يقوم الطالب بحل جميع الأسئلة التالية باهتمام وتركيز

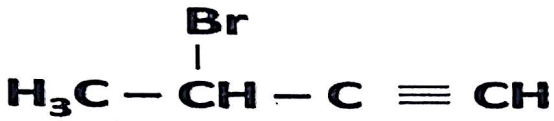
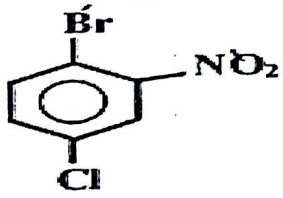
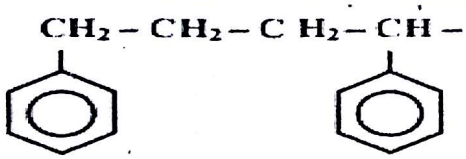
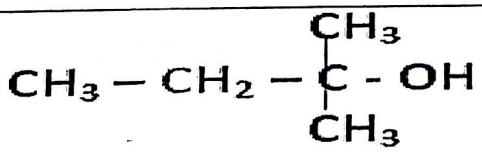
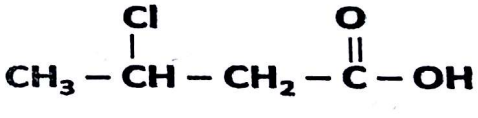
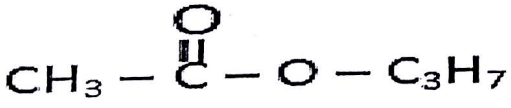
ثم مراجعة مذكرات **Pre-test** الستة لتذكر المعلومات المعتادة

ثم مراجعة مذكرات **Revision** الستة لتذكر أفكار الأسئلة

CHAPTER FIVE

ORGANIC CHEMISTRY

[[Q1]]Write the name of the following compounds according to IUPAC system:-

1) 	2) 
3) 	4) $CHClBr - CF_3$
5) $CH_3 - CHCl - CH_2 - C(CH_3)_3$	6) $CH_3 - CH = CH - CH_2 - CH_2\,Cl$
7) 	8) 
9) 	10) $C_2H_5COO\text{-}C_6H_5$

[[Q1-b]]Compare between Marookh oil & aspirin in: ***

Preparation of each one - Structural formula -Two functional groups in each one

[Q2] Complete the following table :-

		1) name of the functional group	2) to which class of hydrocarbon derivative these functional group are related from A to G
A	-OH	Hydroxyl	Alcohols & phenols
B	-CHO	Formyl	Aldhydes
C	-O-	etherial	Ethers
D	-COO-R	ester	Esters
E	-COOH	carboxyl	Carboxylic Acids
F	-CO-	Carbonyl	Ketones
G	$-NH_2$	Amino	Amines

3) **Which functional group of them… :**

1-gives effervescence with Na_2CO_3 salt.(…C.O.O.H……)

2-reacts with ammonia giving alcohol & amide of acid. (…Co.o.R……)

3-produced from oxidation of secondary alcohol (…..Co……)

4) **Give names of two compounds (X) & (Y)** both contain functional group (C)

(X) is isomer of ethanol ….Dimethyl….ether… CH_3-O-CH_3

& (Y) is produced from dehydration of ethanol at 140°C .diethyl….ether……

5) **Show by equation in one step the following :**

I-Convert compound contain functional group E to compound contain functional group A.

II-Convert compound contain functional group A to compound contain functional group D

Answers of no. 5): …

I- $CH_3COOH_{(aq)} + 2H_{2(g)} \xrightarrow[200\,^{\circ}C]{CuCrO_4} C_2H_5OH_{(v)} + H_2O_{(v)}$

Acetic acid — ethyl alcohol

II- $CH_3-\overset{O}{\overset{\|}{C}}-OH_{(L)} + HOC_2H_5{}_{(L)} \xrightarrow{Conc.\ H_2SO_4} CH_3-\overset{O}{\overset{\|}{C}}-OC_2H_5{}_{(aq)} + H_2O_{(L)}$

Acetic acid — Ethanol — Ethyl acetate (ester)

[Q3] **Choose the proper answer:**

1) All the following molecular formula may be for cyclic compounds except:

a) C_6H_{12} b) C_6H_6 c) C_4H_8 d) C_5H_{12}

2) The simplest cycloalkane contains ..... atoms.

a) 3 b) 9 c) 10 d) 12

3) The functional group for carbolic acid is ....

a) $>C=O$ b) $-NH_2$ c)- COOH d) -OH

4) .... are considered from ketones

a) Teflon and Freon b) Dacron & insulin

c) acetone & fructose d) picric acid & carbolic acid

5) Which of the following compounds has the highest boiling point?

a) $HCOOCH_3$ b) CH_3CH_2OH c) $CH_3C\equiv CH$ d) CH_3OCH_3

6) The structural formula of hydrocarbon where one mole of it burns completely in excess amount of oxygen to produce 4 moles of water is ....

a) C_8H_{10} b) C_4H_8 c) C_3H_6 d) C_5H_{10}

7) Aromatic hydrocarbon used to obtain explosive substance by its nitration is ....

a) glycerol b) toluene c) phenol d) b & c are correct

8) The number of double bonds between carbon atoms in one molecule of organic acid its molecular formula is $C_{18}H_{32}O_2$ is ....

a) 14 b) 3 c) 2 d) 1

9) On adding 2 moles of hydro-bromic acid to propyne, ... is formed.

A- 1,2-dibromo-propane B- 1,2-dibromo-propene

C- 2,2-dibromo-propane D- 2,2-dibromo-propene

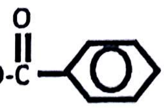
10) The simplest ketone .....

a- its formula CH_3COCH_3 b-called acetone by IUPAC system

c-contains carbinol group d- all the previous

Common Name Acetone

[[Q4]] Correct underlined words then complete :

1-The compound CH_3-CH_2-O-  is called according to IUPAC by <u>phenyl propanoate</u> , (Ethyl Benzoate) &

prepared by reaction between Ethyl alcohol & Benzoic Acid in the presence of

dry HCl .... to absorb water & prevent backward reaction according to Le-chatelier

2- The formula $C_7H_6O_2$ has two isomers, one of them is ester called Phenyl formate .

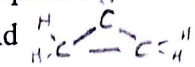
& the other is acid that called <u>catechol</u>. (Benzoic Acid)

3- The formula $C_2H_2O_4$ represents dibasic aliphatic acid , number of carbon atoms in it = number of

Carboxyl Groups .... that called <u>phethalic acid</u> (Oxalic Acid)

[[Q5]] Two organic compounds (A) and (B), each of them contains three carbon atoms and their general formula (C_nH_{2n}):

The compound (A) is an aliphatic unsaturated compound $CH_3-CH=CH_2$

The compound (B) is an aliphatic cyclic compound 

1. Write the structural formula of the compound (A) and what is the product of adding HBr to it ?

$CH_3-CH=CH_2 + HBr \longrightarrow CH_3-CHBr-CH_3$

2. Write the structural formula of the compound (B) , How could you explain the high chemical reactivity of this compound compared to the normal alkane having the same number of carbon atoms. Due to Smaller angle 60° in cyclo propane

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[[Q6]] Write the scientific name:-

1) Reaction between ethene with hydrogen peroxide to form ethylene glycol. oxidation of Alkene

2) Organic compound consists of the active group (functional) – CH_2 – OH primary alcohol

3) The reaction of benzene with methyl chloride in the presence of a catalyst. Fridle craft Reaction

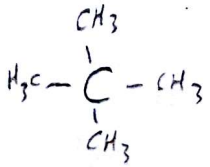
4) saturated aliphatic hydrocarbons its general formula C_nH_{2n}. cyclo Alkane

5) An isomer of phenyl acetate compound. methyl Benzoate

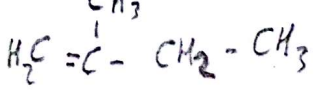
6) Ester contains two carbon atoms methyl formate

[[Q7]] Write the structural formula of :

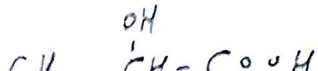
1) Alkane contains 5 carbon atoms and doesn't contain any methylene groups.



2) Alkene contains 5 carbon atoms by hydration it produces tertiary alcohol



3) Lactic acid & its effect

 Causes muscle Constriction

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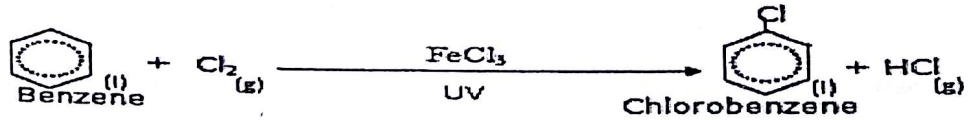
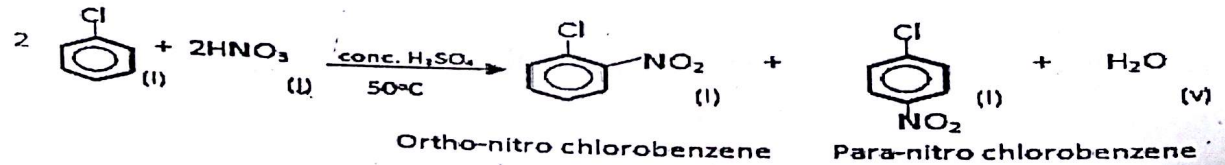
[[Q8]] Show by equations how to obtain :

Ortho and Para nitro chloro benzene from benzene

Ans:

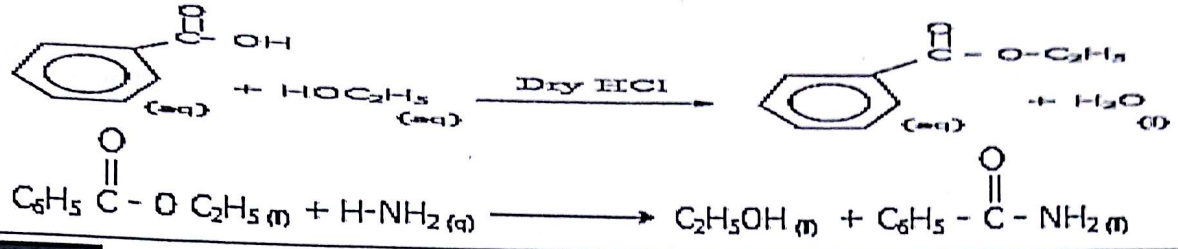




[[Q9]] show by balanced chemical equations how the following can be carried out:

Benzoic acid into benzamide. ***

Ans:



$$C_6H_5C(=O)OC_2H_5\ (l) + H\text{-}NH_2\ (g) \longrightarrow C_2H_5OH\ (l) + C_6H_5C(=O)NH_2\ (l)$$

[[Q10]] **Correct underlined words then complete :**

1-The compound $(HCOO)_2Ca$ called **calcium oxalate** (formate) & can be prepared from neutralization between Calcium hydroxide & formic acid

2-Aromatic acid contains two different functional groups , make effervescence with $NaHCO_3$ & gives also white ppt with bromine water , this acid called **lactic** (Salicylic) acid & its molecular formula is $C_7H_6O_3$ & IUPAC name is 2-Hydroxyl Benzoic Acid

3-Acetic acid prepared in industry by **one method** (two) that is A- Biological method / B- Catalytic hydration of ethyne (oxidation)

* 4- Toluene can be oxidized by air in presence of V_2O_5 as catalyst at 400°C to give **acetic acid** (Benzoic).

[[Q11]] **Arrange the following in ascending order according to the property between brackets with explain your answer:-**

1) aqueous solution of → sodium ethoxide – ethanol – acetic acid (PH)

(3) (2) (1)

2) phenol – acetic acid - ethanol -benzoic acid (acidity)

3) cyclobutane – cyclopropane – cyclohexane (chemical activity)

4) benzene – diphenyl – naphthalene (according to un-saturation)

5) ethanoic acid – ethanol – ethyl ethanoate (boiling point)

7) glycerol – ethanol – ethylene glycol - sorbitol (boiling point)

8) citric – lactic – oxalic (basicity)

[[Q12]] how can you differentiate practically between:-

1) propane & propene gas.

2) acetic acid and ethanal

3)Phenol and acetone

4)2-propanol and 2-methyl-2-propanol

Ans

1) Exp	propane	propene
+ Bromine dissolved in carbon tetrachloride	No reaction	Red color of Br_2 removed.

2) EXP.	Acetic acid	ethanal
By acidity test: Add Na_2CO_3 or $NaHCO_3$ to both	Effervescence and evolution of CO_2 gas which turns lime water turbid.	No reaction

3) EXP.	Phenol	acetone
By adding drops of $FeCl_3$	Violet color appear	No reaction

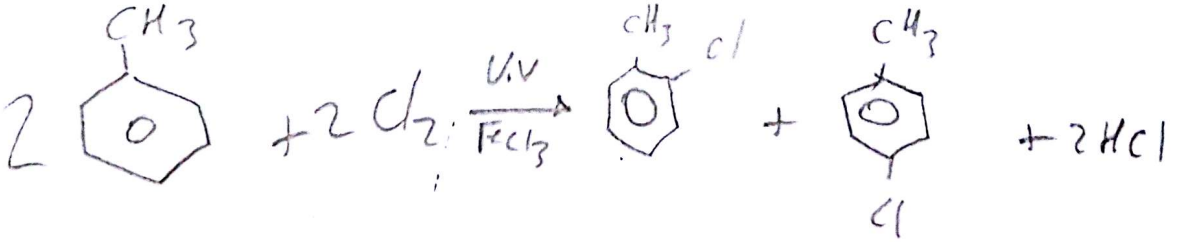
4) EXP	2 -propanol	2-methyl -2-Propanol
Add potassium perminganate acidified by H_2SO_4,.	Violet colour is removed, then smell of acetone appears.	No reaction

Q]] How you can differentiate practically between two aliphatic compounds one of them contain functional group (-OH) & the other contain (-COOH) Acidity test Na_2CO_3

[[Q13]] Correct underlined words then complete :

1-Alcohols are neutral compounds but have weak acidic character specially when react with ..Active metals.. of Hydrogen Hydroxyl That replace **hydroxyl group** & gives ..Sodium Alkoxide.. & hydrogen gas

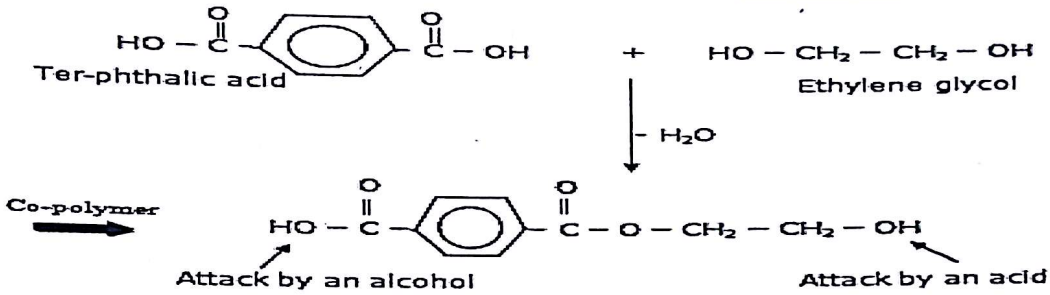
2-Catalytic reforming of normal heptane then chlorination the product gives ortho & para chloro toluene **meta chloro phenol** according to equation :.....



[[[Answered questions in Ch.5 for studying]]]

Q17]] Write the chemical equation that represents the esterification reaction between a dibasic organic acid & a dihydric alcohol. ***

Ans: Reaction of terphethalic acid with ethylene glycol by esterification. **[to prepare dacron fibers]**



[[Q18]] Glycerol is important organic compound which is used in many medical application.

1) For which organic class does glycerol related.

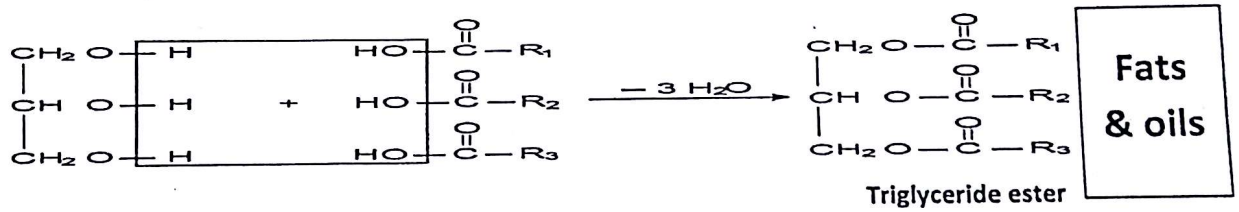
2) Mention the types of carbinol groups found in glycerol? What is the product of oxidation of each group.

3) write a chemical equation that shows reaction of glycerol with:- acetic acid in presence of sulphuric acid.

Ans: 1) Trihydric alcohol.

2) two of **primary carbinol** groups [that are oxidized into aldehyde then carboxyl groups]
& one **secondary carbinol** group .[that oxidized into ketone group]

3) *****



Then replace each alkyl radical (R-) by (CH_3-)

[[Q19]] Arrange the following steps to obtain each of: ***

1) picric acid from sodium benzoate

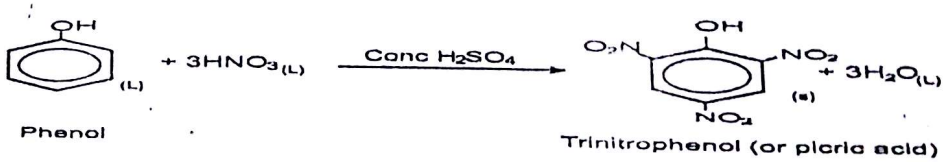
(Nitration – halogenation – alkaline hydrolysis – dry distillation)

Ans

1) dry distillation :- $C_6H_5COONa_{(s)} + NaOH_{(s)} \xrightarrow{CaO/\Delta} C_6H_{6(l)} + Na_2CO_{3(s)}$

Halogenations:- $C_6H_{6(l)} + Cl_{2(g)} \xrightarrow[UV]{FeCl_3} C_6H_5Cl_{(l)} + HCl_{(g)}$ (Benzene → Chlorobenzene)

Alkaline hydrolysis:- $C_6H_5Cl_{(l)} + NaOH_{(aq)} \xrightarrow{300\,^\circ C\ /\ 300\ atm} C_6H_5OH_{(v)} + NaCl_{(aq)}$ (Chlorobenzene → phenol)

Nitration 

2)Methane from calcium carbide

(Oxidation – dry distillation – catalytic hydration – neutralization – dropping water)

Ans

2) Dropping water:- $CaC_{2\,(s)} + 2H_2O_{(L)} \xrightarrow{\text{drops}} C_2H_{2\,(g)} + Ca(OH)_{2\,(aq)}$

Catalytic hydration:- $C_2H_{2\,(g)} + H_2O_{(L)} \xrightarrow[H_2SO_4\ 40\%]{HgSO_4\ /\ 60^oC} CH_3CHO_{(L)}$

oxidation :- $CH_3CHO_{(L)} \xrightarrow{(O)} CH_3COOH_{(L)}$

Acetaldehyde — Ethanoic acid

Neutralization $CH_3COOH_{(aq)} + NaOH_{(aq)} \rightarrow CH_3COONa_{(aq)} + H_2O_{(L)}$

dry distillation $CH_3COONa_{(s)} + NaOH_{(s)} \xrightarrow{CaO\ ,\ \Delta} CH_{4(g)} + Na_2CO_{3(s)}$

[Q15] C_2H_6O **represents two different organic compounds** ← **One oxygen atom**

1- Mention their names

2-Which one has higher B.P ? & why?

Ans

1) ethyl alcohol, dimethyl ether [draw structure for each compound]

2) ethyl alcohol has higher boiling point due to the presence of polar hydroxyl group which form hydrogen bond between alcohol molecules which increase the boiling point. [draw hydrogen bond between molecules of ethyl alcohol]

[Q16] $C_2H_4O_2$ **represents two different organic compounds** ← **Two oxygen atoms**

1- Mention IUPAC names

2- Which one has higher B.P ? & why?

Ans

1) ethanoic acid , methyl methanoate ester. [draw structure for each compound]

2) ethanoic acid has higher boiling point as it forms 2 hydrogen bonds between acid molecules while methyl methanoate ester as no hydrogen bond formed due to absence of polar hydroxyl group [draw two hydrogen bonds between molecules of ethanoic acid]

used in detection glucose sugar in urine of diabetic.

used in sterilizing mouth & teeth

used in making surgical threads.

Used now as safety anesthetic substance.

used in cosmetics for skin moisturizing

CHAPTER FOUR
ELECTROCHEMISTRY

[[Q1]] Write the scientific term:

1-A chemical reaction occurs by transferring an electron or more from one of the reactants to another. Redox

2-A brief expression to show the oxidation reduction reaction that occurs at both the anode and cathode. Eq.

3- The mass of substance that has the ability to lose or gain one mole of electrons during reaction. Eq. wt

4- Process of immersing steel in zinc to protect it from corrosion. Galvanization process

5-A descending order of the standard +ve oxidation potentials of the elements referring to the standard hydrogen pole.

[[Q2]] giving the following potentials:

a-Zn^{2+} / Zn^0 [-0.762V] R.P

b-Mg^0 / Mg^{2+} [+2.375V] O.P

c-$2Cl^- / Cl_2$ [-1.36V] O.P

d-K^+ / K [-2.924] R.P

e-Pt^{2+} / Pt [1.2V] R.P

	O.P	R.P
	+	−
H	0	0
	−	+

- Which is the strongest oxidizing agent?
- Which is the strongest reducing agent?
- Write the symbolic representation for the galvanic cell that gives highest electrical potential,
- calculate its value of E_{Cell}
- and direction of electrons.

KA m)

- Which element(s) can reduce Mn^{3+} ion into Mn^{2+} ion [E_{red} =-1.029]
- Which element has the highest ability to gain electrons during the chemical reaction?
- which one of the following metals may present in nature in the elemental state

(K –Zn -Pt -Mg)

[[Q3]] Choose iron rust is in electrochemical process in which the cell reaction .....

a) oxidation of iron Fe to Fe^{3+} and the water is reduced to OH^-

b) oxidation of iron to Fe^{2+} and the water id reduced to OH^-

c) oxidation of iron to Fe^{2+} and the oxygen dissolved in water is reduced into OH^-

d) oxidation of iron to Fe^{2+} and the water is reduced to O_2.

Correct underlined words then complete :

Galvanization (Rusting) of iron is process of chemical corrosion of metal by surrounding medium , & this process is slow bec Water contain limited amount of Fe^{2+} ions so its speed increases when Fe^{2+} ions increase

& its total equation is $2Fe + 3H_2O + 3/2\,O_2 \rightarrow 2Fe(OH)_3$

[Q4] Compare between ***

Cathodic protection & anodic protection & explain which one of them is preferred.

Then define sacrificial electrode & mention to which type of protection it belongs.

Ans:

Cathodic protection (cover)

- Is a method in which we coat iron with a layer of less active metal as tin

disadvantage :

- **By scratching the cover** a galvanic cell formed in which iron (anode) & tin (cathode) so, iron corrosion is faster if coated with tin than pure iron .

Anodic protection (cover)

- Is a method in which we coat iron with a layer of more active metal as zinc

advantage :

- **By scratching the cover** a galvanic cell is formed in which zinc (anode) & iron (cathode) so, zinc corrosion takes place at the first completely then iron corrosion will start (after a very long time) (iron corrosion begins at its surface).

Anodic protection is preferred

- **Sacrificial electrode:**

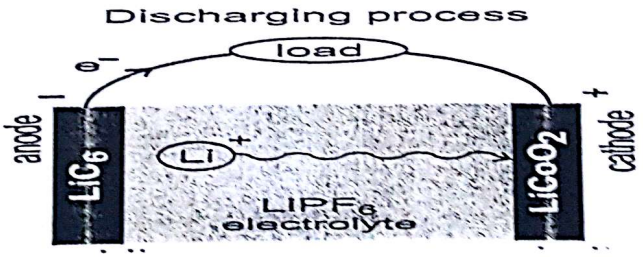
It is a method used to keep bodies of ships in sea water and iron pipes in moist soil from rusting. Due to formation of a galvanic cell in which more active metal like Mg (acts as anode) connected to the less active one; Fe, (acts as cathode) to protect it from corrosion, so corrosion takes place for Mg instead of Fe.

It belongs to anodic protection.

[Q5] 3 Volts are obtained from **Lithium - ion** battery which is important battery that used in mobile phones , laptops & in some modern cars : ***

-Draw its figure during discharging to show its components , then write all equations occur & explain its advantages & using lithium metal in it.

Ans:



at anode : $LiC_{6(s)} \xrightarrow{oxid} C_{6(s)} + Li^{+}_{(aq)} + e^{-}$

at cathode : $CoO_{2(s)} + Li^{+}_{(aq)} + e^{-} \xrightarrow{red} LiCoO_{2(s)}$

sum : $LiC_{6(s)} + CoO_{2(s)} \underset{recharge}{\overset{discharge}{\rightleftharpoons}} C_{6(s)} + LiCoO_{2(s)}$

its advantages

1-light battery

2-can store large amount of energy relative to its small size

3-Using lithium metal because it is:

1) Smallest metal in mass.

2) Smallest metal in reduction potential (- 3.04V).

[Q6] Correct underlined words then complete :

In fuel cell , anode is made of ..... & cathode made of ..... while electrolyte is H_2SO_4 solution & this type of batteries are preferred in spacecrafts due to :.....

[Q7] An electric current of intensity 7A has passed in a chloride solution for 4 minutes. If the cathode mass was 12g before passing the current, and 13.88 g after passing the current. Calculate the equivalent mass of that element.

Ans Mass of element = 13.88 – 12= 1.88g

Mass = (I x t x eq.mass) / 96500

1.88 = (7 x x60 x eq.mass) / 96500 Eq. mass = 107.98g.

[Q8] Choose the proper answer:

1) To obtain equivalent mass of Fe^{Z+} by electrolysis , we need ..... faraday(s)

a) 1 F b) 2 F c) 3 F d) no correct answer

2) To obtain gm / atom (mole) of Fe^{Z+} by electrolysis , we need ..... faraday(s)

a) 1 F b) 2 F c) 3 F d) no correct answer

3) To deposit g/atom (mole) of a metal (X) from one of its compounds, an amount of electricity = 3 Faradays is required. So, that compound will be .....

a) X_2O_3 b) X_2O c) XO_2 d) XO

4)The amount of electricity required to precipitate 0.01 mole of barium from barium chloride solution $BaCl_2$ = ...

a) 0.2 F b) 0.5 F c) 0.02 F d) 0.05 F

5-By connecting a car battery with continuous external source of electricity with electromotive force 12.6V, ...

a)Oxidation occurs for Pb electrode. B)reduction occurs for PbO_2electrode.

c)Lead IV sulphate is changed into sulphuric acid.

D)Reversed reactions occur at the two electrodes.

[Q9] Mention the name of the law that indicates the equivalent mass of chlorine gas evolving at the anode of an electrolytic cell on passing an amount of electricity equals one faraday in the electrolyte used in this cell. General Law of electrolysis

[Q10] Correct underlined words then complete :

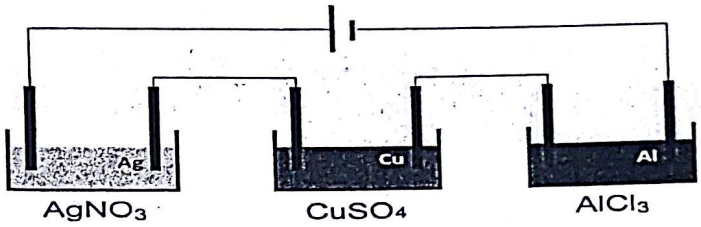
1-To reach to 99.95% pure copper , we form electrolytic cell in which impure copper as ..... anode , then Cu , Fe , Zn changed into ions dissolved in solution but zinc & iron fall down anode in solid state

2-In electroplating jug by silver layer , -ve pole of battery connected to ..... , while other pole connected to copper plate to keep concentration of solution constant.

[[[Answered questions in Ch.4 for studying]]]

[[Q11]] Define the second law of Faraday. Then prove it experimentally. ***

Ans: By passing the same quantity of electricity in different solutions connected in a series, masses of different materials produced are directly proportional to their equivalent masses.



+ writing steps .

[[Q12]] A quantity of electricity is passed through two electrolytic cells connected in series. The first cell contains copper II chloride solution, while the second cell contains copper I chloride solution. If the increase in the mass of the cathode in the first cell was 0.073 g. [knowing that Cu = 63.5]:

1. Find the increase in the mass of the cathode in the second cell.
2. Write the cathode reaction equation that happens in the two cells.

Ans: 1)

$$\frac{mass\ in\ first\ cell}{mass\ in\ second\ cell} = \frac{equivalent\ mass\ of\ Cu^{2+}}{equivalent\ mass\ of\ Cu^{1+}}$$

$$\frac{0.073}{mass\ in\ second\ cell} = \frac{(\frac{63.5}{2})}{(\frac{63.5}{1})}$$

$$Increased\ mass\ in\ the\ cathode\ of\ the\ second\ cell = \frac{0.073\ X\ 63.5}{31.75} = 0.146gm$$

2) **First cell:** $Cu^{2+}_{(aq)} + 2e^- \rightarrow Cu^0_{(s)}$

Second cell: $Cu^{+}_{(aq)} + e^- \rightarrow Cu^0_{(s)}$

[[Q13]] Write the cell diagram for the galvanic cell: $H_2 + Cu^{2+} \rightarrow 2H^+ + Cu$

Then calculate the electro motive force of the cell knowing that the copper oxidation potential = -0.34V

Ans: a) $Pt - H_2 / 2H^+ // Cu^{2+} / Cu$

$e.m.f = O.P_{anode} - O.P_{cathode} = 0 - (-0.34) = +0.34V$

[[Q14]] GRF:

1) Lead acid battery must be recharged after a period of time of its usage.

2) Cryolite and fluorspar added to bauxite ore during extraction of aluminum. ***

Ans: 1) Due to:

1. Consuming both anode material (Pb) & cathode material (PbO_2) converting into $PbSO_4$.
2. Decrease the concentration of H_2SO_4 by produced water.

2) **Cryolite;** Na_3AlF_6, acts as solvent for bauxite.

And **Fluorspar;** CaF_2, acts as flux substance to decrease melting point of mixture from 2045°c to 950°c that to save electrical energy.

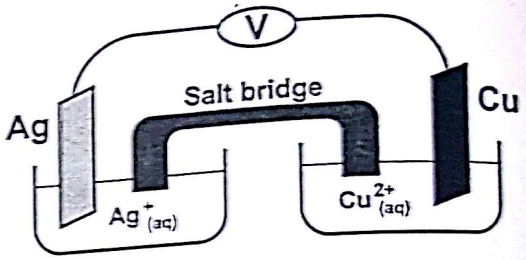
[[Q15]] Choose the best answer:

1) study the following figure, and then answer the related questions:

$Ag^+ + e^- \rightarrow Ag$ $\quad E^o = +0.80V$

$Cu^{2+} + 2e^- \rightarrow Cu$ $\quad E^o = +0.34V$

the electromotive force for this cell is .....



a. 0.8V - 0.34 V

b. 0.34 V ÷ 2 X 0.8V

c. 0.34V – 0.8 V

d. 0.34v – 2x0.8v

2) The reduction potential of hydrogen in fuel cell equal v

a. 0.83 b. -0.83 c. 0 d.0.4

3) in electrochemical cell this reaction occur:-

$2Au^{3+}_{(aq)} + 3\ Zn_{(s)} \rightarrow 2\ Au_{(s)} + 3\ Zn^{2+}_{(aq)}$

Which of the following symbolic representation represent the correct answer?

a) Au^{3+} / Au // Zn / Zn^{2+} b) Au /Au^{3+} // Zn^{2+} / Zn

c) Zn / Au^{3+} // Au / Zn^{2+} d) Zn / Zn^{2+} // Au^{3+} / Au

Ans: 1)a 2)b 3)d

[[Q16]] Aluminum metal is electrically extracted in industry from bauxite. Illustrate with complete labeled diagram the apparatus that used, and support your answer with balanced chemical equations:

a- The reaction that takes place at anode.

b- The reaction that takes place at cathode.

c- total reaction

d- reaction of evolved oxygen with graphite

see pre-test book ...

[[Q17]] Calculate the number of moles aluminum produced by passing current 5A for 9.56 min in molten bauxite [Al = 27]

Ans Equivalent mass of aluminum = atomic mass / no of charges = 27/3 = 9g

Mass of Al = (I x t X eq. mass) / 96500

= (5 x 573.6 x 9) / 96500 = 0.27 gm

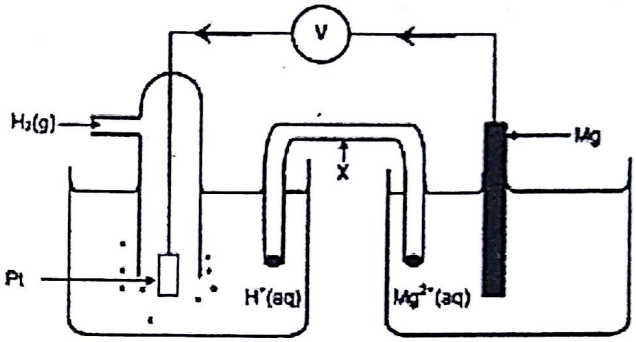
No.of moles of Al = m/ mm = 0.27/27 = 0.01mole.

[Q18] The following galvanic cell is consists of hydrogen as half cell and magnesium half cell, the voltmeter reading = 2.36V at standard condition.

a) Mention the condition needed for hydrogen cell to work as standard half cell.

b) Write the name of the symbol X. what are its functions?

c) Is magnesium is cathode or anode in these cell, use the given information to explain your answer.



d) Calculate the standard reduction potential of magnesium.

e) Write the total balanced equation for this cell.

f) A teacher added drops of methyl orange to half cell of hydrogen and noticed that the gradual change of color and then the color remains. Explain from your study.

g) What is the expected change in P^H value when the cell starts to operate until the color become constant. Explain the reason in stopping changing the color.

Ans

a) Pressure of gas is **1 atm.** and concentration of acid is **1M.**

b) X is salt bridge, its functions:-

1- **Connect** between the two solutions. without direct contact.

2- **Neutralize** of both +ve & -ve ions that formed by oxidation & reduction in the two halves of cell

c) Acts as anode, as oxidation reaction takes place (losing electron).

d) The reduction potential of magnesium is -2.36V

e) $Mg + 2H^+ \rightarrow Mg^{2+} + H_2$

f) As reduction process takes place at hydrogen half-cell, the concentration of H^+ ion decreases, cause decreasing in the red color intensity and when all H^+ ions consumed completely the solution become neutral the color becomes constant at orange

g) In 1M HCl solution the value of P^H starts at $P^H = 0$ then increases as the concentration of H^+ ion decreased when the solution become neutral the P^H value becomes constant = 7.

[Q19] when does the standard hydrogen electrode its potential not equal zero?

Ans By changing the concentration of the acid **or** the pressure of hydrogen gas.

CHAPTER THREE
CHEMICAL EQUILIBRIUM

[Q1] Write the scientific term :

1-The product of the concentration of hydrogen ions and hydroxide ions produced from water ionization. Ionic Product of water

2- Concentration of a saturated solution of a salt which is slightly soluble in water at a certain temperature. Degree of solubility

3- It is the solution in which dissolved substance reach a dynamic equilibrium state with undissolved substance. Saturated solution

4- Molecules of proteins formed in the cell of living organism and act as catalyst. enzymes

---

[Q2] in the following equilibrium reaction:

$$4HCl_{(g)} + O_{2(g)} \rightleftharpoons 2H_2O_{(g)} + 2Cl_{2(g)}, \quad +Heat \quad \Delta H = -113KJ. \quad \text{at } 400^\circ C$$

What happen to the concentration of chlorine when:

1) increase the temperature to 500C. decrease
2) adding O_2 to the mixture. increase
3) transfer the mixture to beaker with larger volume. decrease

---

[Q3] Calculate the equilibrium constant K_p for the following chemical reaction: ***

$$N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)} + heat$$

Knowing that the partial pressures of $N_2 = 2.3$atm., $H_2 = 7.1$ atm , and $NH_3 = 0.6$ atm

Comment on the value of K_p.

Ans:

$$K_p = \frac{(P_{NH_3})^2}{(P_{N_2}).(P_{H_2})^3} = \frac{(0.6)^2}{2.3\ x\ (7.1)^3} = 4.37\,x10^{-4}$$

$K_p < 1$ comment:

1) the predominant reaction is backward reaction before reaching equilibrium.
2) the partial pressure of reactants greater than that of product.
3) the reaction never reach to its end.

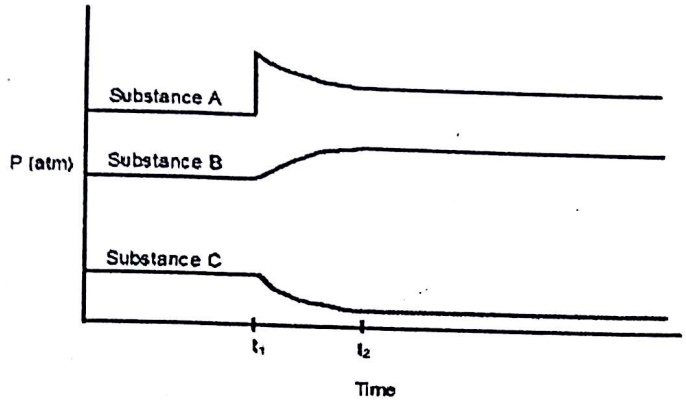
Total Pressure is the sum of partial pressures of all gases in the system

Choose What is the condition to reach chemical equilibrium in this system?

1) Increase pressure.
2) Decrease temperature.
3) add excess of ammonia
4) Keep all reactants & products in closed vessel.

[Q4] Choose the proper answer :-

1) The following graph represents the partial pressure that produced in $t_1 - t_2$ at the equilibrium of the reaction: $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$



At the time t_1, hydrogen gas is added to the system, and after a period of time a new equilibrium state occurred at t_2, which choice can represent substances from the graph?

a. A= H_2 B= N_2 C= NH_3

b. A= H_2 B= NH_3 C= N_2

c. A= NH_3 B= H_2 C= N_2

d. A= NH_3 B= N_2 C= H_2

No effect Because

What happen to equilibrium on adding catalyst to the medium? increase speed of Both F, B same Rate

What happen to Kc value by this change in concentrations at the same temperature? Kc Kept constant

2) Which of the following describe the system at chemical equilibrium.....

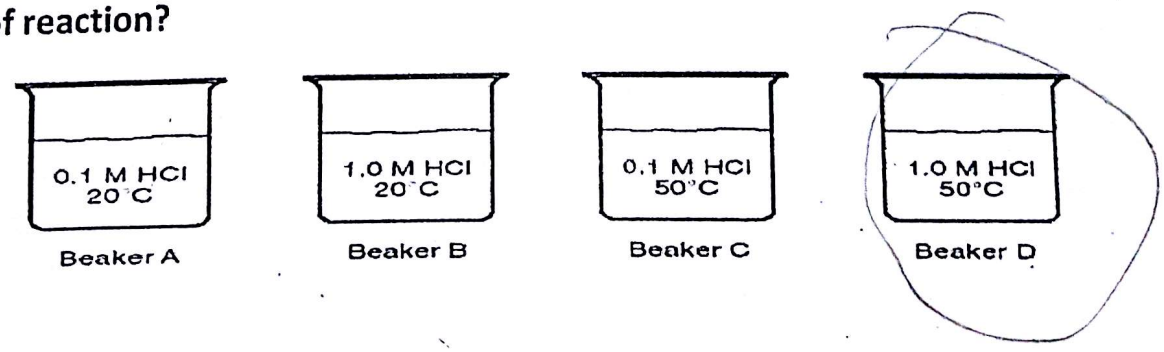
a. products are not formed by forward reaction.

b. stopping of backward reaction.

c. concentrations of reactant and product are equal.

d. concentration of reactant and product are constant

3) You have 4 glass beakers, at each of them 2 cm of magnesium strip reacted with 100 ml of hydrochloric acid solution under the conditions in each beaker. Which beaker has the highest rate of reaction?



[Q5] Write the chemical equations which indicate each of the following:

1. $K_p = \frac{(P_{NH_3})^2}{(P_{N_2}).(P_{H_2})^3}$ 2. $K_C = \frac{[CH_3COO^-][H_3O^+]}{[CH_3COOH]}$

Ans: 1) $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$ 2) $CH_3COOH_{(aq)} + H_2O_{(l)} \rightleftharpoons CH_3COO^-_{(aq)} + H_3O^+_{(aq)}$

[Q6] Correct underlined words then complete :

1- Molecules undergo reaction at collision when their kinetic energy is **equal only** (or more) activation energy , which defined as mini.....

2-Solution of HCl in benzene is **strong electrolyte** , but solution of ..... in water is Weak..... electrolyte that means i..... but ionization increase by dilution according to .....law.

3-by dilution acetic acid solution ..... & ..... will increase while P^H value will **be constant** (decrease)

[Q7] Calculate the p^H value of methylamine solution whose concentration is 0.2 M knowing that its ionic equilibrium constant $K_b = 1.8\times10^{-5}$ ***

Ans: $[OH^-] = \sqrt{Kb \,.\, Cb} = \sqrt{1.8x10^{-5} x\ 0.2} = 1.89x10^{-3} M$

$P^{OH} = -\ Log\ [OH^-] = 2.72$

$P^H = 14 - P^{OH} = 14 - 2.72 = 11.28$

[Q8] Write the equation used to calculate the solubility product K_{sp} for aluminum carbonate salt.

[Q9] a-arrange the following solution in ascending order according to their PH value, given that all of them equal in concentration. NaCl – Na_2CO_3 – NH_4Cl

b-The following reaction has two different equilibrium constant values at two different temp.

$H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{((g)}$ At 850°C Kc = 67

$H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{((g)}$ At 488°C Kc = 50

Is this reaction endothermic or exothermic? Explain your answer. (endo)

Answer endothermic, where by raising temperature from 488°C to 850°C, the equilibrium shift forward , so that concentration of products increases , so value of K_C increases to 67 .

[[Q10]] mention the scientific reason for each of the following:

1) on adding iron III chloride solution (pale yellow) gradually to ammonium thiocyanate (colorless) the color of the solution becomes reddish brown color gradually .

2) the absence of free protons (H^+) in acidic aqueous solutions.

3) it is difficult to dissolve silver chloride in water

$$AgCl_{(s)} \rightleftharpoons Ag^+_{(aq)} + Cl^-_{(aq)} \qquad Kc = 1.7\times10^{-10}.$$

4) Sodium acetate solution has a basic effect on litmus solution***

5) When preparing ammonia gas by Haber-Bosh method, it's necessary to use high pressure.

Ans:

1) According to le-Chatlieur principle, on adding excess amount of iron (III) chloride, the reaction will be shifted in forward direction that result in formation of more iron (III) thiocyanate with bloody red color.

$$\underset{\text{Pale yellow}}{FeCl_3} + \underset{\text{Colourless}}{3NH_4SCN} \rightleftharpoons \underset{\text{Bloody red}}{Fe(SCN)_3} + 3NH_4Cl$$

2) Because hydrogen ion is **attracted to** lone pair of electrons on the oxygen atom of the water molecule and **connected to** a water molecule by a coordinate bond, to form H_3O^+ ion.

3) Because its Kc < 1

So :- 1) the predominant reaction is backward reaction before reaching equilibrium.

2) the concentration of reactants greater than that of products.

3) the reaction never reach to its end.

4) it hydrolyzed into weak acid and strong alkali & according to le chatelieur principle weak acid consume H+ ions that increase ionization of water that make concentration of H^+ greater than OH^- .

$$CH_3COONa \rightleftharpoons CH_3COO^- + Na^+$$
$$H_2O \rightleftharpoons H^+ + OH^-$$
$$CH_3COONH_4 + H_2O \rightleftharpoons CH_3COOH + Na^+ + OH^-$$

5) $N_{2(g)} + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$

Where gas volume of products is less than that of the reactants, so according to le-chatelier principle by increasing pressure that shift forward reaction from **4** volumes to **2** volumes so ammonia formation increases.

[[Q13]]

Find degree of solubility of silver sulphate as its solubility product = 1.4×10^{-4}

then find $[Ag^+]$ in mole /L

Answer:- let degree of solubility = X

$Ag_2SO_4 \rightleftharpoons 2Ag^{1+} + SO_4^{2-}$ $\quad Ksp = [Ag^{1+}]^2 \times [SO_4^{2-}]$

Conc. :- $\quad 2X \quad X$ $\quad 1.4 \times 10^{-4} = (2X)^2 . (X)$

$1.4 \times 10^{-4} = 4X^3$ $\quad X = \ldots$ mol/L

$[Ag^{1+}] = 2X = \ldots\ldots$ mol/L

Choose: Degree of solubility of lead II chloride= .....

a-double concentration of Pb^{2+} b- double concentration of Cl^{1-}

c-half concentration of Pb^{2+} d- half concentration of Cl^{1-}

[[Q14]] in the equilibrium: $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$, Kc = 35.5

At constant temperature the mixture keep its equilibrium in beaker of **2L** and number of moles of sulphur dioxide and sulphur trioxide is equal. Calculate the number of moles of oxygen present in mixture.

Ans

$Kc = [SO_3]^2 / [O_2][SO_2]^2$ since $SO_2 = SO_3$

$Kc = [SO_3]^2 / [O_2][SO_2]^2$

$Kc = 1 / [O_2]$

$35.5 = 1 / [O_2]$ $\quad [O_2] = 0.028M$

No. of moles = $M \times V_L = 0.028 \times 2 = 0.056$ moles

[[Q15]] a-Show the effect of dilution on electrical conductivity of:

a-0.1MHCl b-0.1Macetic acid c-0.1M sugar solution

Answer: a- no effect b-conductivity increases c- no effect

b-Show which solution has the highest degree of ionization:

a-0.1M NH_4OH ($K_b = 1.8 \times 10^{-5}$) or b-0.1M acetic acid ($K_a = 1.7 \times 10^{-4}$)

Answer: calculate value of (α) for each solution from $\alpha = \sqrt{K / C}$

[[Q16]] **Mention one use for each of the following:-**

1-Catalytic converter in modern cars. 2-Light in photography

Don't forget the role of scientists from pre-test books:****

Ch.1	Haber -Bosh	Fisher-Tropsh	
Ch.3	Guldberg-Waage	Chatelieur	Ostwald
Ch.4	Faraday		
Ch.5	Berzelius	Wohler	Markownikoff
	Baeyer	Kekule	Fredle-Craft

CHAPTER TWO

CHEMICAL ANALYSIS

[Q1] Hydrogen sulphide, carbon dioxide & sulphur dioxide gases are produced from the industrial activity causing sever pollution of the environment. From your study suggest a chemical solution to get rid of these pollutant gases.

Ans:

hydrogen sulphide gas can be removed by passing through solution of lead II acetate [forming lead II sulphide] ,

carbon dioxide can be removed by passing through solution of lime water [forming calcium carbonate]

& **sulphur dioxide** can be removed by passing through solution of acidified $K_2Cr_2O_7$ [forming chromium III sulphate] + writing chemical equations.

[Q2] Write the scientific term:

1)Process of determining the concentration of an acid or a base by knowing its volume which neutralizes a base or an acid of known volume and concentration. titration

2) Type of chemical analysis which indicate the component of substance if it pure or mixed with other substance. Qualitative chemical analysis

3) Indicator which give a yellow color in acidic medium (from your study) Bromothymol Blue

4) The group reagent of the third analytical group. NH_4OH

[Q3] How could you differentiate practically between ...?

a) Sodium sulphide and sodium sulphite

b) Potassium nitrate solution and potassium nitrite.

c) Sodium sulphate solution and sodium phosphate solutions.

d) Iron II sulphate & iron III sulphate

Ans a)

	Na_2S	Na_2SO_3
By adding dil HCl to both: Or by adding $AgNO_3$ solution	Hydrogen sulphide gas is evolved,with bad smell is evolved which turns a paper wet with lead II acetate into black.	Sulphur dioxide gas is evolved, which has a very irritating smell and turns paper wet with acidified potassium dichromate from orange into green.

b)

Exp	KNO_3	KNO_2
By adding dil HCl to both:	No change	Gives (NO) gas Colourless & turns into reddish brown at the mouth of tube

c)

Exp	Na_2SO_4	Na_3PO_4
By adding $BaCl_2$	White ppt insoluble in dil.HCl	White ppt soluble in dil.HCl

d)

Exp.	$FeSO_4$	$Fe_2(SO_4)_3$
By adding NaOH or NH_4OH solution	Greenish white ppt. is formed $FeSO_{4(aq)} + 2NH_4OH_{(aq)} \rightarrow (NH_4)_2SO_{4(aq)} + Fe(OH)_{2(s)}$	Reddish brown ppt. is formed $Fe_2(SO_4)_{3(aq)} + 6NH_4OH_{(aq)} \rightarrow 3(NH_4)_2SO_{4(aq)} + 2Fe(OH)_{3(s)}$

[Q4] deduce the salt name and its chemical formula (Without writing chemical equations):

1- On adding dil. hydrochloric acid to a solid salt a colorless gas evolves and change paper wet with acidified potassium dichromate form orange to green with formation of yellow precipitate, and on adding ammonia solution to the salt solution a white gelatinous ppt. is formed.

2-On adding silver nitrate solution to the salt solution, a white ppt. is formed which turns violet when exposed to light. On adding ammonium carbonate solution to the salt solution,a white ppt. is formed.

3) By adding magnesium sulphate solution to a salt solution a white precipitate is formed after heating, and on exposing small amount of salt to platinum wire of Bunsen flame a brick red color appears.

4) On adding concentrating sulphuric acid to a solid salt with heating orange vapor evolves and change a paper wet with ~~ammonia~~ starch solution to yellow, and by adding ammonium hydroxide solution to the salt solution a white green ppt is formed which is dissolved in dil. acids.

[Q5] Choose the proper answer:

1) The phenolphthalein color in a solution of pH = 5.5 is .....

a) Red b) Yellow c) Colorless d) Blue

2) ....mL needed of sulphuric acid 1M to titrate 10mL of KOH solution its concentration is 1M

a) 10 b) 20 c) 5 d) 2

3) What is the mass of magnesium hydroxide needed to neutralize 125mL of 0.136 Molar of hydrochloric acid solution.

a) 0.2465gm b) 0.493gm c) 0.986gm d) 1.972gm

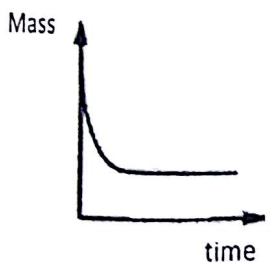
4) By adding equal volumes of 0.5M HCl solution and solution of Na_2CO_3 0.5M the resulting solution is .....

a) Neutral b) uncertain c) acidic d) basic

5) Ion which form precipitate with ions of silver ion and barium ion is .....

a) phosphate b) nitrate c) bicarbonate d) chloride.

6) By strong heating a sample of hydrated barium chloride in crucible a changed occur in it mass which represent by the following diagram .....



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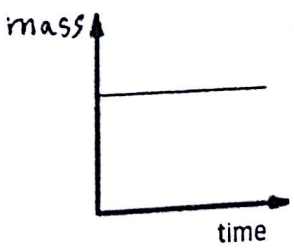

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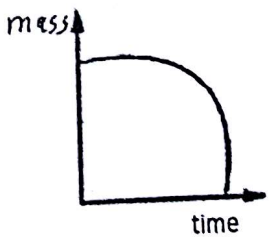

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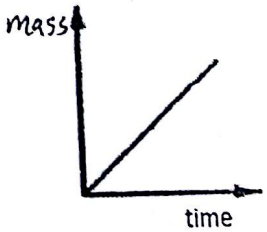


D

[Q6] A sample of hydrated Iron II chloride $FeCl_2 . XH_2O$ has mass 3.98g When it is strongly heated , its mass becomes 2.54g , Find the molecular formula for the hydrated salt

[Fe = 56 , Cl = 35.5 , O = 16 , H = 1]

Ans: Mass of water = 3.98 -2.48 = 1.14 g

$$FeCl_2 \rightarrow X H_2O$$

$$(56+2x35.5)\ g \rightarrow 18\ X\ g$$

$$2.54\ g \rightarrow 1.14\ g$$

X = 3 formula is $FeCl_2.3H_2O$

[Q7] Write the name of the gas or vapor produced from the following reaction & mention how to detect it:

1. Conc. sulphuric acid with sodium chloride.
2. Dil. hydrochloric acid with sodium nitrite.

Ans.

1. Hydrogen chloride gas.

   a-colourless gas

   b- gives white clouds of NH_4Cl when with glass rod wet with ammonia.

$$HCl_{(g)} + NH_{3(g)} \rightarrow NH_4Cl_{(s)}$$

2. Nitric oxide gas (NO)

   a-colourless gas

   b- turns into reddish brown at the mouth of the tube due to formation of nitrogen dioxide NO_2.

$$2NO + O_2 \xrightarrow{\text{At mouth of tube}} 2NO_2$$

[Q8] Show by balanced chemical equation how can you obtain the following :-

1) Nitrogen dioxide from sodium nitrite.
2) Sodium nitrate from sodium nitrite
3) Iodine from potassium iodide
4) magnesium carbonate from Sodium bicarbonate.

Ans.

1) $NaNO_{2(s)} + HCl_{(aq)} \xrightarrow{Dil.} NaCl_{(aq)} + HNO_{2(aq)}$

$3HNO_{2(aq)} \rightarrow HNO_{3(aq)} + H_2O_{(l)} + 2NO_{(g)}$

$2NO_{(g)} + O_{2(g)} \xrightarrow[\text{of tube.}]{\text{At mouth}} 2NO_{2(g)}$

2) $5NaNO_{2(aq)} + 3H_2SO_4 + 2KMnO_{4(aq)\ (aq)} \xrightarrow{Conc..} 5NaNO_{3(aq)} + K_2SO_{4(aq)} + 2MnSO_{4(aq)} + 3H_2O_{(l)}$

3) $2KI_{(s)} + H_2SO_{4(l)} \xrightarrow{Conc.\Delta.} K_2SO_{4(aq)} + 2HI_{(g)}$

$2HI_{(g)} + H_2SO_{4(l)} \xrightarrow{Conc.} 2H_2O_{(l)} + SO_{2(g)} + I_{2(v)}$

4) $2NaHCO_{3(aq)} + MgSO_{4(aq)} \rightarrow Mg(HCO_3)_{2(aq)} + Na_2SO_{4(aq)}$

$Mg(HCO_3)_{2(aq)} \xrightarrow{\Delta} MgCO_{3(s)} + H_2O_{(l)} + CO_{2(g)}$

[Q9] Give reason for

1) Detection of basic radicals (cations) are more complex than acidic radicals (anions)
2) We cannot detect sulphate ions by using dil. hydrochloric acid.

Ans.

1) Where there are a large number of basic radicals

& each radical may be found in more than one oxidation state.

2) Where acid of sulphate ion is H_2SO_4 which is more stable than dil HCl, so dil. HCl cannot replace it from its salt.

Find an scientific solution for the following problem:

To differentiate between sodium carbonate & bicarbonate salts, where both of them gives CO_2 gas with dil. HCl, that turns lime water turbid.

see pre-test book ...

[[Q10]] (X) and (Y) are two insoluble salts in water. Compound (X) is a yellowish white precipitate that dissolves slowly in ammonia solution. Compound (Y) is a yellow precipitate that doesn't dissolve in ammonia solution. **Write the molecular formula for the two compounds.** **Ans:** X: AgBr Y: AgI

[[Q11]] **Correct underlined words then complete :**

1-DII. HCl solution is used as indicator for $\underline{CO_3^{2-}}$, $\underline{SO_3^{2-}}$, $\underline{SO_4^{2-}}$ bec.....

Also HCl is a reagent for Ag^{1+} , Hg^{1+} , Pb^{2+} bec. .....

2-$AgNO_3$ solution can differentiate between :.....

3-Lead II acetate can differentiate between :.....

4-it is possible to differentiate between sodium carbonate & calcium carbonate by .....

Ans: 1- $\underline{CO_3^{2-}}$, $\underline{SO_3^{2-}}$, $\underline{SO_3^{2-}}$ bec. HCl is more stable than acids of these anions so it can replace these acids

Bec. These cations precipitated as Chlorides bec. chlorides are sparingly soluble in water

2-sulphide , sulphite , chloride , bromide ,iodide & phosphate [6 anions]

3-sulphide & sulphate 4-dissolving in water

[[Q12]] Five gram of impure barium chloride was dissolved in water. Excess of sodium sulphate solution was added to precipitate 2 grams of barium sulphate.

A-Calculate the % of barium chloride in the sample.

B- Calculate the % of impurities in the sample.

C- Calculate the % of Cl in the sample. (Ba = 137 , Cl = 35.5 , S = 32 , O = 16)

$*BaCl_2 + Na_2SO_4 \rightarrow *BaSO_4 + 2NaCl$

1 mole $\rightarrow$ 1 mole

208 g $\rightarrow$ 233 g

X g $\rightarrow$ 2 g mass of $BaCl_2$ = 1.79 g.

% of barium chloride = (1.79/5)x100 = 35.8% % of impurities = 100 – 35.8 =64.2%.

$*BaCl_2 \rightarrow 2Cl^-$.

208 g $\rightarrow$ 71 gm

1.79 g $\rightarrow$ X X = 0.61 gm % OF Cl = 12.2 %

[[Q13]] **Mention the importance of chemical analysis in:-**

1- Medical field. 2- Agricultural field. 3- Industrial field. 4- Environmental field.

see pre-test book ...

[[Q14]] **Show the difference between:-**

- Analysis of organic & inorganic compounds.
- Precipitation & volatilization method
- Qualitative & quantitative analysis

see pre-test book ...

CHAPTER ONE

TRANSITION ELEMENTS

[Q1] Write the scientific term or sentence which indicate each of the following :

1) An alloy formed from two elements having the same atomic radius, crystal lattice and chemical properties.
2) Formation of a thin nonporous layer of oxide which protects the metal from further reaction.
3) Increasing the percentage of iron in its ores by removes impurities and strange substances by means of surface tension and magnetism.
4) The element which has the d or f sublevel is completely filled with electron in their atomic state or one of its oxidation state.
5) Element in first transition series give oxidation state exceeds its group number.
6) Organic compound of iron on heating produce three different oxides, one of them can obtain iron from it.
7) One of iron compounds doesn't obey law of valency.
8) Two elements from first transition series have only one oxidation state.
9) Iron produced from electric furnace.
10) One of Iron ores during its decomposition produces water vapor.
11) One of iron ores cannot be oxidized.
12) Mineral acid which can remove passivity of metal.
13) Transition element cannot form colored compounds.
14) Compound by its thermal decomposition produce iron II oxide & carbon dioxide only.

[Q2] Correct underlined words then complete :

1-$\underline{CO_2}$ gas evolved when adding iron to diluted sulphuric acid but , ... gas with concentrated acid

2-Alloys formed from **metals only** & can be prepared by.....

3-cementite is **substitution** alloy , while ferrochromium is .....alloy & steel is .....alloy

4-Some elements have no economical importance in pure form as **Aluminum & copper**

bec. .....

5-Roasting process is one of **reduction** steps ,by heating iron ores in air to get rid of

.....

6- Crushing ,sintering & **roasting** are used to improve ..... properties of ore.

[Q3] Choose the proper answer:

1) On heating iron II oxalate in air, ... is formed

a) Iron II oxide b) Iron III oxide c) Magnetic iron oxide d) Iron III sulphate

2) Which of the following ions are colored in its salt solution?

a) Fe^{3+} only. b) Al^{3+} only c) Fe^{3+} & Ni^{2+} only d) Fe^{3+} & Ni^{2+} & Al^{3+}

3) electronic configuration of ion of transition element is .....

a) $[Ar_{18}]\ 4s^1, 3d^5$ b) $[Ar_{18}]\ 4s^2, 3d^2$

c) $[Ar_{18}]\ 4s^2, 3d^0$ d) $[Ar_{18}]\ 4s^0, 3d^2$

4) The transition element where the (d) sublevel is filled before the filling of(s) sublevel is ..

a) cobalt b) copper c) scandium d) zinc

5) The acid which used to differentiate between iron II oxide and iron III oxide is .....

a) Conc. nitric acid. b) dil. Hydrochloric acid.

c) conc. sulphuric acid. d) acetic acid.

[Q4] From your study of transition series and its usage, mention the name of element, compound, alloy which is used:-

1) Poor lighting during television photography.

2) The unbearable of the railway tracks which are made of steel when the heavy cargo trains move on it.

3) Determination of sugar percent in urine for diabetic.

4) To overcome the weakness of structure of MIG fighter during the friction with atmospheric air.

5) Rusting and corrosion of soft drink cans .

6) Breaking bones of legs for victims during accident.

7) The weakness of the structures of the cars when driving in bumps in the street

8) Detecting some manufacturing defects as cracks in welds positions.

9) Sterilization and preservation of food product.

Q51 three compounds:

$$Fe_2O_3 - TlSO_4 - MnO_4^{1-}$$

Classify into coloured & colourless

Classify into para or dia magnetic

Arrange in descending order of magnetic moment. ***

Q52 How can you convert iron rust into iron metal?

يقوم الطالب بحل جميع أسئلة المذكرة باهتمام وتركيز

ثم مراجعة مذكرات **Pre-test** الستة لتذكر المعلومات المعتادة

ثم مراجعة مذكرات **Revision** الستة لتذكر أفكار الأسئلة

[[[Answered questions in Ch.1 for studying]]]

[[Q7]] Compare between the Blast furnace and Midrex furnace according to: ***

	Blast furnace	Midrex furnace
1. reducing agent:	Carbon monoxide	Mixture of carbon monoxide and hydrogen (water gas)
2. Source of reducing agent:	Coke (C)	Natural gas (CH_4)
3. Equations:	$C_{(s)} + O_{2(g)} \xrightarrow{\Delta} CO_{2(g)}$ $CO_{2(g)} + C_{(s)} \xrightarrow{\Delta} 2CO_{(g)}$ $3CO_{(g)} + Fe_2O_{3(s)} \xrightarrow{\Delta \text{ above } 700^\circ C} 2Fe + 3CO_{2(g)}$	$2CH_{4(g)} + CO_{2(g)} + H_2O_{(v)} \xrightarrow{\Delta} 3CO_{(g)} + 5H_{2(g)}$ $2Fe_2O_{3(s)} + 3CO_{(g)} + 3H_{2(g)} \xrightarrow{\Delta} 4Fe_{(s)} + 3CO_{2(g)} + 3H_2O_{(v)}$

[[Q8]] **What is meant by:** Sintering process?

Ans: a process in which fine particles of iron ores treated to obtain large particles suitable for reduction process

[[Q9]] **Give reason for:**

1) The electronic configuration of chromium and copper differ than other elements in 1st transition series.
2) The relative constancy of the atomic radii of elements in the first transition series
3) Elements of the first transition series are considered as ideal catalysts.
4) Iron III ion difficult to reduced into iron II ion, while manganese III ion is easily reduced to manganese II
5) The magnetic moment of manganese ion Mn^{2+} is greater them magnetic moment of iron ion Fe^{2+}
6) Although scandium is transition element it cannot formed colored compound.
7) Compound of copper ion Cu^{1+} is diamagnetic while copper ion Cu^{2+} is paramagnetic
8) Reaction of iron with dil. hydrochloric acid gives iron II chloride not iron III chloride.
9) it is not preferred to use iron and manganese in its pure state.
10) scandium is used in manufacture of MIG fighter.
11) copper, silver and gold are considered transition element although its d sublevel are completely filled with electrons.
12) Transition series is characterized by its multiple oxidation state.

Ans 1) Due to extra stability of half-filled 4s and half-filled 3d in chromium atom ($_{24}Cr$ [Ar] $4S^1,3d^5$) & extra stability of half-filled 4s and completely filled 3d in copper atom ($_{29}Cu$ [Ar] $4S^1,3d^{10}$), this explain that the atom has low energy in both of them.

2) Bec. there are two opposite factors:

a-The first factor:- by increasing the effective +ve charge of proton in nucleus, so the attraction force of nucleus increases on electrons. **That leads to**: decreasing in the atomic radius

b-The second factor by increasing number of the –ve electrons in 3d sublevel, so the repulsion force among electrons increases in the outer most energy level. **That leads to:** increasing in the atomic radius

As result for these opposite factors we find relatively constant atomic radii

3) Due to the presence of the 4s and 3d-electrons:

TO form bonds between the catalyst surface and the reactants molecules

TO increase concentration of the reactants molecules at the surface of catalyst

TO decrease activation energy & decrease the strength of the bond in the reactant molecules

so rate of the reaction increased.

4)Because **Iron (III) ion** the 3d sublevel is half-filled $3d^5$ (more stable) so difficult to be reduced into iron II ion 3d sublevel is $3d^6$ (less stable) , while **manganese III** is $3d^4$ (less stable) so easily reduced into manganese II ion $3d^5$ half filled (more stable).

5) Number of unpaired electron in manganese ion Mn^{2+} is 5 electrons $3d^5$, while number of unpaired electron in iron Fe^{2+} is only 4 electrons $3d^6$. So magnetic moment increases by increase the number of unpaired electron
6) because scandium give only one oxidation state 3+ which indicate losing all electron from 4s and 3d, so 3d sublevel become $3d^0$, and the color in transition element depends on incompletely filled of orbital from d^{1-9}
7) bec. Cu^{1+} ion its d sublevel is $3d^{10}$ which is completely filled that's diamagnetic due to the absence of unpaired electron while Cu^{2+} ion its d sublevel is $3d^9$ that is paramagnetic due to the presence of unpaired e-.
8) due to presence of hydrogen gas as reducing agent , prevent formation of iron III chloride .

$$Fe_s + 2HCl_{aq} \xrightarrow{dil} FeCl_{2\,aq} + H_{2g}$$

9) because manganese is brittle in its pure state while iron is malleable in its pure state.
10) because it hard and light.
11) although they are completely filled in atomic state they are incompletely filled in oxidation state 2+ and 3+
12) Because 4s and 3d are very close energy, so atom loses 4s electrons then lose 3d electrons in sequence.

[Q10] show by balanced chemical equations how the following can be carried out:

1) Iron III chloride into Iron III oxide

2) Reaction of conc. sulphuric acid with the produced product from strong heating of iron with hot air.

Ans 1) $FeCl_{3(aq)} + 3NH_4OH_{(aq)} \longrightarrow 3NH_4Cl_{(aq)} + Fe(OH)_{3(s)}$

$2Fe(OH)_{3(s)} \xrightarrow{\text{Over 200C}} Fe_2O_{3(S)} + 3H_2O_{(v)}$

2) $3Fe_{(s)} + 2O_{2(g)} \xrightarrow{\Delta} Fe_3O_{4(s)}$

$Fe_3O_{4(s)} + 4H_2SO_{4\,(l)} \xrightarrow{\text{Conc. }\Delta} FeSO_{4\,(aq)} + Fe_2(SO_4)_{3\,(aq)} + 4H_2O_{(v)}$

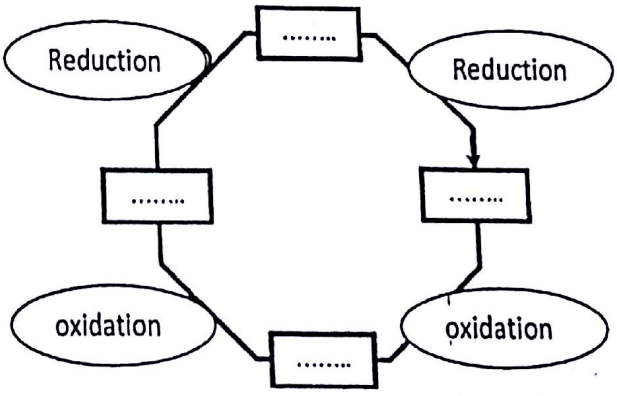
[Q11] Complete the spaces in the following diagram by the suitable answer from the following according to their oxidation and reduction process in clock wise direction.

a) black iron magnetic oxide Fe_3O_4.

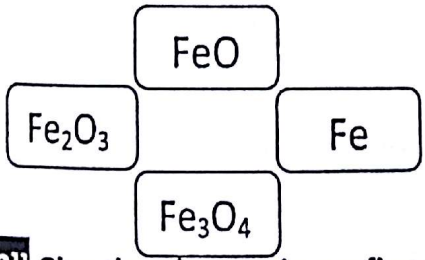
b) iron metal Fe.

c) iron III oxide Fe_2O_3.

d) iron II oxide FeO.



Ans



[Q12] Give the electronic configuration of 1st group & last group of main transition elements

ans: $ns^2, (n-1)d^1$, $ns^2, (n-1)d^{10}$

[Q13] Compare between the four ores of iron

[Q14] Show by equation effect of heat on Iron II sulphate - limonite

see pre-test book ...

Organic chemistry - Organic chemistry - Organic chemistry - Organic chemistry - Organic chemistry - Organic

[Q1] A monohydric aliphatic alcohol has molar mass 74 g/mol [C=12, O=16, H=1]

1. Find the molecular formula for this alcohol.
2. Give structure & IUPAC names for 3 isomers from alcohols for this molecular formula.
3. What is the effect of adding acidified potassium permanganate to two of different isomeric forms of that alcohol?

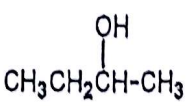
Ans:

1. General formula of alcohols is R-OH or $C_nH_{2n+1}OH$ that means $C_nH_{2n+2}O$

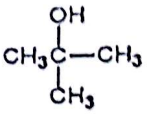
So ,its molar mass calculated as $12n + 1(2n+2) + 16 = 74$ So, **n = 4**

& Molecular formula $C_4H_{10}O$***

2. $CH_3CH_2CH_2CH_2OH$ 1-butanol



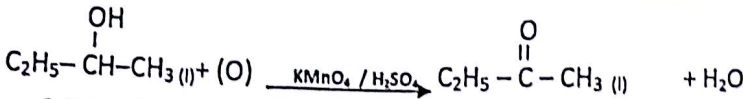
2-butanol



2-methyl-2-propanol

3. $CH_3CH_2CH_2CH_2OH_{(l)} + (O) \xrightarrow{KMnO_4 / H_2SO_4} CH_3CH_2CH_2CHO_{(l)} \xrightarrow{(O)} CH_3CH_2CH_2COOH_{(l)}$

1-Butanol — Butanal — Butanoic acid



2-Butanol — (Butanone)

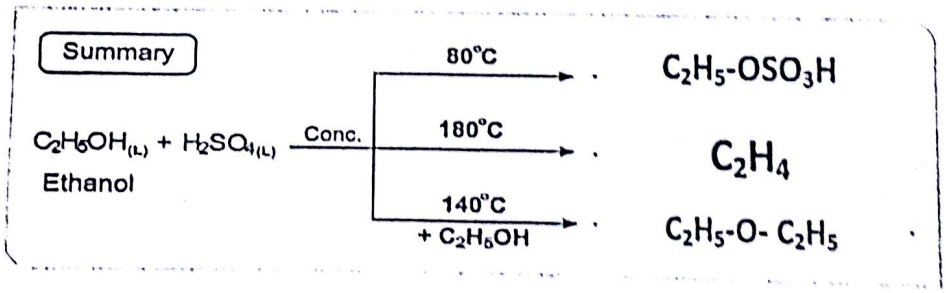
[Q2] The teacher asked students to do an experiment by heating ethanol with conc. sulphuric acid; he found that the students found three different products. Explain the reason for this difference. ***

1) Write the structural formula for these products.

2) Which of the following product can be converted directly into **antifreezing substance**? Mention the name of reaction & explaining working of anti- freezing

3) What do you expect to happen if we replace sulphuric acid with hydrochloric acid.

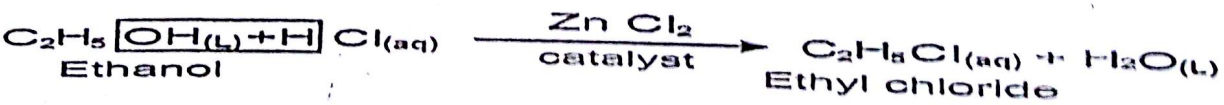
Ans:



2) from ethene we can prepare Ethylene glycol , by Baeyr's reaction (remember its equation)

Ethylene glycol forms hydrogen bonds with water molecules that prevents combination between water molecules each other so ice crystals not formed.

3)



[Q3] An aliphatic organic compound (A) having p^H slightly less than 7 can be reduced by hydrogen in the presence of copper chromate at 200°C forming a compound (B) that is converted into acetaldehyde by adding acidified $K_2Cr_2O_7$.

What are the chemical formulae for the compounds (A & B)? & write equation of reaction between A & B.

Ans: A: Acetic acid B: Ethanol

$$CH_3COOH + C_2H_5OH \xrightarrow{\text{Conc. } H_2SO_4} CH_3COOC_2H_5 + H_2O$$

[Q4] **Addition & condensation polymerization are two famous types of polymerization:**

a-mention the difference between them. ***

b-Classify the following according to the type of polymerization if possible & mention importance of produced polymer: ethene – phenol –hexane – ethylene glycol -acetylene

Ans:

Polymerization by addition	Polymerization by condensation
1- Formed between similar monomers. 2- Monomer contains double bond . 3- Polymerization takes place by (breaking pi bond). 4- No co-polymer is formed.	1- Formed between two different types of monomers. 2- Monomer contains active groups like (-OH). 3- Polymerization takes place by emission of water . 4- co-polymer formed & that's able to polymerize.
1-**ethene** [polyethene in making hoses , bottles & plastic sheets] 2-**acetylene** [giving aromatic benzene as organic solvent]	1-**pheno**l [in Bakelite to make electric instruments & ashtrays] 2-**ethylene glycol** [in making PEG , in films & cassette tap , Dacron fibers in replacing spoiled heart valves]

While hexane cannot be polymerized

[Q5] **Show by balanced chemical equations how could you obtain :**

First: Ordinary ether (diethyl ether) from ethanoic acid. Second: sodium ethoxide from glucose

Ans:

1) $CH_3COOH_{(aq)} + 2H_{2(g)} \xrightarrow{CuCrO4\ /\ 200C} C_2H_5OH_{(L)} + H_2O_{(V)}$ $\quad 2C_2H_5OH_{(l)} \xrightarrow{\text{Conc. } H_2SO_4\ /\ 140\ ^\circ C} C_2H_5\text{-}O\text{-}C_2H_{5\,(g)} + H_2O_{(V)}$

2)

$$C_6H_{12}O_{6\,(aq)} \xrightarrow[\text{yeast}]{\text{Zymase enzyme}} 2C_2H_5OH_{(l)} + 2CO_{2\,(g)} \qquad 2C_2H_5OH + 2Na \longrightarrow 2C_2H_5ONa + H_2$$

[Q6] **Explain the following:** Nitro compounds are extremely explosive substances. ***

mention three different explosives

Ans: Because their molecules contain their own fuel (carbon) beside the oxidizing agent (oxygen). These compounds burn rapidly & great amount of heat and gases are produced accompanied by explosion. This is due to the weakness of bond (N-O) and the formation of two strong bonds (N-N) in N_2 gas and (C-O) in CO_2.

1) trinitro toluene 2) trinitro glycerol 3) trinitro phenol

[[Q7]] Give reason for: 1) Water isn't suitable to remove fat spots from textiles. ***

2) by adding hydrogen bromide to ethyne 1,2-dibromo ethane not formed.

3) At hydration of alkene the medium must be acidic.

Ans: 1) Because dirties are insoluble in water, where they are organic substances while water is polar. And due to the strong surface tension of water that makes textile not wet.

2) CH $CH_{(g)} + HBr_{(g)} \longrightarrow \underset{\text{1-bromoethene}}{CH_2{=}CHBr_{(g)}} + HBr_{(g)} \longrightarrow \underset{\text{1,1-dibromo ethane}}{CH_3 - CHBr_{2\,(g)}}$

Where **First addition** of HBr doesn't obey Markownikoff rule as ethyne is a symmetric alkyne, but **second addition** obeys Markownikoff , where 1-bromoethene is an asymmetric alkene.

3) as water is weak electrolyte give small amount of H^+ so using acidic medium to provide with H^+ to break pi bond.

[[Q8]] Explain how we can detect the taking of drivers for liquors. ***

Ans: By allowing drivers to blow in a balloon through tube contains silica gel saturated with orange acidified $K_2Cr_2O_7$. If the color changed into green that indicates presence of ethanol (taking liquors).

[[Q9]] Show by chemical equations how you can obtain an insecticide from the natural gas.

Ans: $2CH_4 \xrightarrow{1500^\circ C \text{ fast cool}} C_2H_2 + 3H_2$

$3C_2H_{2\,(g)} \xrightarrow{\text{Red hot NI tube}} C_6H_{6\,(l)}$

$C_6H_6 + 3Cl_2 \xrightarrow{UV} C_6H_6Cl_6$ (Gamixane)

[[Q10]] Mention one example for the following reaction from your study:

Oxidation of unsaturated compound to obtain saturated one.

Ans

$$CH_2 = CH_2 + H_2O + (O) \xrightarrow[\text{Alkaline medium}]{KMnO_4} \underset{\quad|\quad\quad|}{\underset{OH}{CH_2} - \underset{OH}{CH_2}}$$

[[Q11]] if you have four organic compounds :-

acetic acid – carbolic acid – benzoic acid – ethanol. Answer the following:-

a) Two compounds react with sodium carbonate.

b) Compound doesn't react with sodium carbonate while react with sodium hydroxide.

c) Compound doesn't react with sodium carbonate and sodium hydroxide while react with sodium metal.

d) two compounds react together to form phenyl ethanoate.

e) Two compounds each of them used to obtain benzene

Ans a) acetic acid and benzoic acid b) carbolic acid c) ethanol
d) acetic acid and carbolic acid e) carbolic acid and benzoic acid.

[Q12] Alcohol (A) reacts with acid (B) by heating to obtain propyl methanoate ester answer the following:- ***

a) Write the structural formula of alcohol A and acid B

b) Write the chemical equation which indicate the reaction.

c) Write the common name of acid B, explain the reason of this nomenclature?

d) Write the structural formula of isomer of alcohol A when it oxidized produce acetone.

e) After a period of time of formation of ester, what will happen if adding drops of methyl orange to the beaker of the previous reaction? Mention the reason?

f) How can you increase the amount of ester produced from this reaction.

Ans

a)	Alcohol A	Acid B
IUPAC Name	1-propanol	Methanoic acid
Structural formula	$CH_3CH_2CH_2OH$	HCOOH

b) $HCOOH + CH_3CH_2CH_2OH \rightleftharpoons HCOO\,CH_2CH_2\,CH_3 + H_2O$

c) formic acid because it extracted from ants.

d) iso propyl alcohol. $CH_3\,CHOH\,CH_3$

e) the solution becomes red color because it is reversible reaction where all reactants and products are still found in the medium so the acid is present in the medium.

f) by adding **conc. sulphuric acid** as it absorb water and reaction become complete.

[Q13] From acetic acid how to get acetamide.

$$CH_3COOH + C_2H_5OH \xrightarrow{-H_2SO_4} CH_3COOC_2H_5 + H_2O$$

$$CH_3\overset{O}{\overset{\|}{C}}-O\,C_2H_5\,(l) + H\text{-}NH_2\,(s) \longrightarrow C_2H_5OH\,(l) + CH_3\text{-}\overset{O}{\overset{\|}{C}}\text{-}NH_2\,(s)$$

[Q14] How can you get acetone 1) From propene 2) From 2-bromopropane.

Ans

1) $CH_3 - CH = CH_2 \xrightarrow[H_2SO_4\ 110^\circ C]{+\ H_2O}$ $CH_3 - \underset{OH}{\underset{|}{CH}} - CH_2$ (isopropyl alc.) $+ (O) \xrightarrow[H_2SO_4]{KMnO_4}$ $CH_3 - \overset{O}{\overset{\|}{C}} - CH_3$ (Acetone) $+ H_2O$

2) $CH_3 - \underset{Br}{\underset{|}{CH}} - CH_3 \xrightarrow[\Delta]{+\ NaOH}$ $CH_3 - \underset{OH}{\underset{|}{CH}} - CH_2$ (isopropyl alc.)

[Q15] Draw the structural formula of the **monomer** which used to prepare polymer (PVC) & its uses

Ans PVC: used in hoses, bottles , drainage tubes , shoes & insulator floors

[Q16] **Show by balanced chemical equation how can you obtain:**

1. Detergent from one of the compound of aromatic sulphonic acid***
2. Methanol from suitable alkyl halide

Ans

1. 

2. $CH_3{-}Cl_{(l)} + KOH_{(aq)} \xrightarrow{\Delta} CH_3{-}OH_{(aq)} + KCl_{(aq)}$

[Q17] The product of hydrolysis of ethyl hydrogen suphate differs from its thermal decomposition.

Ans its hydrolysis produces ethanol

$$C_2H_5OSO_3H + H_2O \xrightarrow{110C} C_2H_5OH + H_2SO_4$$

And its thermal decomposition produces ethene

$$C_2H_5OSO_3H \xrightarrow{180\,C} C_2H_4 + H_2SO_4$$

[Q18] **Write short not on:** a) Converted alcohol. b) alcoholic fermentation

Don't forget the drawing & experiments from pre-test books:**

Chapter 2	1	Titration process to determine concentration of NaOH solution by using HCl 0.1M
	2	Precipitation of barium sulphate
	3	Brown ring experiment
Chapter 3	4	Effect of surface area of reactants on rate of reaction
	5	Effect of concentration of reactants on rate of reaction
	6	Effect of temperature on rate of reaction
	7	Prove Ostwald law experimentally (experiment of battery & lamp part [B])
Chapter 4	8	Immersing zinc sheet in copper sulphate solution
	9	Prove Faraday first law & second law*
	10	Electroplating of jug by silver*
	11	Purification of copper or getting gold & silver impurities from copper*
	12	Extraction of aluminum from bauxite
	13	Standard hydrogen electrode*
Chapter 5	14	Detection for carbon & hydrogen in organic compounds
	15	Preparing methane gas in lab.
	16	Preparing ethene gas (ethylene) in lab.*
	17	Preparing ethyne gas (acetylene) in lab.*
	18	Preparing of sodium ethoxide
	19	Preparing of ethyl acetate ester
	20	Oxidation of ethyl alcohol