chlorine

(ix) Na_3AlF_6 used in the electrolytic reduction of alumina is the formula of:
(a) Alumina
(b) Fluorspar
(c) Cryolite
(d) Bauxite

(x) Ammonia reduces a black coloured metal oxide to a reddish-brown coloured metal
The metal in the metal oxide may be:
(a) Lead
(b) Tin
(c) Copper
(d) Zinc

(xi) Lime water turns milky due to the evolution of a gas from a salt treated with dilute sulphuric acid. The anion in the salt may be:
(a) NO_3^-
(b) SO_3^-
(c) CO_3
(d) Both (b) and (c)

(xii) HCl gas is collected by upward displacement of air because:

(a) it is heavier that air
(b) it is highly soluble in water
(c) it is lighter than air
(d) Both (a) and (b)

(xiii) Which of the following would occupy 22.4 litres at S.T.P.?
(a) 2 moles of oxygen gas
(b) 2 grams of hydrogen gas
(c) 56 grams of nitrogen gas
(d) 12.044×10^{23} molecules of ammonia gas

(xiv) Which of the following is true for a hydronium ion?
1. It has one lone pair of electrons.
2. It has one coordinate bond.
3. It has two shared pairs of electrons.

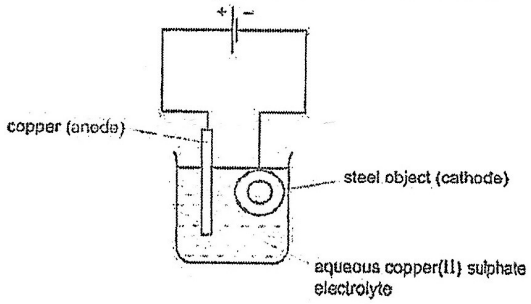
(a) 1 & 2
(b) 1 & 3
(c) 2 & 3
(d) 1, 2 & 3

(xv) The acid that converts glucose to sugar charcoal is:
(a) conc. sulphuric acid
(b) conc. hydrochloric acid
(c) conc. acetic acid
(d) conc. nitric acid

Question 2

(i) Electroplating steel objects with silver involves a three-step process. [5]
Step 1: A coating of copper is applied to the object.
Step 2: A coating of nickel is applied to the object.
Step 3: The coating of silver is applied to the object.

A diagram of the apparatus used for step 1 is shown below. Answer the questions that follow:



(a) Explain why the concentration of copper ions in the electrolyte remains constant throughout step 1.
(b) Write the reaction at the cathode for step 2.
(c) Name the electrolyte used for step 3.
(d) What is the observation at the anode in the process of electroplating?
(e) Mention one condition needed for the smooth coating of metal on the article.

(ii) Complete the following by choosing the correct answers from the bracket: [5]
(a) _____ (Pyridine/Water) is added to ethanol to denature it.
(b) The element with the smallest atomic size will be present at the _____ (beginning/end) of a period in the periodic table.
(c) A dirty green precipitate is formed when ammonium hydroxide solution is added to a solution of_____ (ferric chloride/ferrous sulphate).
(d) But-1-yne and But-2-yne are_____ (chain/position) isomers.
(e) The fragment of an alkane molecule from which one atom of_____ (carbon/hydrogen) is removed from its straight chain is called an alkyl group.

(iii) State the term/Identify the following: [5]
(a) A salt formed by partial neutralization of a dibasic acid by a base.
(b) An electrode that takes part in the electrolytic reaction.
(c) A hydrocarbon that is used for artificial ripening of fruits.
(d) The process of heating the concentrated ore in the presence of air, to a high temperature.
(e) Conversion of ethene to 1,2-dichoroethane by the action of chlorine, in an inert solvent like carbon tetrachloride.

(iv) [5]

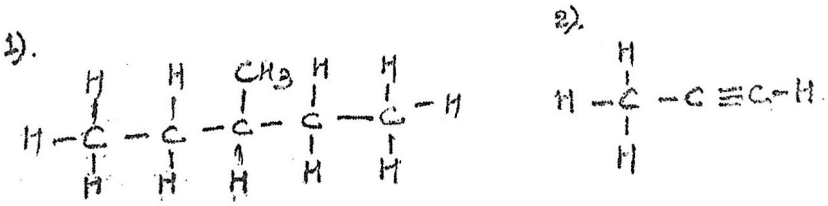
(a) Draw the structural diagram for the following compounds:

1). Butan -1 - ol

2). Ethanoic acid

3). Methanal

(b) Give the IUPAC name of the following organic compounds:



(v) Match **Column A** with **Column B** [5]

Column A	Column B
i) Solder	a). Non-volatile
ii) Nitric acid	b). Electrorefining
iii) Anode mud	c). Methylene group
iv) Homologous series	d). Ostwald process
v) Sulphuric acid	e). Lead

Section B (40 Marks)

Attempt any **FOUR** questions from this section

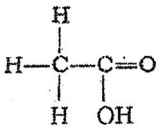
Question 3

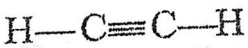
(i) Draw the electron dot structure of : [2]

a) Ammonium ion

b) Calcium oxide

(ii) Give the IUPAC names of the following organic compounds: [2]

(a) 

(b) 

(iii) Distinguish between following pairs of compounds using the reagent given in the bracket: [3]

(a) Copper sulphate solution and Zinc sulphate solution (using sodium hydroxide solution).

(b) Copper oxide and Lead monoxide (using ammonia).

(c) Saturated and unsaturated hydrocarbons (using bromine gas).

(iv) Write a balanced chemical equation for the preparation of: [3]

(a) ethanol from ethylchoride.

(b) ammonia from ammonium chloride.

(c) hydrogen chloride from sodium chloride.

Question 4

(i) What is the meaning of: [2]

(a) Lone pair effect?

(b) Glacial acetic acid?

(ii) Draw the structural diagram of: [2]

(a) 4 – methyl pentanoic acid

(b) 3, 3 – dichloro but-1-yne

(iii) A cylinder contains 68 g of ammonia gas at STP. [3]

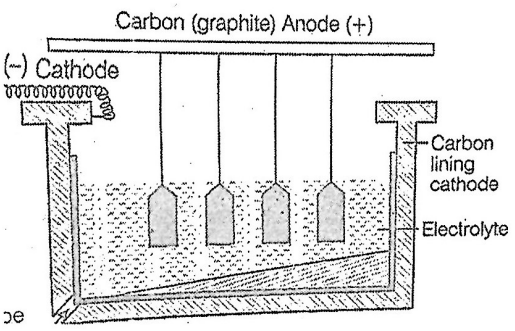
(a) What is the volume occupied by this gas?

(b) How many moles of ammonia are present in the cylinder?

(c) How many molecules of ammonia are present in the cylinder?

[Atomic mass: N = 14; H = 1]

(iv) Given below is the diagram of a step in the extraction of Aluminium metal: [3]



(a) What is the name of this process?
(b) Name the constituents of the electrolyte other than alumina.
(c) What is the temperature at which this process takes place?

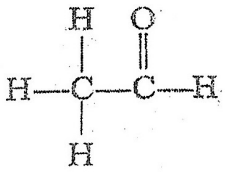
Question 5

(i) A gas cylinder of capacity 40dm^3 is filled with gas X, the mass of which is 20g. When the same cylinder is filled with hydrogen gas at the same temperature and pressure, the mass of hydrogen gas is 2g. Find the relative molecular mass of the gas. [2]

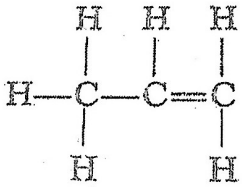
(ii) The percentage composition of a gas is: nitrogen = 82.38%; hydrogen = 17.64%. Find the empirical formula of the gas. [Atomic mass: N = 14; H = 1] [2]

(iii) (a) Write the IUPAC names of the following: [3]

(1).



(2).



(b) Name the process by which ammonia is used to manufacture nitric acid.

(iv) (a) What are the products formed upon complete combustion of methane? [3]
(b) Name the catalyst used in the Contact process.
(c) State one relevant observation when concentrated sulphuric acid acts on hydrated copper sulphate.

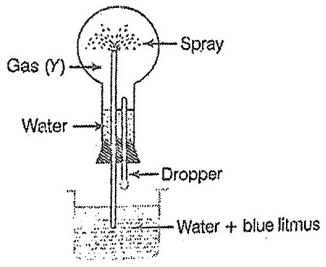
Question 6

(i) Give one accurate reason why: [2]
(a) an inverted funnel is used while dissolving hydrogen chloride gas in water, for the preparation of hydrochloric acid.
(b) ionic or electrovalent compounds have high melting and boiling points.

(ii) What volume of oxygen is required to burn completely 90 dm^3 of butane, under similar conditions of temperature and pressure? [2]

$2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$

(iii) Observe the diagram given below and answer the questions that follow: [3]



(a) What is the name and purpose of this experiment?
(b) Name the gas (Y).
(c) What will be the colour of the spray inside the flask?

(iv) (a) Draw the structural diagram of the following compounds: [3]
(1). Hex – 2 – ene
(2). 3 – methyl butan – 1 – ol
(b) What kind of isomerism exists in Pentane, 2 – methyl butane and 2, 2 – dimethyl propane?

Question 7

(i) Complete the reaction: [2]

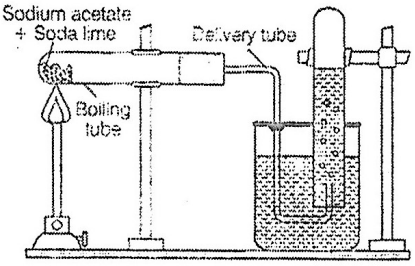
(a) $C_2H_5OH \xrightarrow[170°C]{Conc.H_2SO_4}$

(b) $CH_3COOH + NaOH \longrightarrow$

(ii) Identify the reactant **R** and write the **balanced equation** for the following: [2]
Nitric acid reacts with compound **R** to give a salt $NaNO_3$ and water.

(iii) A compound made up of two elements X and Y has an empirical formula X_2Y. [3]
If the atomic weight of X is 10 and that of Y is 5 and the compound has a vapour density 25, find its molecular formula.

(iv) Study the diagram given below and answer the questions that follow: [3]

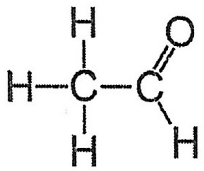


(a) Name the gas collected in the jar.
(b) Write a balanced equation for the above preparation.
(c) What is the method of collection of this gas?

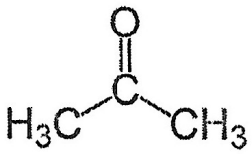
Question 8

(i) Name the functional group present in the following organic compounds: [2]

(a)



(b)



(ii) In period 3 of the periodic table, element **B** is placed to the left of element **A**. On the basis of this information, choose the correct word from the brackets to complete the following statements: [2]
(a) The element **B** would have (lower/higher) metallic character than **A**.
(b) The element **A** would probably have (lesser/higher) electron affinity than **B**.

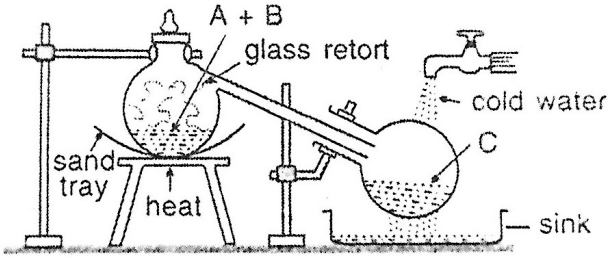
(iii) (a) What is the chemical name of Oleum? [3]
(b) Write the reaction for converting oleum to sulphuric acid.
(c) What is the major difference between the action of cold, dilute nitric acid and concentrated nitric acid on copper metal?

(iv) (a) How much calcium oxide is formed, when 82g of calcium nitrate is heated? [3]

$2Ca(NO_3)_2 \xrightarrow[\Delta]{} 2CaO + 4NO_2 + O_2$

[Atomic mass: Ca = 40; N = 14; O = 16]

(b) The figure given below shows the preparation of an acid **C** from **A** and **B**. Write the reaction taking place.



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