Question 1

A) Choose the correct answer :

1) picric acid gives the skin a ………….. colour.

a) red   b) yellow   c) green   d) black

2) The magnetic quantum number defines ……… .. .

a) the type of electron movement around its axis .

b) the number of electrons in the sublevel .

c) the number of the sublevels in the principal level .

d) the number of orbitals in the sublevel .

3) sodium metal is extracted in the industry by electrolysis of
   ………. .

a) caustic soda solution

b) molten sodium chloride .

c) molten sodium oxide .

d) sodium chloride solution .

4) Surgical threads are manufactured from ………. .

a) polyethlene   b) poly propylene

c) Teflon   d) poly vinyl chloride

5) The bonds in methane molecule are formed by the overlap

Of the orbitals ………….. .

a) S with SP^3 b) S with SP^2

c) S with SP   d) SP with SP

6) To precipitate one gram/atom of a trivalent metal in solution of one of its salts, the quantity of electricity needed equals ……….coulomb .

a) 9650   b) 96500

c) 189000   d) 289500

B) How can you obtain (Benzoic acid) from (Benzene),write

The symbolic equations and state the conditions of the Reaction .

Question 2

A) Write the scientific term for each of the following :

1) The minimum amount of energy that must be gained

By a molecule to react at collision .

2) The Tendency of an atom to attract the electrons of the

Chemical bond to itself .

3) Hydrolysis of esters in alkaline medium .

4) The quantity of electricity consumed on passing a current

With strength of one ampere through a conducting solution

For time of one second .

5) The reaction of Alcohols with carboxylic acids in the presence Of a dehydrating agent .

B) Lead acid battery and alkaline nickel-cadmium battery are from galvanic cells.

1) Compare between the two cells related to the type of anode substance.

2) Are the two batteries from primary cells or secondary cells ?

Give reason .

3) Write the total reaction of the Alkaline nickel-cadmium battery.

Question 3

A) Give reasons for the following :

1) chromium is a chemically reactive metal, but it resists the effect of rusting and corrosion.

2) Galvanic cells are reversible cells .

3) thermal decomposition of copper (II) nitrate is a complete reaction .

4) potassium superoxide is used to purify the atmosphere of submarines .

B) Mention one use for each of the following :

1) Ferromanganese alloy   2) Molasses

C) Calculate the volume of sulphuric acid solution where its concentration is 0.05 mole/liter and contains

3.92 gm of acid $\left[H=1, \quad S=32, \quad O=16 \right]$

Question 4

A) Write the structural formula of each of the following :

1)Ester triglyceride   2) fructose

3) Citric acid   4)2-methyl-2-propanol

B) Show by symbolic equation how can obtain each of the following ,state the reaction conditions :

1) Sodium ethoxide from ethanol .

2) Iron (III) oxide from siderite .

3) chlorotoluene from benzene .

4) Reduction of iron (III) oxide in Midrex furnace .

Question 5

A) Mention the composition of the salt bridge of a galvanic cell and state its functions.

B) Using the following :

Quick lime – chloroform – calcium carbide – slaked lime – caustic soda – ammonium chloride – chlorine gas – water – copper sulphate solution .

How can you prepare the following compounds , write the symbolic equations and state the conditions of each reaction :

1) Ammonia gas .

2) Carbon tetrachloride .

3) Ethyne gas .

Question 6

A) What is meant by each of the following :

1) Addition polymerization .

2) subsidiary Quantum number .

3) coordinate bond .

4) catalytic hydration of alkynes .

B) The following experiments were carried out on two solutions:

1) Adding sodium hydroxide to the first solution , a blue precipitate was formed and changed by heating into black .

2) Adding caustic soda solution to the second solution , a white

Precipitate was formed which dissolved i n excess of caustic soda solution .

C) In the following equilibrium reaction :

$N_2(g) + O_2(g) \rightleftharpoons 2NO(g) - Energy$.
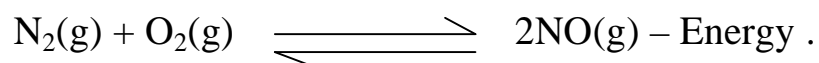
What are the Effects of heat, pressure and concentrations of the

Reactants on the quantity of produced (nitric oxide).

D) Calculate the number of hydroxide ion s [OH$^-$] produced from the solubility of 4 grams sodium hydroxide in water
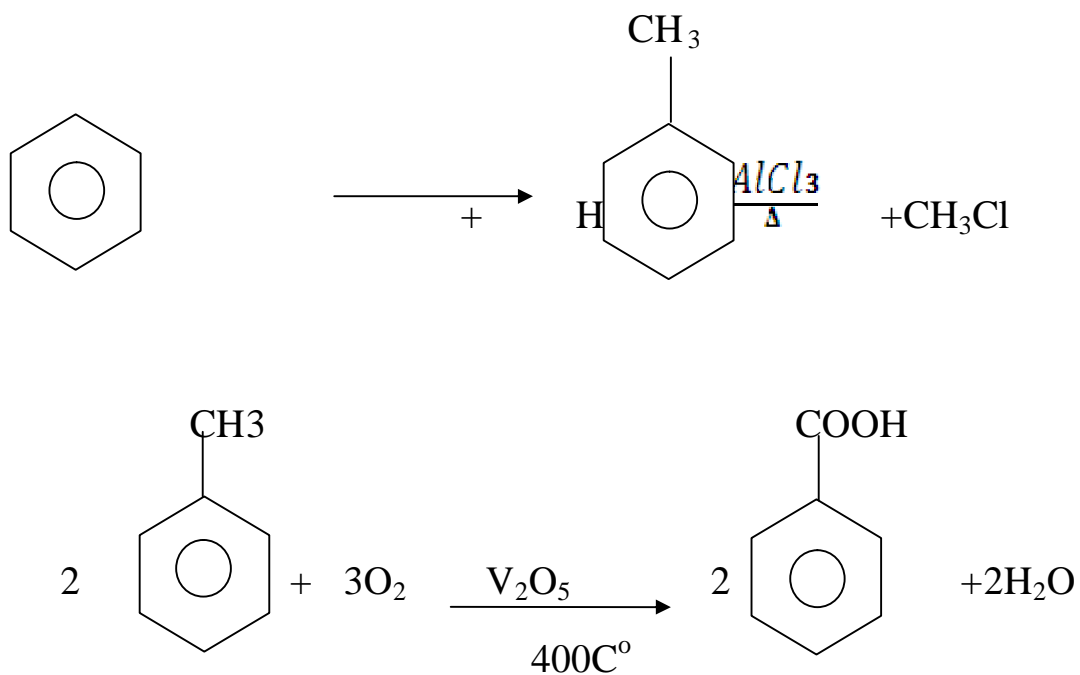
[Na = 23,O = 16,H = 1]

The Guide Answers

Question 1

10 marks   (A) 6marks, (B) 4 marks.

A) (1) b   (2) d   (3) b

   (4) c   (5) a   (6) d

B) (Benzoic acid) from (Benzene) :

$$\text{Benzene} + \xrightarrow{\quad\quad} \text{H} - \overset{CH_3}{\underset{}{\bigcirc}} \xrightarrow[\Delta]{AlCl_3} + CH_3Cl$$

$$2\,\overset{CH3}{\bigcirc} + 3O_2 \xrightarrow[400C^o]{V_2O_5} 2\,\overset{COOH}{\bigcirc} + 2H_2O$$

Question 2 10 marks   (A) 5marks , (B) 5 marks .

A) 1- Activation energy.

2- Electro negativity.

3- Saponification.

4- Coulomb.

5- Ester formation.

B) 1-* Lead-acid battery : the Anode is network of lead filled with spongy lead (pb).

*Alkaline nickel- cadmium battery : the Anode is the cadmium.

2- The batteries are secondary cells , Because they can be Recharged.

3- $2NiO (OH)+ Cd + 2H_2O \underset{\text{charge}}{\overset{\text{discharge}}{\rightleftharpoons}} 2Ni(OH)_2+ Cd(OH)_2$
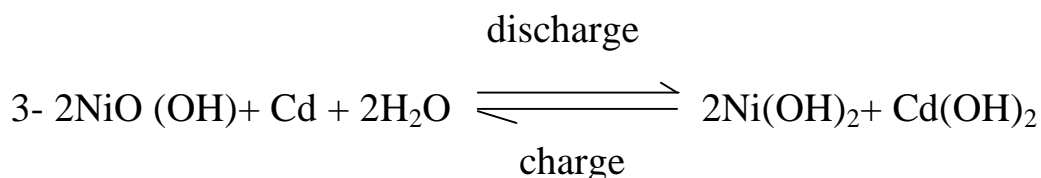
Question 3 10 marks (A) 6 marks , (B) 2 marks , (C)2 marks.

A) 1- Due to the formation of a non- porous oxide layer on the surface of the metal , which prevents further reaction with Air-oxygen and resists corrosion and rusting .

2- If the Galvanic cell is connected to outside e lectrical source with an amount of electricity greater than the original cell , the spontaneous reaction that was taking place is reversed .

Where the oxidation reaction is reversed to reduction and the reduction to oxidation .

3- The Reaction proceeds in one direction , Because the products (NO_2gas) and (O_2gas) escapes from the system and can not Combine with each other .

4- Because potassium superoxide reacts with CO_2 to give oxygen as the equation :

$$4KO_2 + 2CO_2 \xrightarrow[\text{catalyst}]{CuCl_2} 2K_2CO_3 + 3O_2$$
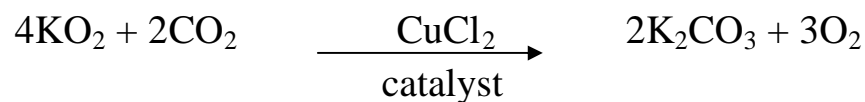
B) 1- Ferromanganese alloy (Fe , Mn , C) is added during the conversion of pig iron into steel , where (Mn) combines with Oxygen in the iron to prevent the formation of gas bubbles in the steel .

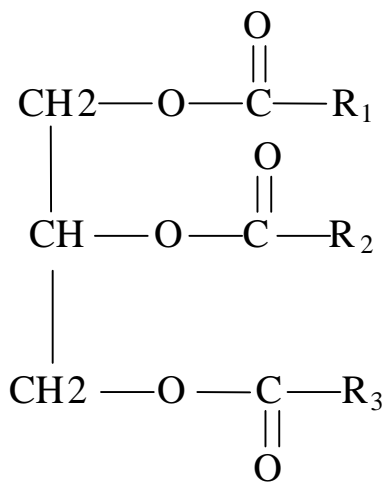 2- preparation of ethanol in industry .

C) 1 mole of $H_2SO_4 = 2 + 32 + (4 \times 16) = 98$ gm   .

$= 0.04$ mole   No of Moles $= \dfrac{3.92}{98}$

$=0.8$ liter .   The volume of the acid $= \dfrac{0.04}{0.05}$

Question 4 10 marks (A) 4marks , (B) 6 marks .

A) 1- Tri glyceride ester

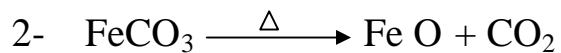$$\begin{array}{l} CH2\!-\!O\!-\!\overset{\displaystyle O}{\overset{\|}{C}}\!-\!R_1 \\ \quad | \qquad\quad \overset{\displaystyle O}{\overset{\|}{}} \\ CH\!-\!O\!-\!\overset{\|}{C}\!-\!R_2 \\ \quad | \\ CH2\!-\!O\!-\!\underset{\underset{\displaystyle O}{\|}}{C}\!-\!R_3 \end{array}$$

  2- Fructose

$$\begin{array}{l} CH_2OH \\ \quad | \\ C=O \\ \quad | \\ (CHOH)_3 \\ \quad | \end{array}$$

$$CH_2OH$$

3- citric acid

$$H—C—COOH$$
$$HO—C—COOH$$
$$H—C—COOH$$

with H on top and H on bottom

4- 2-methyl-2-propanol

$$H_3C—C—CH_3$$
with CH_3 on top and OH on bottom

B) 1- $2C_2H_5OH + 2Na \longrightarrow 2C_2H_5ONa + H_2$
(ethanol)   (sodium ethoxide)

2- $FeCO_3 \xrightarrow{\Delta} Fe\,O + CO_2$

$4FeO + O_2 \xrightarrow{\Delta} 2Fe_2O_3$

3- (Benzene) $+ CH_3Cl \xrightarrow[\triangle]{Alcl_3}$ (toluene) $+ HCl$

2 (CH$_3$) $+ 2Cl_2 \xrightarrow{Fe}$ (ortho chloro toluene) $+$ (Para chloro toluene) $+ 2HCl$

4- $2Fe_2O_3 + 3CO + 3H_2 \xrightarrow{\triangle} 4Fe + 3CO_2 + 3H_2O$
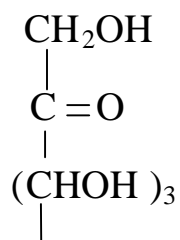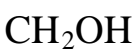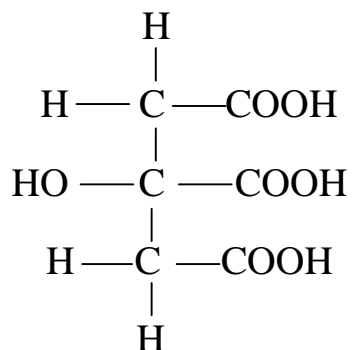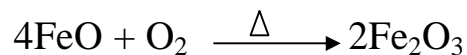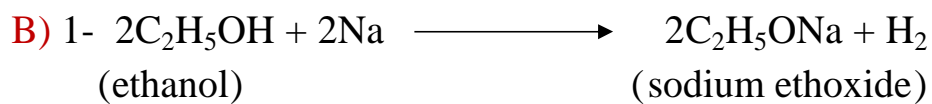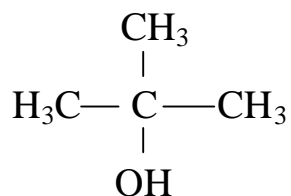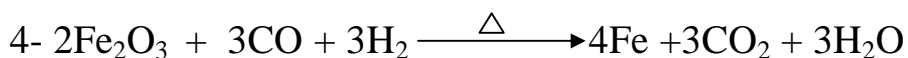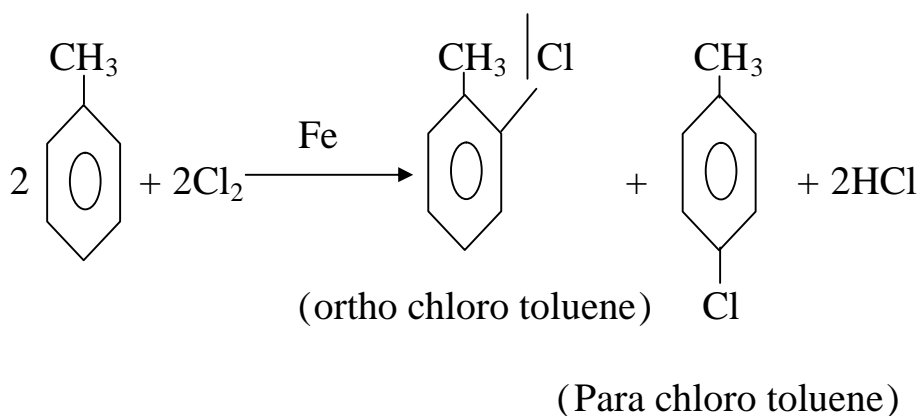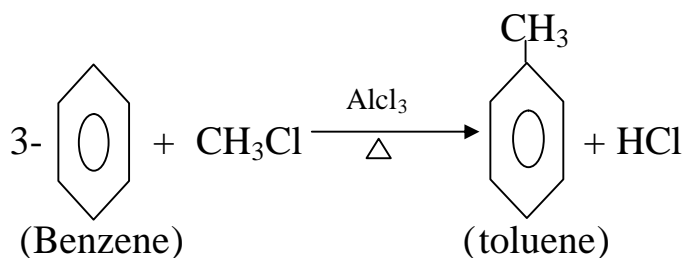
Question 5 10 marks (A) 4marks , (B) 6 marks .
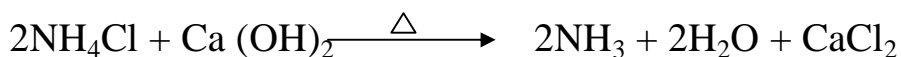
A) *The composition of the salt bridge:

it is made of a porous "U" shaped Tube , containing an electrolyte solution which does not react with either solutions in the half cells.

*The Function of the salt bridge:

It permits the passage of the ions in the two solutions of the half cells through it , and prevents saturation in either half cell with excess positive or negative ions.
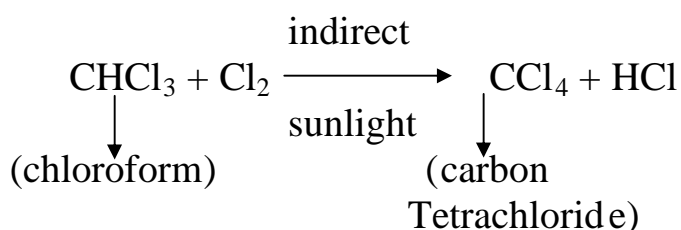
B) 1- preparation of Ammonia gas:
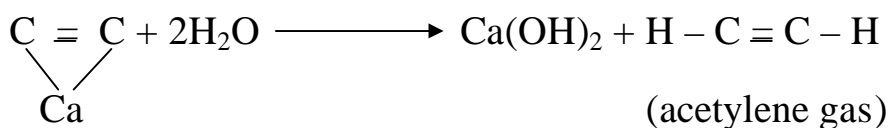
Ammonium chloride, slaked lime and quick lime are used:

$$2NH_4Cl + Ca(OH)_2 \xrightarrow{\triangle} 2NH_3 + 2H_2O + CaCl_2$$

2- preparation of CCl_4 :

Chloroform and chlorine are used:

$$CHCl_3 + Cl_2 \xrightarrow[\text{sunlight}]{\text{indirect}} CCl_4 + HCl$$

(chloroform)   (carbon
                                  Tetrachloride)

3- preparation of acetylene gas:

Water and calcium carbide , the produced gas passing over copper sulphate solution.

$$\underset{Ca}{C \equiv C} + 2H_2O \longrightarrow Ca(OH)_2 + H - C \equiv C - H$$
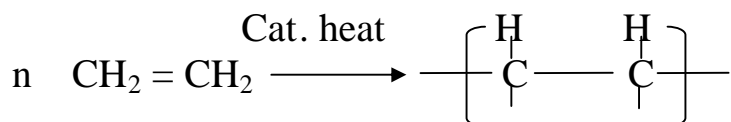
(acetylene gas)

Question 6

10 marks (A) 4marks , (B) 2 marks , (C)2 marks,(D)2Marks.

A) 1) Addition polymerization :

It takes place by adding a huge number of unsaturated small molecules to each other to form a very large molecule such as formation of (polyethylene)

$$n \ CH_2 = CH_2 \xrightarrow{\text{Cat. heat}} \begin{bmatrix} H & H \\ | & | \\ C & - C \\ | & | \end{bmatrix}$$

2) subsidiary Quantum number :

It indicates the number of energy sublevels with each principal energy level.

3) coordinate bond :

It is a chemical bond between two atoms , where a lone pair of electrons occupying one orbital found in one atom called (the donor atom) is donated to another atom having a vacant orbital called (acceptor atom) to reach a stable electronic configuration.e.g.hydronium ion $(H_3O)^+$

$$H - \overset{..}{O} : + H^+ \longrightarrow \left[H - \overset{..}{O} - H \right]^+$$
$$\underset{H}{|} \qquad\qquad\qquad \underset{H}{|}$$
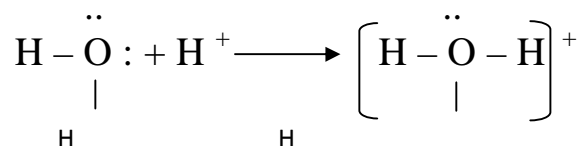
4) catalytic hydration of alkynes :

B) Effect of temperature:

The increases of the reaction temp. , increases the Quantity of number formed.

Effect of pressure:

It has no effect , because the reaction does not accompanied by increases or decreases in the number of molecules .
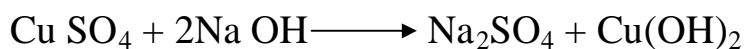
Effect of concentration:

The increase in concentration of the reactants increases the Quantity of number produced.

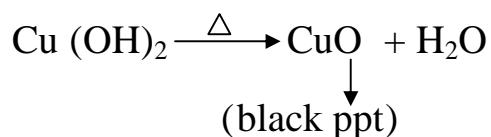C) 1 mole Na OH $= 23 + 16 + 1 = 40$ g.

$$= 0.1 \text{ mole} . \frac{4}{40} \qquad \text{No of moles} =$$

No of (OH^-) ions $= 0.1 \times 6.02 \times 10^{23} = 0.602 \times 10^{23}$ ions

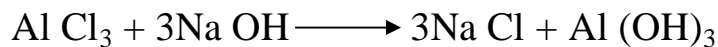D) 1- The first solution contains copper II (Cu^{+2}) cation.

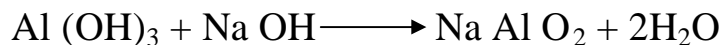$$Cu\,SO_4 + 2Na\,OH \longrightarrow Na_2SO_4 + Cu(OH)_2$$

$$(\,blue.ppt\,)$$

$$Cu\,(OH)_2 \xrightarrow{\triangle} CuO + H_2O$$

$$\downarrow$$

$$(black\ ppt)$$

2- The second solution contains (Al^{+3}) cation.

$$Al\,Cl_3 + 3Na\,OH \longrightarrow 3Na\,Cl + Al\,(OH)_3$$

$$(\,white\ ppt)$$

$$Al\,(OH)_3 + Na\,OH \longrightarrow Na\,Al\,O_2 + 2H_2O$$

$$(\,sod.meta\ aluminate\,)$$