Rathi's Aspire Academy
Preparing You For Tomorrow

Pre- Board Test -1
Subject – Chemistry
Solution

SECTION A

1. (i) *(c) A silver grey deposit at cathode and reddish brown fumes at anode.*

Explanation: During electrolysis of fused lead bromide, following reaction takes place:

At cathode $Pb^{2+} + 2e^- \longrightarrow \underset{\text{Silver grey}}{Pb}$

At anode $Br^- - e^- \longrightarrow Br$

$Br + Br \longrightarrow \underset{\substack{\text{Reddish}\\ \text{brown fumes}}}{Br_2\uparrow}$

Caution

↳ *All students must learn the reactions take place at cathode and anode during electrolysis of an electrolyte.*

(ii) *(d) Argon*

Explanation: Electronic configuration of Argon ($_{18}Ar$) = 2,8,8

∵ It has 8 electrons in its outermost shell i.e. stable electronic configuration and it belongs to period 3 as it has three shells. So, it has zero electron affinity.

Related Theory

↳ *The amount of energy released during conversion of a neutral gaseous isolated atom into a negatively charged anion by the addition of electron.*

(iii) *(b) Brass*

Explanation: Composition of Brass

= 60-70% Cu

40-30% Zn

Related Theory

↳ *An alloy is a homogeneous mixture of two or more metals or of one or more metals with certain non-metallic elements.*

(iv) *(a) Oxidation*

Explanation: $M \rightarrow M^{2n} + ne^-$ (Oxidation)

(v) *(c) $NaHSO_4$*

Explanation: $NaHSO_4$ contains hydrogen atom and it ionises in aqueous solution to give hydronium ion. So, it is an acid salt.

Caution

↳ *Students must know the difference between acid salt and other salts.*

(vi) *(c) Zinc*

Explanation: Zinc shows amphoteric nature, so, it produces hydrogen on reacting with alkali as well as with acid.

$Zn + \underset{\substack{\text{Hot and conc.}\\ \text{(Alkali)}}}{2NaOH} \longrightarrow Na_2ZnO_2 + H_2\uparrow$

$Zn + \underset{\text{(Acid)}}{H_2SO_4} \longrightarrow ZnSO_4 + H_2\uparrow$

(vii) *(b) CH_2O*

Explanation: Molecular formula of an organic compound

= CH_3COOH

OR

$C_2H_4O_2$

Ratio of C, H and O = 2 : 4 : 2

Simple ratio = 1 : 2 : 1

∴ Empirical formula = CH_2O

Related Theory

↳ *The molecular formula of compound represents the actual number of atoms of different elements present in one molecule of the compound.*

(viii) *(d) Conc. sulphuric acid*

Explanation: Hydrogen chloride gas is dried by passing through conc. sulphuric acid. The other drying agents like phosphorus pentoxide, quick lime etc. can not be used, since they react with HCl gas.

(ix) *(b) Ammonium nitrite*

Explanation:

$\underset{\text{Ammonium nitrite}}{NH_4NO_2} \longrightarrow N_2\uparrow + 2H_2O$

Caution

↳ *Students must learn chemical equations and products formed.*

(x) *(c) NO_2*

Explanation:

$2Pb(NO_3)_2 \xrightarrow{\Delta} 2PbO + + 4NO_2 + O_2$

Lead nitrate

Caution

↳ *Students must learn and understand the effect of heat on nitrates.*

(xi) *(a) Hydrogen sulphide*

Explanation:

$FeS + H_2SO_4 \longrightarrow FeSO_4 + H_2S\uparrow$

(xii) *(c) $C_{10}H_{22}$*

Explanation: General formula of Hydrocarbon = C_nH_{2n+2}

If $n = 10$

then hydrocarbon = $C_{10}H_{2\times10+2}$

$= C_{10}H_{22}$

(xiii) *(b) downward displacement of water.*

Explanation: Ethyne gas is collected by the downward displacement of water, since it is insoluble in water.

(xiv) *(d) Graphite*

Explanation: Graphite is an inert electrode while copper, nickel and silver are active electrodes.

(xv) *(d) Atomic radius decreases and nuclear charge increases.*

Explanation: The ionisation potential increases over a period form left to right because the atomic radius decreases and nuclear charge increaes, so, more energy is required to remove the electron(s).

Related Theory

↪ *The energy required to remove an electron from a neutral isolated gaseous atom and convert it into a positively charged gaseous ion is called ionisation potential.*

2. (i) (a) Fountain experiment

(b) HCl gas is highly soluble in water.

(c) Ammonia

(d) Blue litmus solution turns red.

(e) Acidic nature

(ii) (a) →5, (b) →4, (c) →2, (d) →1, (e) →3

(iii) (a) hydrogen gas

(b) High

(c) loss

(d) tin

(e) Ammonia

(iv) (a) Ni

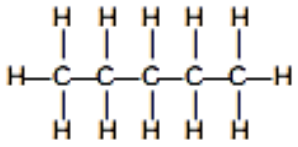
(b) Oxygen

(c) Electronegativity

(d) Mixture of molten alumina (20%), cryolite (60%) and fluorspar (20%).

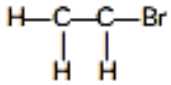
(e) Coordinate bond

(v) (a) 1.



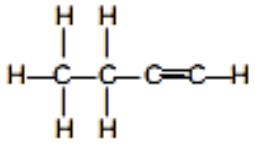
Pentane

2.



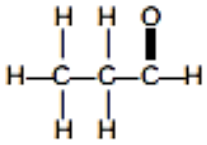
Bromoethane

3.



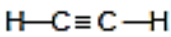
But-1-yne

(b) 1.



IUPAC name : Propanal

2.



IUPA name : Ethyne

SECTION B

3. (i) (a) $\underset{\text{Ammonia}}{2NH_3} + \underset{\text{Copper oxide}}{3CuO} \longrightarrow 3Cu + 3H_2O + N_2\uparrow$

(b) $\underset{\text{Ammonia (excess)}}{8NH_3} + \underset{\text{Chlorine}}{3Cl_2} \longrightarrow N_2 + 6NH_4Cl$

(ii) (a) $CaCO_3 + 2HCl \longrightarrow CaCl_2 + H_2O + CO_2\uparrow$

(b) $C + 2H_2SO_4 \longrightarrow CO_2 + 2H_2O + 2SO_2\uparrow$

Caution

↪ *Be precise in your answer and read question carefully.*

(iii) (a) Cation is obtained by the loss of electron(s), so, the number of protons is more than electrons in a cation. Hence, electrons are strongly attracted by the nucleus and are pulled inward and the size decreases.. Thus, the cation is always smaller than the parent atom.

(b) Anion is obtained by the gain of electron(s), so, the number of electrons is more than number of protons in an anion. The effective positive charge in the nucleus is less, so less inward pull is experienced and the size expands. Thus, anion is aways larger than parent atom.

(c) The size of the atoms of inert gases are bigger because the outer shell of inert gases is complete. They have the maximum number of electrons in their outer most orbit, so, the electronic repulsions are maximum.

(iv) (a) 2

(b) covalent

(c) electrostatic

4. (i) (a) Stainless steel : 73% Fe, 18% Cr, 8% Ni, 1% C

(b) Bronze : 80% Cu, 18% Sn, 2% Zn

(ii) (a) $\underset{1\text{ VoL}}{H_2} + \underset{1\text{ VoL}}{Cl_2} \longrightarrow \underset{2\text{VoL}}{2HCl}$

∵ 1 volume of chlorine reacts with 1 volume of hydrogen

∴ 4 litres of chlorine reacts with $\frac{1}{1}\times 4$ l of hydrogen

So, Hydrogen used = 4 litres

Remaining hydrogen = 6 – 4 = 2 litres

∵ 1 volume of chlorine forms 2 volume of HCl

∴ 4 litres of chlorine forms = $\frac{2}{1}\times 4 = 8$ l of HCl

Hence, gases after reaction, 8 l HCl and 2l hydrogen i.e. 10 litres.

When water is added to the gases formed, HCl dissolves and residual gas is 2 litres of hydrogens.

(b) Empirical formula of compound = CH

Empirical formula mass = 12 + 1 = 13

Vapour density = 39

Relative molecular mass = Vapour density × 2

= 39 × 2 = 78

$$n = \frac{\text{Relative molecular mass}}{\text{Empirical formula mass}}$$

$$= \frac{78}{13} = 6$$

∴ Molecular formula of compound = Empirical formula × n

= CH × 6

= C_6H_6

(iii) (a) Dirty green precipitate is formed which is insoluble in excess of NH_4OH solution.

(b) Reddish brown precipitate is formed which is insoluble in excess of NH_4OH solution.

(c) White precipitate is formed which is insoluble in excess of NH_4OH solution.

Caution

↪ *Do practice for such reactions and also know about the particular colour of precipitate formed.*

(iv) (a) Nitric acid

(b) $3Cu + 8HNO_3 \xrightarrow[\text{dilute}]{\text{Cold and}} 3Cu(NO_3)_2 + 4H_2O + 2NO$

(c) Oxidising property

5. (i)

Name of process	Inputs	Equation	Output
Ostwald process	Ammonia + Air	$4NH_3 + 5O_2 \xrightarrow[700-800^\circ C]{Pt} 4NO + 6H_2O + \text{heat}$ $2NO + O_2 \xrightarrow{50^\circ C} 2NO_2$ $4NO_2 + 2H_2O + O_2 \rightarrow 4HNO_3$	Nitric acid

(ii) (a) Pb^{2+} ion (Lead ion)

(b) Cu^{2+} ion (Cupric ion)

(iii) (a) $\underset{\text{Methane}}{CH_4} \xrightarrow[\text{Diffused sunlight, HCl}]{Cl_2} CH_3Cl \xrightarrow[\text{Diffused sunlight, HCl}]{Cl_2}$

$CH_2Cl_2 \xrightarrow[\text{Diffused sunlight, HCl}]{Cl_2} \underset{\text{Chloroform}}{CHCl_3}$

(b) $\underset{\text{Ethyne (Alkyne)}}{HC{\equiv}CH} + H_2 \xrightarrow{Ni} \underset{\text{Ethene (Alkene)}}{H_2C{=}CH_2}$

(c) $\underset{\text{Ethene (Alkene)}}{H_2C{=}CH_2} + H_2 \xrightarrow{Ni} \underset{\text{Ethane (Alkane)}}{H_3C{-}CH_3}$

(iv) (a) Yellow solid is obtained.

(b) Yellow coloured liquid is obtained.

(c) White precipitate is obtained.

6. (i) (a) Electrolytes which allow a large amount of electricity to flow through them are called strong electrolytes.

(b) The process by which polar covalent compounds are converted into ions, in aqueous solution, is called ionisation.

(ii) $\underset{\substack{2\text{ VoL}\\100\text{ cm}^3}}{2C_2H_2} + \underset{5\text{ VoL}}{5O_2} \longrightarrow \underset{\substack{4\text{ VoL}\\200\text{ cm}^3}}{4CO_2} + \underset{2\text{ VoL}}{2H_2O}$

∴ 2 volumes = 100 cm^3

1 volume of acetylene = $\frac{100}{2} = 50$ cm^3

Volume of oxygen react

5 volumes of oxygen react = 5 × 50

= 250 cm^3

∴ Volume of oxygen required for combustion = 250 cm^3

(iii) (a) Lead oxide

(b) Silver chloride

(c) Ammonium nitrate

(iv) (a) $\underset{\text{Glucose}}{C_6H_{12}O_6} \xrightarrow{\text{conc}H_2SO_4} 6C + 6H_2O$

(b) $NaCl + \underset{\text{Conc.}}{H_2SO_4} \longrightarrow NaHSO_4 + HCl$

(c) $S + 2\underset{\text{Conc.}}{H_2SO_4} \longrightarrow 3SO_2 + 2H_2O$

7. (i)

Element	Percentage composition	Atomic mass	Atomic ratio	Simplest ratio
C	40	12	$\frac{40}{12} = 3.3$	$\frac{3.3}{3.3} = 1$
H	6.7	1	$\frac{6.7}{1} = 6.7$	$\frac{6.7}{3.3} = 2$
O	53.3	16	$\frac{53.3}{16} = 3.3$	$\frac{3.3}{3.3} = 1$

Empirical formula = CH_2O

Empirical formula mass = $12 + 1 \times 2 + 16 = 30$

Molecular mass = 60

$$n = \frac{\text{Molecular mass}}{\text{Empirical formula mass}}$$

$$= \frac{60}{30} = 2$$

∴ Molecular formula = Empirical formula × n

$= CH_2O \times 2$

$= C_2H_4O_2$

Caution

↳ *Learn and understand the rules for determining the empirical formula of a compound.*

(ii) (a) $\underset{\text{Bromo ethane}}{C_2H_5Br} + \underset{\text{alcoholic (Hot and conc.)}}{KOH} \rightarrow \underset{\text{Ethene}}{C_2H_4} + \underset{\text{Potassium bromide}}{KBr} + \underset{\text{Water}}{H_2O}$

(b) $\underset{\text{Ethanol}}{C_2H_5OH} \xrightarrow[170°C]{\text{Conc}H_2SO_4} \underset{\text{Ethene}}{C_2H_4} + \underset{\text{Water}}{H_2O}$

(iii) (a) Acidified water (water + dil. H_2SO_4)

(b) $H^+, OH^-, SO_4^{2-}, H_2O$

(c) $OH^- \longrightarrow OH + e^-$

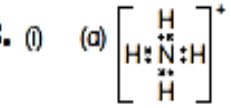
$OH + OH \longrightarrow H_2O + O$

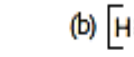
$O + O \longrightarrow O_2$

(iv) (a) When we add alkaline solution or a base to solution of pH 7, then its pH increases.

(b) An alkaline solution changes red litmus to blue, it means its pH is greater then 7.

(c) Its pH is less than 7. It means it is an acidic solution that liberates CO_2 from Sodium carbonate.

8. (i) (a) 

(b) 

Caution

↳ *Ask students to differentiate between electrons of unlike atoms. Lay emphasis on writing the positive charge or negative charge on the ion as required.*

(ii) (a) Sulphur dioxide

Explanation:

$K_2SO_3 + 2HCl \longrightarrow 2KCl + H_2O + SO_2\uparrow$

(b) Chlorine

Explanation:

$MnO_2 + \underset{\text{conc.}}{4HCl} \xrightarrow{\Delta} MnCl_2 + 2H_2O + Cl_2\uparrow$

(iii) (a) Left electrode is oxidising electrode i.e. anode as it is attached to positive terminal.

(b) $CuSO_4 \rightleftharpoons Cu^{2+} + SO_4^{2-}$

$H_2O \rightleftharpoons H^+ + OH^-$

(c) Reddish brown copper is deposited at cathode.

(iv) (a) Electronic configuration of element = 2,8,8,2

Number of valence electrons = 2

∴ Group number = 2

(b) Number of shells in the element = 4

∴ Period number = 4

(c) Number of valence electrons = 2

∴ Valency = 2