

X - ICSE BOARD - 2018

Date: 19.03.2018

Chemistry - Question Paper Solutions

SECTION - I (40 Marks)

Attempt all questions from this Section

Question 1

(a) Choose the correct answer from the options given below :

(i) The salt solution which does not react with ammonium hydroxide is :

(A) Calcium Nitrate

(B) Zinc Nitrate

(C) Lead Nitrate

(D) Copper Nitrate

Ans. (A) Calcium Nitrate

(ii) The organic compound which undergoes substitution reaction is :

(A) C_2H_2

(B) C_2H_4

(C) $C_{10}H_{18}$

(D) C_2H_6

Ans. (D)

C_2H_6 - ethane is saturated hydrocarbon which undergoes substitution reaction.

(iii) The electrolysis of acidified water is an example of :

(A) Reduction

(B) Oxidation

(C) Redox reaction

(D) Synthesis

Ans. (C)

Redox reaction, as water undergoes oxidation and reduction at anode and cathode respectively.

(iv) The IUPAC name of dimethyl ether is :

(A) Ethoxy methane

(B) Methoxy methane

(C) Methoxy ethane

(D) Ethoxy ethane

Ans. (B)

$CH_3 - O - CH_3$ (Methoxy methane)

(v) The catalyst used in the contact process is :

(A) Copper

(B) Iron

(C) Vanadium pentoxide

(D) Manganese dioxide

Ans. (C)

V_2O_5 is used in contact process.

(b) Give one word or a phrase for the following statements :

(i) The energy released when an electron is added to a neutral gaseous isolated atom to form a negatively charged ion.

Ans. Electron affinity or electron gain enthalpy.

(ii) Process of formation of ions from molecules which are not in ionic state.

Ans. Ionization

(iii) The tendency of an element to form chains of identical atoms.

Ans. Catenation - It's a self linking.

Property of atoms like carbon to give long chains of carbon.

(iv) The property by which certain hydrated salts, when left exposed to atmosphere, lose their water of crystallization and crumble into powder.

Ans. Dehydration

(v) The process by which sulphide ore is concentrated.

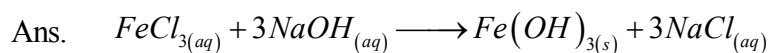
Ans. Froth floatation

(c) Write a balanced chemical equation for each of the following :

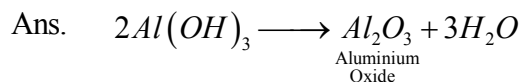
(i) Action of concentrated sulphuric acid on carbon.

Ans. $C_{(s)} + H_2SO_4 \longrightarrow CO_2 + 2SO_2 + 2H_2O$
conc.

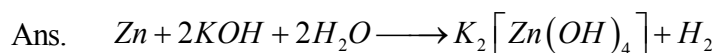
(ii) Reaction of sodium hydroxide solution with iron (III) chloride solution.



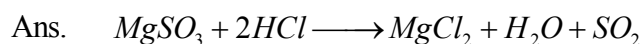
(iii) Action of heat on aluminium hydroxide.



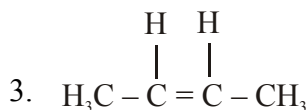
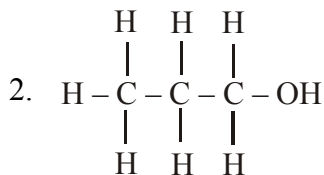
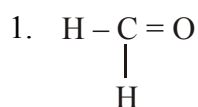
(iv) Reaction of zinc with potassium hydroxide solution.



(v) Action of dilute hydrochloric acid on magnesium sulphite.



(d) (i) Give the IUPAC name for each of the following :

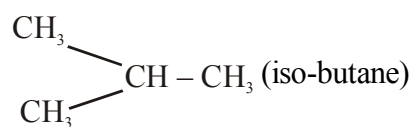


(ii) Write the structural formula of the two isomers of butane.

Ans. (i) IUPAC Names :

1. Methanal 2. Propanol 3. But-2-ene

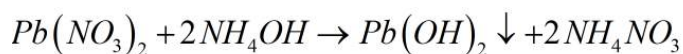
(ii) $CH_3 - CH_2 - CH_2 - CH_3$ (n-butane)



(e) State one relevant observation for each of the following :

(i) Lead nitrate solution is treated with sodium hydroxide solution drop wise till it is excess.

Ans. ppt. of lead hydroxide is observed



(ii) At the anode, when molten lead bromide is electrolyzed using graphite electrodes.

Ans. Brown fumes of bromine gas are observed at anode.

(iii) Lead nitrate solution is mixed with dilute hydrochloric acid and heated.

Ans. White ppt. of $PbCl_2$ is formed.

(iv) Anhydrous calcium chloride is exposed to air for some time.

Ans. Anhydrous $CaCl_2$ on exposure to atmosphere form solution.

(v) Barium chloride solution is slowly added to sodium sulphate solution.

Ans. White ppt. of barium sulphate is formed solution turns turbid.

(f) Give a reason for each of the following :

(i) Ionic compounds have a high melting point.

Ans. Ionic compounds have alternatively arranged cations and anions to give closely packed structure and balanced forces. A lot of energy is needed to break strong ionic bonds therefore ionic compounds have high melting point.

(ii) Inert gases do not form ions.

Ans. Inert gases have stable completely filled orbitals hence they do not loose or gain electron to form ions.

(iii) Ionisation potential increases across a period, from left to right.

Ans. From left to right in periodic table, atomic size decreases smaller the size more the effective nuclear charge.

Therefore more energy is required to remove an electron from atom therefore ionization potential increases.

(iv) Alkali metals are good reducing agents.

Ans. Alkali metals have large size and single electron in valence shell. This e^- can be easily lost therefore alkali metals are good reducing agents (e^- donors)

(v) Conductivity of dilute hydrochloric acid is greater than that of acetic acid.

Ans. Acetic acid is weak electrolyte which dissociated partially where as HCl is strong electrolyte which dissociate completely therefore HCl is better conductor compared to CH_3COOH .

(g) Name the gas that is produced in each of the following cases :

(i) Sulphur is oxidized by concentrated nitric acid.

(ii) Action of dilute hydrochloride acid on sodium sulphide.

(iii) Action of cold and dilute nitric acid on copper.

(iv) At the anode during the electrolysis of acidified water.

(v) Reaction of ethanol and sodium.

Ans. (i) SO_2

(ii) H_2S

(iii) NO_2

(iv) O_2

(v) H_2

(h) Fill up the blanks with the correct choice given in brackets.

(i) Ionic or electrovalent compounds do not conduct electricity in their _____ state. (fused/solid)

Ans. Solid

(ii) Electrolysis of aqueous sodium chloride solution will form _____ at the cathode.

(Hydrogen gas / Sodium metal)

Ans. Hydrogen gas

(iii) Dry hydrogen chloride gas can be collected by _____ displacement of air. (downward / upward)

Ans. Downward

(iv) The most common ore of iron is _____. (Calcium / Haematite)

Ans. Haematite

(v) The salt prepared by the method of direct combination is _____.

(iron (II) chloride / iron (III) chloride)

Ans. Iron (III) chloride

SECTION - II (40 Marks)

Attempt any four questions from this Section

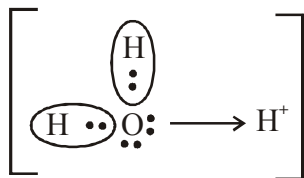
Question 2

(a) (i) What do you understand by a lone pair of electrons?

(ii) Draw the electron dot diagram of Hydronium ion ($H = 1$; $O = 8$)

Ans. (i) Lone pair of electrons are those valence electrons which do not take part in bonding and remain nonbonded.

(ii) Hydronium ion $[H_3O^+]$



(b) 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:

(i) The element B would have (lower / higher) metallic character than A.

(ii) The element A would probably have (lesser / higher) electron affinity than B.

(iii) The element A would have (greater / smaller) atomic size than B.

Ans. Periodic table

- (i) Higher - Metallic character decreases from left to right.
- (ii) Higher - Electron affinity increases from left to right.
- (iii) Smaller - Atomic size decreases from left to right.

(c) Copy and complete the following table which refers to the conversion of ions to neutral particles.

| Conversion | Ionic equation | Oxidation / Reduction |
|-----------------------------------|----------------|-----------------------|
| Chloride ion to chlorine molecule | (i) _____ | (ii) _____ |
| Lead (II) ion to lead | (iii) _____ | (iv) _____ |

Ans.

| Conversion | Ionic equation | Oxidation / Reduction |
|-----------------------------------|---------------------------------------|-----------------------|
| Chloride ion to chlorine molecule | (i) $2Cl^- \rightarrow Cl_2 + 2e^-$ | (ii) Oxidation |
| Lead (II) ion to lead | (iii) $Pb^{+2} + 2e^- \rightarrow Pb$ | (iv) Reduction |

Question 3

- (a)
- (i) Write the balanced chemical equation to prepare ammonia gas in the laboratory by using an alkali.
 - (ii) State why concentrated sulphuric acid is not used for drying ammonia gas.
 - (iii) Why is ammonia gas not collected over water ?

Ans. (i) $Ca(OH)_2 + 2NH_4Cl \longrightarrow CaCl_2 + 2H_2O + 3NH_3 \uparrow$

(ii) As ammonia gas is basic in nature it forms ammonium sulphate salt.

(iii) Ammonia gas is highly soluble in water. Therefore it is not collected over water.

- (b)
- (i) Name the acid used for the preparation of hydrogen chloride gas in the laboratory. Why is this particular acid preferred to other acids?

(ii) Write the balanced chemical equation for the laboratory preparation of hydrogen chloride gas.

Ans. (i) H_2SO_4 (Sulphuric acid is used for preparation of HCl gas in laboratory). H_2SO_4 has dehydrating properties so act as dehydrating agent.

(ii) $H_2SO_{4(aq)} + NaCl_{(s)} \longrightarrow NaHSO_{4(aq)} + HCl_{(g)}$

(c) For the preparation of hydrochloric acid in the laboratory:

- (i) Why is direct absorption of hydrogen chloride gas in water not feasible?
- (ii) What arrangement is done to dissolve hydrogen chloride gas in water?

Ans. (i) The reaction is highly exothermic.

- (ii) As the reaction is exothermic, the installation is called HCl over or burner. The HCl gas is absorbed in deionized water resulting in chemically pure HCl.

(d) For the electro-refining of copper :

- (i) What is the cathode made up of?
- (ii) Write the reaction that takes place at the anode.

Ans. (i) Pure copper metal

- (ii) Reaction at anode -



Question 4

(a) The percentage composition of a gas is:

Nitrogen 82.35%, Hydrogen 17.64%.

Find the empirical formula of the gas. [N = 14, H = 1]

Ans. No. of mole of nitrogen = $\frac{82.35}{14} = 5.88$

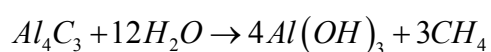
No. of mole of Hydrogen = $\frac{17.64}{1} = 17.64$

The ratio of their mole is 5.88:17.64

1 : 3

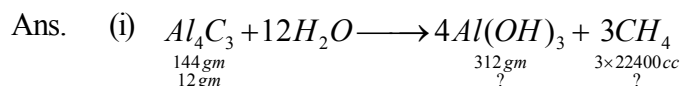
So the empirical formula is NH_3

(b) Aluminum carbide reacts with water according to the following equation :



- (i) What mass of aluminum hydroxide is formed from 12g of aluminum carbide ?
- (ii) What volume of methane at s.t.p. is obtained from 12g of aluminum carbide?

[Relatively molecular weight of $Al_4C_3 = 144$; $Al(OH)_3 = 78$]



So, the amount of $Al(OH)_3$ formed will be 26 gm

(ii) From 12 gm Al_4C_3 5600 cc methane will be formed.

(c) (i) If 150 cc of gas A contains X molecules, how many molecules of gas B will be present in 75 cc of B?

The gases A and B are under the same conditions of temperature and pressure.

(ii) Name the law on which the above problem is based.

Ans. (i) According to Avogadro's law equal volume of gases contain equal no. of molecule of same temperature and pressure.

So, 150 cc B will also contain X molecule, and 75 cc will contain X/2 molecule.

(ii) Avogadro's law

(d) Name the main component of the following alloys:

(i) Brass

(ii) Duralumin

Ans. Brass \rightarrow Copper and Zinc

Duralumin \rightarrow Copper, Manganese and Magnesium

Question 5

(a) Complete the following table which relates to the homologous series of hydrocarbons.

| General Formula | IUPAC name of the homologous series | Characteristic bond type | IUPAC name of the first member of the series |
|-----------------|-------------------------------------|--------------------------|--|
| C_nH_{2n-2} | (A) _____ | (B) _____ | (C) _____ |
| C_nH_{2n+2} | (D) _____ | (E) _____ | (F) _____ |

Ans. (A) Alkyne (B) $-C \equiv C-$ (C) Ethyne

(D) Alkane (E) $\begin{array}{c} | \quad | \\ -C - C- \\ | \quad | \end{array}$ (F) Methane

- (b) (i) Name the most common ore of the metal aluminum from which the metal is extracted. Write the chemical formula of the ore.
- (ii) Name the process by which impure ore of aluminum gets purified by using concentrated solution of an alkali.
- (iii) Write the equation for the formation of aluminum at the cathode during the electrolysis of alumina.

Ans. (i) The most common ore of Al is bauxite. Chemical formula is Al_2O_3 .

(ii) The process is called Bayer process.

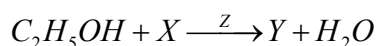
(iii) $Al_2O_3 \longrightarrow 2Al^{+3} + 3O^{2-}$

Reaction of cathode: $2Al^{+3} + 6e \longrightarrow 2Al$

Question 6

- (a) A compound X (having vinegar like smell) when treated with ethanol in the presence of the acid Z, gives a compound Y which has a fruity smell.

The reaction is:



- (i) Identify Y and Z.
- (ii) Write the structural formula of X.
- (iii) Name the above reaction.

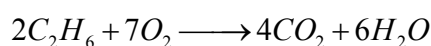
Ans. (i) Y is ester $CH_3COOC_2H_5$ (Ethyl ethanoate)

Z is concentrated H_2SO_4

(ii) X is CH_3COOH

(iii) Esterification reaction

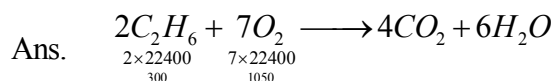
- (b) Ethane burns in oxygen to form CO_2 and H_2O according to the equation:



If 1250 cc of oxygen is burnt with 300 cc of ethane.

Calculate:

- (i) the volume of CO_2 formed.
- (ii) the volume of unused O_2



So, ethane is limiting reagent.

(i) 2×22400 cc ethane gives $\rightarrow 4 \times 22400$ cc CO_2

$$\therefore 300 \text{ cc ethane gives } \rightarrow \frac{4 \times 22400 \times 300}{2 \times 22400} \text{ cc } CO_2$$

$$= 600 \text{ cc } CO_2$$

(ii) For 300 cc Ethane 1050 cc of O_2 will be required.

So, unused O_2 is $(1250 - 1050) = 200$ cc

(c) Three solutions P, Q and R have pH value of 3.5, 5.2 and 12.2 respectively. Which one of these is a:

(i) Weak acid?

(ii) Strong alkali?

Ans. (i) Q having pH 5.2 is weak acid

(ii) R having pH 12.2 is strong alkali.

Question 7

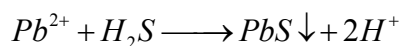
(a) Give a chemical test to distinguish between the following pairs of chemicals:

(i) Lead nitrate solution and Zinc nitrate solution

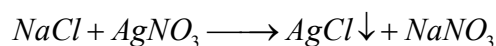
(ii) Sodium chloride solution and Sodium nitrate solution

Ans. (i) Lead nitrate and Zinc nitrate solution can be distinguished by passing H_2S in solution.

$Pb(NO_3)_2$ will give black precipitate of PbS whereas $Zn(NO_3)_2$ will not.



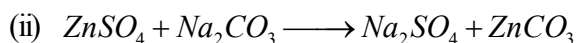
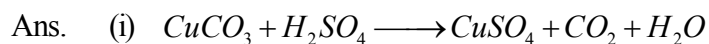
(ii) $NaCl$ and $NaNO_3$ solution can be distinguished simply by addition of $AgNO_3$ solution into it $NaCl$ solution will give white precipitate of $AgCl$ whereas $NaNO_3$ will not.



(b) Write a balanced equation for the preparation of each of the following salts:

(i) Copper sulphate from Copper carbonate.

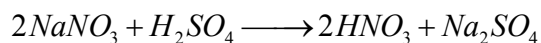
(ii) Zinc carbonate from Zinc sulphate.



(c) (i) What is the type of salt formed when the reactants are heated at a suitable temperature for the preparation of Nitric acid?

(ii) State why for the preparation of Nitric acid, the complete apparatus is made up of glass.

Ans. (i) Sodium or potassium nitrate on reaction with H_2SO_4 can produce nitric acid in that case sulphate salt will be prepared.



(ii) Because nitric acid will not react with glass.

(d) Which property of sulphuric acid is shown by the reaction of concentrated sulphuric acid with:

(i) Ethanol?

(ii) Carbon?

Ans. (i) Sulphuric acid acts as a dehydrating agent while reaction with ethanol.

(ii) With carbon it will act as oxidizing reagent.