PRELIMINARY EXAMINATION 2015 - 2016

Subject: Chemistry

Date: January 14, 2016

Std: X A

Time: 2 Hrs.
(plus 15 minutes reading time)

Marks: 80

General Instructions:

- Answers to this paper must be written on the paper provided separately.
- This paper consists of two sections.
- All questions in section A are compulsory.
- Solve any 4 out of 6 from section B.
- This paper consists of 7questions on 10 pages.
- The intended marks for questions or parts of questions are given in brackets. [ ]

Section A (40)

Attempt all questions.

Question 1

(a) Select the correct answer from the choices A, B, C and D in each case. [5]

i) The elements arranged in correct increasing order of ionization potential in a period of the Periodic Table are:

A carbon, boron, nitrogen
B oxygen fluorine, neon
C boron, beryllium, lithium
D nitrogen, carbon, boron

ii) The covalent compound having shared pair of electrons unequally distributed between its two atoms is:

A nitrogen
B chlorine
C ammonia
D methane

iii) The paraffin from the following organic compound is:

A $H_2C = CH_2$ B $HC \equiv CH$

C $H_3C - CH_3$ D $CH_3 - OH$

(iv) In an experiment, 1 cm^3 of a gaseous hydrocarbon **'X'** required 4 cm^3 of oxygen for complete combustion to give 3 cm^3 of carbon dioxide. All gas volumes are measured at r.t.p. Which formula represents 'X'?

A C_2H_2 B C_2H_4 C C_3H_4 D C_3H_8

(v) Three chemicals, P, Q and R, were each dissolved in water. The table shows some of the reactions of these solutions.

solution	reaction when solid Na_2CO_3 is added	reaction when heated with solid NH_4Cl
P	gas evolved	no reaction
Q	no reaction	gas evolved
R	no reaction	no reaction

The pH of the three solutions were also measured.

What are the correct pH values of these solutions?

	P	Q	R
A	2	7	13
B	2	13	7
C	7	2	13
D	13	7	2

(b) What do you observe when: [5]

(i) The gas formed on heating rock salt and concentrated sulphuric acid is passed through lead nitrate solution.

ii) The gas formed on reacting sodium propanoate and sodalime is bubbled through a solution of bromine in an inert solvent.

iii) The gas formed on reacting a metallic nitride of a trivalent metal with warm water is bubbled through ferrous sulphate solution.

iv) The gas formed on heating ethylene dibromide with alcoholic potassium hydroxide is bubbled through ammoniacal cuprous chloride solution.

v) Ammonia – oxygen mixture is passed over heated platinum.

(c) Name one element in each case to which the following description could apply. [5]

i) The metal of the third period whose oxide, hydroxide and carbonate do not decompose on heating.

ii) The metal immediately below lead in the activity series whose oxide is reduced to the metal by a reducing agent.

iii) The metal whose red oxide on thermal decomposition gives back the metal as a residue.

iv) The non-metal which has highest electron affinity.

v) The non – metal formed when concentrated sulphuric acid reacts with cane sugar.

(d) Give balanced chemical equations for the following reactions: [5]

i) Conversion of methyl iodide to methane.

ii) Concentrated hydrochloric acid reacts with manganese dioxide.

iii) Catalytic oxidation of ethane to ethanal.

iv) Sulphur reacts with conc. Nitric acid.

v) Sodium thiosulphate reacts with dilute hydrochloric acid.

(e) 1) Concentration of the ore is an important process during metallurgy. State the principle involved in the froth flotation process. [1]

2) Differentiate between calcination and roasting. [1]

3) Give reasons for the following:

i) Hydrogen chloride gas does not conduct electricity but when dissolved in a polar solvent like water conducts electricity. [3]

ii) During electro - refining of copper, the ions which migrate to the anode are not discharged, but instead copper ions are formed in solution.

iii) Ammonium chloride on hydrolysis gives an acidic solution.

(f) 1) Define the following: [3]

i) Co-ordinate bond

ii) Basic salt

iii) Isomers

2) Distinguish between: [2]

i) Electron affinity and electro negativity

ii) Gangue and flux

(g) 1) A vessel contains 6.4 g of oxygen gas at STP. Calculate: [2]

i) Number of moles of oxygen.

ii) Volume of the gas in the vessel.

2) 20cm^3 of a hydrocarbon was burnt in 175 cm^3 of oxygen. [2]
After cooling, the volume of the remaining gases was 125 cc. The addition of aqueous sodium hydroxide removed carbon dioxide leaving 25 cm^3 of unreacted oxygen. Calculate :

i) volume of oxygen used.

ii) volume of carbon dioxide formed.

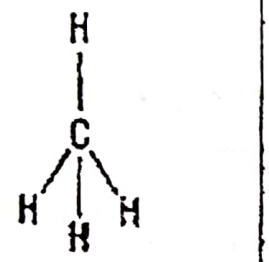
3) State Avogadro's law. [1]

$CH_4 + O_2 \rightarrow CO_2 + H$

125

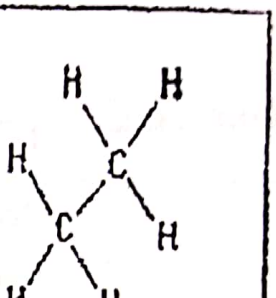
(h) The structures given below are of five organic compounds. [5]

A



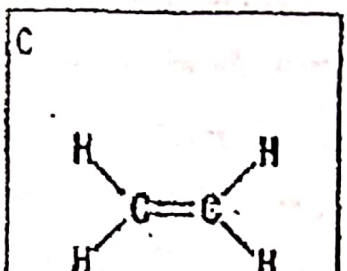
CH_4

B



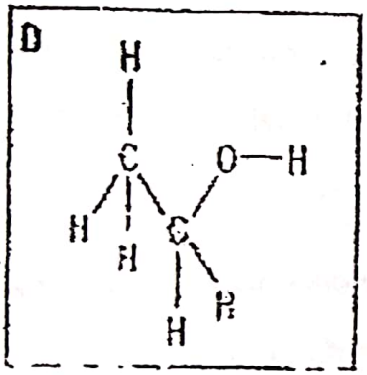
C_2H_6

C



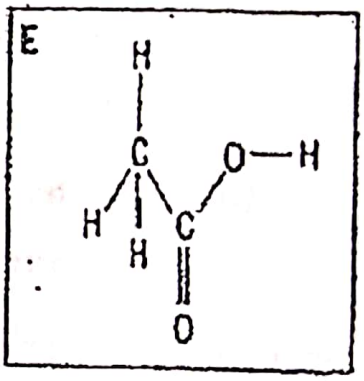
C_2H_4

D



C_2H_5OH

E



CH_3COOH

Answer each of the following questions using letters **A, B, C, D** or **E.**

I) Which compound is unsaturated?

ii) Which compound forms an acidic solution when mixed with water?

iii) Which compound, when oxidised, becomes E?

iv) Which compound can be converted by the catalytic addition of steam into compound D?

v) Which two compounds react together to form an ester?

$CH_4 + H_2O \rightarrow C$

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Section B (40 Marks)

Attempt **any four** out of six questions.

Question 2

Solve the following:

(a) Use the following equation to answer the question given below: [2]

$NaClO_3 \longrightarrow NaCl + O_2$ [Unbalanced]

How many grams of O_2 will be produced by 12 moles of $NaClO_3$? [Na= 23, Cl=35.5, O=16]

(b) i) What volume of hydrogen sulphide at STP will burn in oxygen to yield 12.8 g of sulphur dioxide according to the equation [3]

$2H_2S + 3O_2 \longrightarrow 2H_2O + 2SO_2$

ii) For the volume of hydrogen sulphide calculated above, what volume of oxygen would be required for complete combustion? [H=1, S=32, O=16]

(c) A compound is composed of 74% C, 8.7% H and 17.3% N by mass. If the molecular mass of the compound is 162, what is its molecular formula? [H=1, C=12, N=14] [4]

(d) Calculate the number of molecules in 1.6 gm of SO_2. [1]

[S= 32, O=16]

Question 3

(a) Element 'A' is a metal with valency 3. Element 'B' is a non-metal with valency 2.

i) Write equations to show how 'A' and 'B' forms ions. [2]

ii) If 'B' is a diatomic gas, write the equation for the direct combination of 'A' and 'B' to form a compound. [1]

(b) The properties of a few elements are given below:

Elements	A	B	C
Melting points	100 °C	120 °C	213 °C
Atomic size	120 pm	131 pm	136 pm

[2]

Answer the following:

i) Are these elements of the same group or the same period? Justify.

ii) Will the metallic character increase or decrease from A to C? Give reason.

(c) Give the structural formula of the following: [2]

i) 2, 3 dimethyl butane

ii) Acetone

(d) The sequence shows reactions involving copper compounds. [3]

$$CuCO_3 \xrightarrow{\text{step 1}} CuO \xrightarrow{\text{step 2}} Cu(NO_3)_2 \xrightarrow{\text{step 3}} Cu(OH)_2$$

step 4 ↓

complex ion

i) Give balanced chemical equation for the reaction taking place in step 3.

ii) Name the type of reaction taking place in step 2.

iii) What is the colour of the complex ion formed?

Question 4

(a) Answer the following questions pertaining to the purification of bauxite ore in the metallurgy of aluminium.

i) Why is a base (alkali) preferred in the purification of bauxite ore? [1]

ii) Give a balanced equation for the reaction in (a) (i) above. [1]

iii) The sodium aluminate obtained in (a) (i) is converted to insoluble aluminium hydroxide, which is later ignited to give pure alumina. Give balanced equation for the action of heat on aluminium hydroxide. [1]

iv) Name the other electrolyte containing aluminium added to the electrolytic cell during the reduction of alumina. State why is it added to the electrolyte. [2]

v) What is the purpose of adding these electrolytes mentioned above in qs (a) (iv) in the electrolytic cell?. [1]

vi) Write the ionic equation taking place at the anode during the electrolytic reduction of alumina. [1]

(b) Write balanced chemical equations for the following conversions stating necessary conditions: [3]

i) Ethanol to ethene

ii) Ethyl bromide to ethanol.

iii) Ethyne to 1,2 dichloro ethene

Question 5

(a) Write balanced chemical equation for the reaction taking place in the dilution tank in Contact process. [1]

(b) Which properties are exhibited by sulphuric acid in the reactions given below? [2]

i) $FeS + H_2SO_4 \longrightarrow FeSO_4 + H_2S$

ii) $Zn + 2H_2SO_4 \longrightarrow ZnSO_4 + 2H_2O + SO_2$

(c) What do you observe when conc. Sulphuric acid is added to hydrated copper sulphate crystals? [1]

(d) In the laboratory preparation of hydrochloric acid, hydrogen chloride gas is dissolved in water.

i) Draw a diagram to show the arrangement used for the absorption of HCl in water. [1]

ii) Why is such an arrangement necessary? Give two reasons. [2]

iii) Draw the structure of the positive ion formed when hydrogen chloride gas is dissolved in water. [1]

iv) Write the chemical equation for the laboratory preparation of HCl gas when the reactants are above 200 °C. [1]

v) Name the drying agent used to dry the gas. [1]

Question 6

(a) Give balanced chemical equations for the following conversions involving A, B, C, D and E. [5]

i) A + chlorine $\longrightarrow$ nitrogen trichloride + B

ii) A + B $\longrightarrow$ C

iii) C + potassium hydroxide $\longrightarrow$ D + water + A

iv) D + E $\longrightarrow$ potassium bisulphate + B

v) A + E $\longrightarrow$ ammonium sulphate

(b) i) What is meant by the term electrolysis? [1]

ii) Sodium hydroxide is considered as a 'strong electrolyte' while ammonium hydroxide 'a weak electrolyte'. Give reason. [1]

iii) Give the cathode and anode reaction taking place during electrolysis of aqueous sodium argento cyanide solution using silver electrodes. [2]

iv) Distinguish between electroplating and electro refining on the basis of cathode taken. [1]

Question 7

(a) Give a chemical test to distinguish between the following: [3]

i) Copper oxide and Manganese dioxide

ii) Potassium sulphite and Potassium carbonate

iii) Zinc sulphide and Zinc oxide

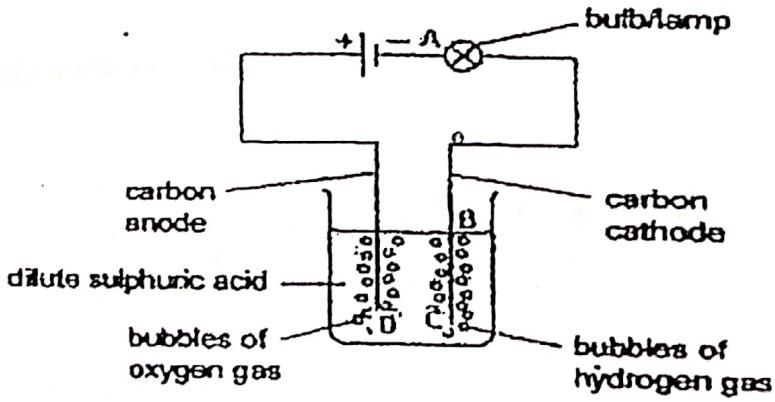
(b) From the list of substances given below, choose the pair required to prepare the salts (i) to (iii) in the laboratory and give balanced equation for the same. [3]

Substances: zinc, *zinc sulphate, chlorine, lead carbonate, sodium carbonate, dilute sulphuric acid, dilute hydrochloric acid, ammonium carbonate, dilute nitric acid, lead*

Salts: i) ammonium chloride ii) lead nitrate

iii) zinc carbonate

(c) 1) The following apparatus was set up to investigate the electrical conductivity of dilute acids. [4]



How is electricity conducted in the part of the circuit labelled

i) A to B? ii) C to D?

2) Dilute sulphuric acid is a strong acid. If it was replaced by a weak acid, what two differences in the observations would you expect to make?