Answers of Full Portion Test Series 2019 – 2020

CHEMISTRY

Section I (40)

1. a.

   i. Glacial acetic acid
   ii. Methanol
   iii. Brass
   iv. Zinc oxide
   v. Carbon

   b.

   i. The compounds of various metals found in nature associated with their earthly impurities are called minerals.
   ii. The number of electrons donated or accepted by the valence shell of an atom of an element so as to achieve stable electronic configuration is called electrovalency.
   iii. The phenomenon of organic compounds having the same molecular formula but differing in molecular arrangement or in structural formula.
   iv. Physical and chemical properties of elements are periodic functions of their atomic numbers.
   v. Electrolysis is the decomposition of a chemical compound (electrolyte) in the aqueous or fused (molten) state by the passage of a direct electric current resulting in discharge of ions of the electrolyte at the respective electrodes.

   c.

   i. Barium chloride when added to H_2SO_4, forms a white ppt. of barium sulphate where as it does not form any ppt with dilute HNO_3. Since it gives a visible change in one and it is used for distinguishing both acids.
   ii. HCl gas reacts with CaO forming calcium chloride and water, hence not used for frying HCl gas.
   iii. Organic acids dissociates partially in fused or aqueous solution state hence they are generally weak electrolytes.
   iv. Copper is a good conductor of electricity but does not undergo chemical decomposition due to the flow of electric current hence it is an electrolyte.

   d.

   i. Forms curdy white ppt of $Pb(OH)_2$ which is insoluble in excess.
   ii. Red colour of bromine solution is discharged and turns colourless.
   iii. It gives a reddish glow and reacts to form colourless gas NO which reacts with O_2 and gives reddish brown fumes of NO_2 and gives water vapour.
   iv. It reacts to give white zinc sulphate and a colourless gas H_2S with rotten egg smell and it turns moist Pb acetate paper colourless to silvery black.
   v. It gives an ester – ethyl acetate which gives a fruity smell.

e.

i. $CH_3COOH + Zn \rightarrow (CH_3COO)_2Zn + H_2$

ii. $4NH_3 + 3O_2 \rightarrow 2N_2 + 6H_2O$

iii. $K_2SO_3 + H_2SO_4 \rightarrow K_2SO_4 + H_2O + SO_2$

iv. $C_2H_2 + H_2 \xrightarrow{Ni \quad 300^oC} C_2H_4$

v. $C_2H_5 + 2[H] \xrightarrow{Zn/Cu\ Couple \quad Alcohol} C_2H_6 + HBr$

f.

i.

Sodium chloride	Sodium sulphide
Take a small quantity of NaCl in a test tube and add dil. H_2SO_4. A white precipitate of sodium sulphate is obtained and a colorless pungent smelling gas is evolved.	Take a small quantity of Na_2S in a test tube and add dil. H_2SO_4. Rotten egg smelling gas is evolved which turns moist blue litmus paper red.

ii.

Carbon dioxide gas	Sulphur dioxide gas
Add few drops of potassium permanganate solution, it remains unchanged.	Add few drops of potassium permanganate solution, it turns from pink to colorless.
Add few drops of potassium dichromate solution, it remains unchanged.	Add few drops of potassium dichromate solution, it turns orange to green.

iii.

Manganese dioxide	Copper II oxide
Add conc HCl, black MnO_2 turns to colorless solution of manganese chloride and give out a greenish yellow gas chlorine.	Add conc HCl, black CuO turns to greenish blue solution of copper chloride and give out no gas.

iv.

Barium sulphite	Barium sulphide
Add dil. HCl, it gives a colorless solution of $BaCl_2$ and a colorless Gas SO_2 which turns moist orange $K_2Cr_2O_7$ paper green.	Add dil. HCl, it gives a colorless solution of $BaCl_2$ and a colorless gas with rotten egg smell which turns lead acetate paper silvery black.

v.

Acidic solution	Alkaline solution
Add alkali (NaOH/KOH), it forms salt and water test with red litmus, no change.	Add alkali (NaOH/ KOH), it forms strong alkaline solution, test with red litmus, it turns blue.

g.

i. Ans: 1. Galena

ii. Ans: 3. The atoms lose their electrons more easily

iii. Ans: 1. 22.4 litres of nitrogen at 1 atm pressure and 273 K

iv. Ans: 4. Conc. H_2SO_4

v. Ans: 2. Ethene

h.

i.

?		0.3 moles				
MgO	+	2 HCl	$\rightarrow$	$MgCl_2$	+	H_2O
24 + 16		2 moles				
40						
MgO		HCl				
40 g		2 moles				
?		0.3 moles	$= \frac{0.3 \times 40}{2}$			
			= 6g			

$\therefore$ 2 tabs of 3g should be taken.

ii.

	Wt.	%	At. Wt.	Rel. no. of atoms	Simple ratio
X	**24g**	**27.27**	**12**	$\frac{27.27}{12}$ **= 2.272**	$\frac{2.272}{2.272}$ **= 1**
O	**64g**	**72.73**	**16**	$\frac{72.73}{16}$ **= 4.545**	$\frac{4.545}{2.272}$ **= 2**

EF = XO_2

Section II (40)

Write each question on a new page

2.

a.

i.

Group No.	1 - IA	2 – IIA	13 – IIIA	14 – IVA	15 – V A	16 –VIA	17 - VIIA	18 - 0
2nd period	Li		B			O	F	Ne
3rd period	Na	Mg	Al	Si		S	Cl	
4th period	K	Ca	Ga		Q	Se		Kr

ii. Fluorine.

iii. 1. Metallic

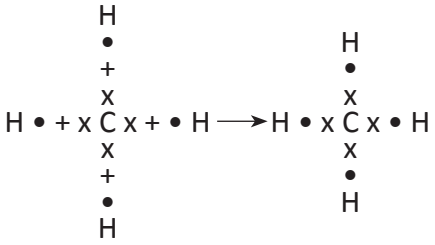
2. Smallest

b.

i.

1. Polar covalent (co-ordinate) bond.
2. Electrovalent bond.

ii. 1.



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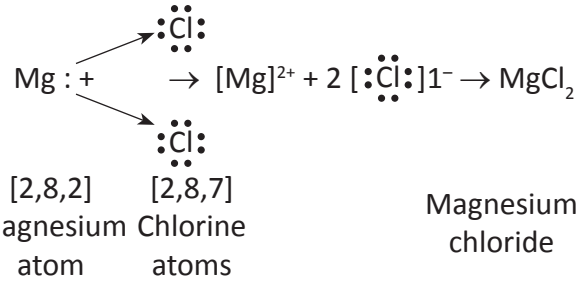


3.

a.

i.

1. $Na_2CO_3 + H_2SO_4[dil.] \rightarrow Na_2SO_4 + H_2O + CO_2$.
2. $Zn(NO_3)_2 + Na_2CO_3 \rightarrow 2\ NaNO_3 + ZnCO_3$.
3. $CuCO_3 + H_2SO_4$ (dil) $\rightarrow CuSO_4 + H_2O + CO_2$.
4. $Fe + H_2SO_4(dil) \rightarrow FeSO_4 + H_2$.

ii. $\underline{ZnCO_3} + 2HNO_3 \rightarrow \underline{Zn(NO_3)_2} + H_2O + CO_2$

b.

i.

1. Impure block of copper.
2. Aqueous copper sulphate solution.
3. Reactions at anode [Cu – active electrode]

   $Cu - 2e^{-}\ Cu^{2+}$ [cation]

ii.

Electrolyte	Molten / Fused $PbBr_2$
Cathode	Iron or Graphite (Inert)
Anode	Graphite (Inert)
Dissociation	$PbBr_2 \leftrightarrow Pb^{2+} + 2Br^{1-}$
R. at cathode	$Pb^{2+} + 2e^{-} \rightarrow Pb$
R. at anode	$Br^{1-} - 1e^{-} \rightarrow Br$ $Br + Br \rightarrow Br_2$ (reddish-brown fumes)
Over all reaction	$PbBr_2 \rightarrow Pb + Br_2$
Products : Cathode	Lead (Grey)
Anode	Bromine (Vapours red)

4. a.

i. Conc. NaOH.

ii. $2Al(OH)_3 \xrightarrow{1100^\circ C} Al_2O_3 + 3H_2O$

iii. Cathode: Carbon lining; Anode: Thick carbon rod.

iv. $2Al^{+3} + 6e^- \rightarrow 2Al$.

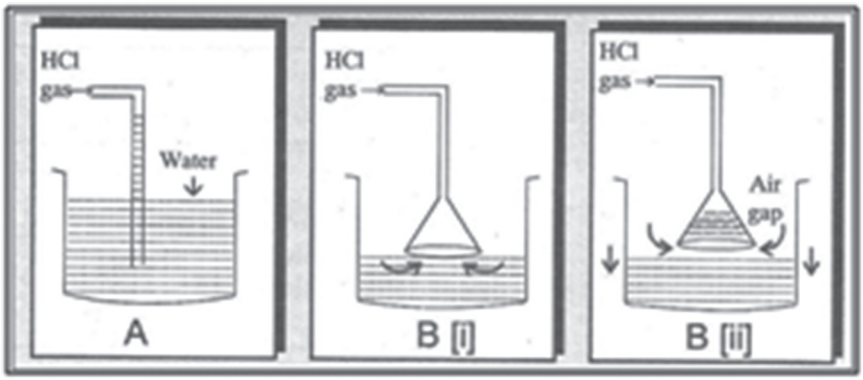
v. $Al - 3e^- \rightarrow Al^{+3}$.

vi. Cryolite & Alumina.

vii. The oxygen evolved at the anode reacts with the carbon to form carbon monoxide which burns to form carbon dioxide and escapes out through an outlet. The carbon anode is hence consumed and replaced after some period of time.

b.

i.



ii. Prevents or minimizes back – suction of water andProvides a large surface area for the absorption of HCl gas

iii.

1. $NaCl + H_2SO_4 \xrightarrow{< 200^\circ C} NaHSO_4 + HCl$
2. $2NaCl + H_2SO_4 \xrightarrow{> 200^\circ C} Na_2SO_4 + 2HCl$

5.

a.

i.

Wt.	–	Vol.
?		6.72 /
$2KClO_3 \rightarrow$	2KCl +	$3O_2$
2(39 + 35. 5 + 16 × 3)		3 × 22.4 /
245 g		3 moles

245 g of $KClO_3$ gives 3 × 22.4 / of O_2

$\therefore$? g of $KClO_3$ gives 6.72 / of $O_2 = \frac{6.72 \times 245}{3 \times 22.4}$ = 24.5 g

245 g of $KClO_3$ gives 3 moles of O_2

$\therefore$ 24.5 g of $KClO_3$ gives ? mole of $O_2 = \frac{3 \times 24.5}{245}$ = 0.3 mole

1 mole of O_2 contains = 6.023×10^{23}

$\therefore$ 0.3 mole of O_2 = ? molecules

X = $6.023 \times 10^{23} \times 0.3 = \underline{1.8069 \times 10^{23}}$

ii. 20 of N_2 contains x molecules, given.

$\therefore$ 10 *l* of Cl_2 contains $\frac{x}{2}$ molecules, as vol. is halved

20 *l* of NH_3 contains x molecules, as vol. is same

5 *l* of SO_2 contains $\frac{x}{4}$ molecules, as vol. is $\frac{1^{th}}{4}$

b.

i.

Name of process	Input	Catalyst	Equation for catalyzed reaction	Output
Haber's Process	Hydrogen + (i) NITROGEN	(ii) Finely divided iron	(iii) $N_2 + 3H_2$ $2NH_3$	(iv) Ammonia Gas

ii. The color of the fountain will indicate the gas used. Red fountain means the gas used is HCl and blue fountain means the gas used in Ammonia.

iii.

1. $2NH_3 + 3CuO \rightarrow 3Cu + 3H_2O + N_2$ [g]

   [basic oxide]

2. $2NH_4Cl + Ca(OH)_2 \rightarrow CaCl_2 + 2H_2O + 2NH_3$

6.

a.

i. Dilute nitric acid is generally considered a typical acid except for its reaction with metals, since it generally does not liberate hydrogen on reaction with metals. Nitric acid is a powerful oxidizing agent and nascent oxygen formed on decomposition oxidizes the hydrogen to water.

ii. 1. A $\rightarrow$ conc. H_2SO_4 ; B $\rightarrow$ $NaNO_3$/ KNO_3

2. $4HNO_3 \rightarrow 4NO_2 + 2H_2O + O_2$

3. $Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2H_2O + 2NO_2$.

iii. 1. All glass apparatus.

2. **Higher temperatures causes:** Formation of a hard residual crust of sulphate which is a poor conductor of heat, sticks to the glass and cannot be easily removed from the apparatus, and damages the glass apparatus.

b.

i.

1. $CuSO_4.5H_2O \xrightarrow[H_2SO_4]{Conc.} CuSO_4 + 5H_2O$

   OR

   $C_{12}H_{22}O_{11} \xrightarrow[H_2SO_4]{Conc.} 12C + 11H_2O$

2. $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$ Or any reaction with oxide / hydroxide / carbonate / sulphite / sulphide with dil. H_2SO_4.

3. $NaNO_3 + H_2SO_4$ (Conc.) $\rightarrow NaHSO_4 + HNO_3$

   $NaCl + H_2SO_4$ (Conc.) $NaHSO_4 + HCl$

ii. $SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$

$H_2S_2O_7 + H_2O \rightarrow 2H_2SO_4$

7.

a.

i.

1. $CH_3 - I + 2\,[H] \xrightarrow{Zn/Cucouple,\ \ Alcohol} CH_4 + HI$
2. $C_2H_5 - OH \xrightarrow{conc.\ H_2SO_4\ at\ 170^oC\ or\ Al_2O_3\ at\ 350^o} C_2H_4 + H_2O$
3. $CaC_2 + 2H_2O \rightarrow C_2H_2 + Ca(OH)_2$
4. $C_2H_5 - Br + KOH \xrightarrow{boil} C_2H_5 - OH + KBr$

ii. Isomers are organic compounds having the same molecular formula but differing in molecular arrangement or in structural formula. This phenomenon is called isomerism.

2 – methyl propane is the IUPAC name.

b.

i.

1. Cl^- [as A- NaCl]
2. CO_3^{2-}
3. SO_4^{2-}

ii.

1. Mn^{2+}
2. Cu^{2++}
3. Ca^{2++}
4. NH^{4+}

Answers being written by students may have caused spelling errors.