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Chemistry

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STD X CHEMISTRY MUST KNOW QUESTIONS

I. PERIODIC PROPERTIES AND VARIATIONS OF PROPERTIES

Two elements

X = group II A & period 3 **Y = group 16 & period 2**

1) Write the electronic configuration of X and Y
2) Write the formula of the ions formed by both - state whether they are anions or cations
3) Write the formula of the compound formed by X and Y.
4) Write a balanced equation showing reaction of this compound with dilute hydrochloric acid.
5) Write the formula of the Chloride, sulphate & nitride of X
6) Explain: F is more non-metallic than Cl.
7) Define – Electronegativity, Ionisation position

8) Choose the correct option:

i) Among the elements given below, the element with the least electronegativity is:

a) Lithium b) Carbon c) Boron d) Fluorine

ii) If an element A belongs to Perion 3 and Group 2, then it will have:

a) 3 shells and 2 valence electrons b) 2 shells and 3 valence electrons

c) 3 shells and 3 valence electrons d) 2 shells and 2 valence electrons

iii) As the elements in group 2 are considered from beryllium to radium, the extent of metallic activity:

a) increases and atomic radius increases b) increases and atomic radius decreases

c) decreases and atomic radius increases d) decreases and atomic radius decreases

iv) M represents an alkali metal, the correct formula for a compound of this atom with sulphur is:

a) MS b) M_2S c) MS_2 d) SM_2

II. CHEMICAL BONDING

1) Explain why ionic compounds do not conduct electricity in their crystalline form.
2) Describe whether the following compound is likely to be ionic or not ionic based on the properties given. Explain your reasoning.

Compound A has a melting point of 545 degrees Celsius and dissolves well in water.

3) Draw electron dot structures of :

a) hydronium & ammonium ion.

Label the lone pair of electrons

b) calcium oxide

c) carbon tetrachloride

4) Define the following terms : Coordinate covalent bond ; Lone pair of electrons

5) Fill in the blanks :

a) _____ compounds are generally soluble in organic solvent. (covalent / ionic)

b) _____ is an example of a diatomic molecule with double bond. (nitrogen / oxygen)

c) In a polar covalent compound electrons are distributed _____ between the combining atoms. (unequally / equally)

d) _____ conducts electricity in its aqueous/ liquid state. (alcohol / potassium chloride)

III. METALLURGY

1) What is rusting? Give an equation that shows the rusting of iron.

2) Give the 3 equations that represent the purification of aluminium ore by Baeyer's process. (mention conditions)

3) Give the name of the constituents of the electrolyte used in the Hall-Heroult's process. Write the equations occurring at both the electrodes.

4) Why is sodium hydroxide used in the concentration of bauxite?

5) Define alloy.

6) Name are the principal metal in Duralumin.

7) Name 2 ores of (i) zinc (ii) iron

8) What is the role played by cryolite?

9) Why metals are called reducing agents?

IV. ELECTROLYSIS

Sr.	Electrolytic cell	Electrolyte	Dissociation of electrolyte	Material of cathode	Material of anode	Reaction and product at cathode	Reaction and product at anode
1	Molten lead bromide						

2	Acidified water						
3	Aqueous copper sulphate			platinum	platinum		
4	Electroplating on a key chain with nickel						
5	Electroplating of a star with silver						
6	Electro refining with copper						

1) List the main precautions to be taken during electroplating.
2) For electroplating with silver, silver nitrate is not used as electrolyte.
3) List the factors that influence the preferential discharge of ions at the electrodes.
4) Define: electrolysis; cathode; electroplating.
5) During electroplating a small current should be used for a longer time.
6) Electrolysis is a redox reaction. Explain.

V. STUDY OF COMPOUNDS- HCl, AMMONIA, NITRIC ACID AND SULPHURIC ACID

Manufacture of ***sulphuric acid***

Compounds	Name of process	Reactants	Temperature	Pressure	Catalyst
Sulphuric acid					

Write the reactions of the above process:

1) Burning of pyrites to form SO_2…….....
2) Conversion of SO_2 to SO_3…….....
3) Conversion of SO_3 to Oleum…….....
4) Conversion of Oleum to Sulphuric acid…….

Reactions of Sulphuric acid – showing the properties of the acid as:-

I – As a Typical dilute acid – Action With

1) Metals – Zinc …….....

2) Carbonates and bicarbonates…….....

3) Sulphites ……..…….....

4) Sulphides (FeS) ……..…….....

5) Bases ……..…….....

II - As an Oxidizing reactions (showing oxidizing property of ***conc*** Sulphuric acid) -

1) Carbon (oxidation of non-metals) ……..……....

2) Sulphur (oxidation of non-metals) ……..…….……....

III - As a Dehydrating Property (***conc*** Sulphuric acid) – dehydration of

1) Sugar ……..……..……....

2) Hydrated copper (II) sulphate (blue crystals)……..……

IV. As a Least Volatile Acid (***conc*** **Sulphuric acid**) Reaction with

1) Sodium chloride……..……....

2) Potassium nitrate……..……....

Test of Sulphuric acid- or any sulphate (contains SO_4^{--} anion)

3) Reaction with $BaCl_2$……..……....

4) Reaction with Lead nitrate……..……..……..

Give reasons:

1) Conc.sulphuric acid gives two types of salts on reacting with NaOH.

2) SO_3 is absorbed in conc. $H2SO_4$, not water.

State the flame colour of sodium,potassium,calcium.

Ammonia

I) The table below shows the manufacture of Ammonia, complete by filling appropriate data:-

	Compound	Process	Reactants	Temperature	Pressure	Catalyst
1	NH_3					

II) Write balanced equations for the following reactions, write any special conditions required.

1) Ammonia is passed over hot oxides of copper, lead (which property of ammonia is shown)

2) Catalytic oxidation of NH_3 by platinum. In which process is it used?

3) NH_3 reacts with excess of Cl_2.

4) Ammonia from Aluminium nitride.

5) Heat copper(II) nitrate.
6) Heat potassium nitrate.

III. Give reasons:

1) Ammonia is a good refrigerant.
2) Ammonia is a monoacidic base.
3) Funnel arrangement is used to dissolve NH_3.
4) Ammonia is dried by quick lime.
5) Ammonia is collected by downward displacement of air.

Nitric acid

Explain:-

1) In lab preparation of nitric acid the entire apparatus is made up of **glass only**
2) Dil. Nitric acid does not give hydrogen gas with metals like other dil. acids.
3) Pure nitric acid is **colourless** yet in the labs the acid is little **yellowish**
4) In the **brown ring** test for nitric acid / nitrates, ferrous sulphate used should be freshly prepared.

Hydrogen chloride and Hydrochloric acid

Write balanced equations for the given reactions:-

1) Sodium chloride is treated with conc. Sulphuric acid. (below and above 200 ^{o} C)
2) Hydrogen chloride gas is bubbled through lead nitrate solution.

Explain why?

1) The temperature of the apparatus should not be above 200^{o}C while preparing hydrogen chloride gas in the lab.
2) Hydrogen chloride cannot be dried using quick lime or phosphorus pentachloride.
3) HCl is a monobasic acid.
4) Dry HCl does not turn blue litmus red.

VI. ORGANIC COMPOUNDS

Write balanced equations for the preparation of the following:

1) Ethane from sodium propanoate.
2) Ethane from ethyl bromide.
3) Ethene by dehydration reactions.

4) Ethyne from calcium carbide.

5) 1,2 – dibromoethane from ethene.

6) Chloromethane from methane.

Draw the structural formula of :

1) Isomers of butene

2) ethanoic acid

3) 1,1-dichloropropane

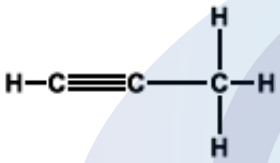
4) Formaldehyde

5) Propionic acid

6) 2 – methyl 1 – butanol

Name the following structures (IUPAC):

A



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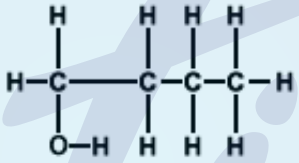

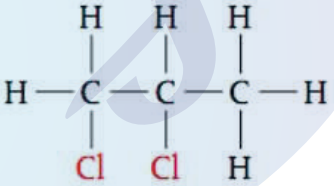

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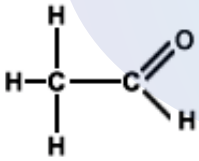

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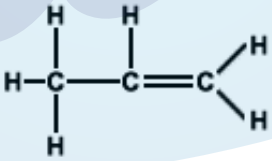


Write the common name of the structural formula C given above.

VII. ANALYTICAL CHEMISTRY

1) State the colour and the formula of the following:

(i) Cupric hydroxide

(ii) Ferric hydroxide

(iii) Calcium Hydroxide

2) You are given three white powders-calcium carbonate, lead carbonate and zinc carbonate. Describe the test you would carry out in solution, to identify the metal ion in each of the above compounds. Indicate clearly how you would prepare the solutions for the tests.

3) Describe in each case, one chemical test that would enable you to distinguish between the following pairs of chemicals. Describe what happens with each chemical or state 'no visible reaction'.

   (i) Zinc chloride solution and Zinc sulphate solution

   (ii) Calcium nitrate solution and lead nitrate solution.

   (iii) sodium chloride and sodium carbonate.

   (iv) Conc. sulphuric acid and dil. sulphuric acid.

4) Identify the substances P and Q in each case based on the information given below:

(i) Salt P, is pale green when dissolved in water, and gives a dirty green precipitate with sodium hydroxide solution, and white precipitate with barium chloride solution.

(ii) The white crystalline solid Q is soluble in water. It liberates a pungent smelling gas when heated with sodium hydroxide solution. Solution of Q when mixed with aqueous silver nitrate gives a white precipitate.

Answers

Chemistry Must Know.

8 i) X: 2, 8, 2 Y: 2, 6.

ii) X^{2+} - cations
Y^{2-} - Anions

iii) XY

iv) $XY + 2HCl_{dil} \longrightarrow XCl_2 + H_2Y$

v) XCl_2, XSO_4, XSN_2

vi) Flourine is above chlorine in periodic table. It has less atomic size and greater effective nucleus charge than chlorine. Thus the tendency to gain electron is more than chlorine.

vii) The tendency of an atom to pull a shared paired of electrons towards itself in a covalent molecule.

The amount of energy required to remove an electron from an isolated gaseous atom.

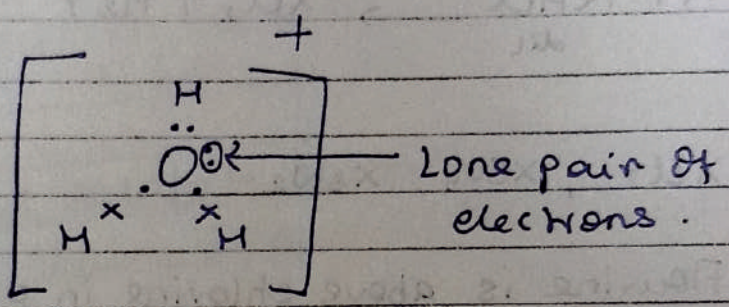
8 i) a) Lithium
ii) a) 3 shells and 2 valence electrons
iii) a) increases and atomic radius ~~radi~~ increases.
iv) b) M_2S.

Q2

1 They ~~do not~~ lack ~~a~~ free mobile ions. Thus they do not conduct electricity

2 Ionic compound. As high melting point and and since ~~all ionic compound~~ it dissolves in water, it is an ionic compound.

3a



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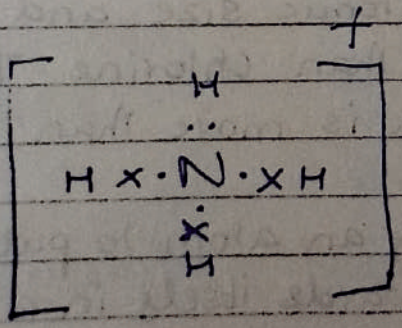

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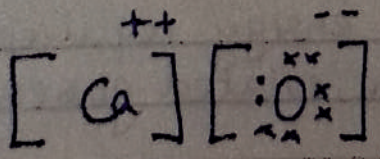

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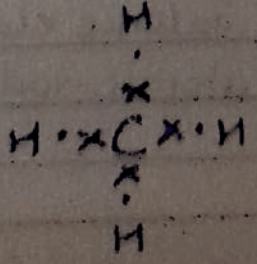


4 The bond formed by sharing a pair of electrons provided completely by one of the combining particles but shared by both.

The unshared pair of electrons found on the central atom of a covalent molecule.

5 a Covalent
b Oxygen
c unequally
d Potassium Chloride

Q3

1 Oxidation of Iron in the presence of moisture.

$$2Fe + 3O_2 \xrightarrow{2xH_2O} 2Fe_2O_3 \cdot xH_2O$$

[redacted]

2 $Al_2O_3 \cdot 2H_2O + 2NaOH \xrightarrow{150\text{-}200^\circ C} 2NaAlO_2 + 3H_2O$

$NaAlO_2 + 2H_2O \xrightarrow{50\text{-}60^\circ C} NaOH + Al(OH)_3$

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

3 Alumina, Cryolite, Flourspar

Cathode: $Al^{3+} + 3e^- \longrightarrow Al$

Anode: $O^{2-} \longrightarrow O + 2e^-$

$O + O \longrightarrow O_2$

4 It is used as Sodi Bauxite being amphoteric in nature reacts with basic sodium hydroxide. The basic impurity Fe_2O_3 is left behind and can be removed by filtration.

5 Alloy is a homogenous mixture of a metal with another metal or with non metallic element.

6 Aluminium.

7 i Zinc Blende
Calamine.

ii Haemetite, Magnetite

8 It ~~reduces the~~ lowers the fusion temperature from 2050°C to 950°C.

9 All metals lose electrons thus undergo oxidation. Thus reduces others and are reducing agents.

Q4

1 Molten Lead Bromide, $PbBr_2 \rightleftharpoons Pb^{2+} + 2Br^-$
Graphite, Graphite.
Cathode: $Pb^{2+} + 2e^- \longrightarrow Pb$ Lead.
Anode: $Br^- \longrightarrow Br + e^-$
$Br + Br \longrightarrow Br_2$ Bromine.

2 Acidified water, $H_2O \rightleftharpoons 2H^+ + OH^-$
Platinum, Platinum
Cathode: $H^+ + e^- \longrightarrow H$ Hydrogen.
$H + H \longrightarrow H_2$

Anode: $O^{2-} \longrightarrow O + 2e^-$ Oxygen.
$O + O \longrightarrow O_2$

3 Aqueous copper sulphate, $CuSO_4 \rightleftharpoons Cu^{2+} + SO_4^{2-}$
$H_2O \rightleftharpoons 2H^+ + OH^-$

Cathode: $Cu^{2+} + 2e^- \longrightarrow Cu$ Copper
Anode: $O^{2-} \longrightarrow O + 2e^-$
$O + O \longrightarrow O_2$ Oxygen

4 Nickel sulphate solution, $NiSO_4 \longrightarrow Ni^{2+} + SO_4^{2-}$
Key Chain, ~~Inferno~~ Block of Nickel.

Cathode: $Ni^{2+} + 2e^- \longrightarrow Ni$ Nickel
Anode: $Ni \longrightarrow Ni^{2+} + 2e^-$ No Product.

5 Sodium Argento cyanide solution.
$Na[Ag(CN)_2] \rightleftharpoons Na^+ + Ag^+ + 2CN^-$
Star, Block of Silver.
Cathode: $Ag^+ + e^- \longrightarrow Ag$ Silver

Anode: $Ag \longrightarrow Ag^+ + e^-$ No Product.

6 Acidified Copper Sulphate Solution; ~~$CuSO_4 \rightleftharpoons Cu^{2+}$~~
$CuSO_4 \rightleftharpoons Cu^{2+} + SO_4^{-2}$; $H_2O \rightleftharpoons H^+ + OH^-$
~~Copper~~ Impure Copper, Pure Copper.

Cathode: $Cu^{2+} + 2e^- \longrightarrow Cu$ Copper
Anode: $Cu \longrightarrow Cu^{2+} + 2e^-$ NIL

7 The object must be washed with NaOH solution.

8 It ~~co~~ results in uneven plating on object.

9 The reactivity of the metal ~~in~~ influence the discharge at cathode.
The reactivity of the different radicals influence the discharge at anode.

10; The decomposition of a chemical compound in its aqueous or fused state accompanied by a chemical reaction by passing direct electric current.

ii The ~~terminal~~ electrode connected to the negative terminal of the battery.

iii The deposition of a thin film of metals on another metal by passing electric current.

11

6 As oxidation and ~~react~~ reduction reaction both takes place. Oxidation ~~at~~ at ~~cathode~~ Anode and Reduction at Cathode.

Q5

1 Contact Process
Sulphur Dioxide and Oxygen
450 - 500°C, 1 - 2 atm, Vanadium Pentoxide.

2 i $4FeS_2 + 11O_2 \longrightarrow 2Fe_2O_3 + 8SO_2$

ii $2SO_2 + O_2 \xrightarrow[1\text{-}2\,atm]{450\text{-}500^\circ C,\ V_2O_5} 2SO_3$

iii $SO_3 + H_2SO_4 \longrightarrow H_2S_2O_7$

iv $H_2S_2O_7 + H_2O \longrightarrow 2H_2SO_4$

3 I $Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2$

a $ZnCO_3 + H_2SO_4 \longrightarrow ZnSO_4 + H_2O + CO_2$

b $MgSO_3 + H_2SO_4 \longrightarrow MgSO_4 + H_2O + SO_2$

c $FeS + H_2SO_4 \longrightarrow FeSO_4 + H_2S$

d $Zn(OH)_2 + H_2SO_4 \longrightarrow ZnSO_4 + 2H_2O$

II

1 $C + 2H_2SO_4 \xrightarrow{conc} CO_2 + 2H_2O + 2SO_2$

2 $S + 2H_2SO_4 \xrightarrow{conc} 3SO_2 + 2H_2O$

III

1 $C_{12}H_{22}O_{11} \xrightarrow{\text{conc } H_2SO_4} 12C + 11H_2O$

2 $CuSO_4 \cdot 5H_2O \xrightarrow{\text{conc } H_2SO_4} CuSO_4 + 5H_2O$

IV 1 $NaCl + \underset{\text{conc}}{H_2SO_4} \xrightarrow{\text{below } 200^\circ C} NaHSO_4 + HCl$

2 $KNO_3 + \underset{\text{conc}}{H_2SO_4} \xrightarrow{\text{below } 200^\circ C} KHSO_4 + HNO_3$.

3 $BaCl_2 + H_2SO_4 \longrightarrow BaSO_4 + 2HCl$

4 $Pb(NO_3)_2 + H_2SO_4 \longrightarrow PbSO_4 + 2HNO_3$.

5 Conc Sulphuric is a dibasic acid. It generates two hydronium ion per molecule of acid in water. Thus it forms 2 salts.

6 A dense misty cloud is formed which is difficult to condense.

Sodium - Golden Yellow
Potassium - Lilac
Calcium - Brick Red.

Q6

1 Habers Process. Nitrogen and Hydrogen.
450°C - 500°C, 200 - 900 atm, Fe

II

1 i $3CuO + 2NH_3 \longrightarrow 3Cu + 3H_2O + N_2$

ii $3PbO + 2NH_3 \longrightarrow 3Pb + 3H_2O + N_2$

} Reducing Property

2 $4NH_3 + 5O_2 \xrightarrow[800^\circ C]{Pt} 4NO + 6H_2O$

Ostwald's Process.

3 $NH_3 + 3Cl_2 \underset{excess}{\longrightarrow} NCl_3 + 3HCl$

4 $AlN + 3H_2O \underset{warm}{\longrightarrow} Al(OH)_3 + NH_3$

5 $2Cu(NO_3)_2 \longrightarrow 2CuO + 4NO_2 + O_2$

6 $2KNO_3 \longrightarrow 2KNO_2 + O_2$

III

1 ~~It absorbs the~~ It has a high latent heat so absorbs heat from the surrounding.

2 As it generates 1 hydroxyl ion per molecule of base in water.

3 To avoid back suction by providing large surface area.

4 As being basic it would not react with basic quicklime.

5 Since ammonia is lighter than air. Highly soluble in water.

Q7

1 Nitric Acid vapours are corrosive in nature thus corrodes metal and attacks rubber and cork.

2 Due to its oxidising property it oxidises hydrogen to water.

3 Due to the dissolution of reddish brown gas Nitrogen Dioxide.

4 As ferrous sulphate gets oxidised to ferric sulphate which does not give brown ring.

Q8

1 $NaCl + \underset{\text{conc}}{H_2SO_4} \xrightarrow{\text{below } 200^\circ C} NaHSO_4 + HCl$

2 $Pb(NO_3)_2 + 2HCl \longrightarrow PbCl_2 + 2HNO_3$

3 To avoid the formation of hard crust of Na_2SO_4 which is difficult to remove.

4 Hence Since acidic HCl would react with basic quicklime to form new products.

5 As it generates 1 hydronium per molecule of acid in water.

6 Since dry HCl is neutral in nature. It does not contain moisture resulting in no formation of hydronium ion.

VII

1 $C_2H_5COONa + NaOH \xrightarrow[300^\circ C]{CaO} Na_2CO_3 + C_2H_6$

2 $C_2H_5Br + 2[H] \xrightarrow[\text{alcohol}]{Zn/Cu} C_2H_6 + HCl$

3 $C_2H_5OH \xrightarrow[170^\circ C]{\text{conc } H_2SO_4} C_2H_4 + H_2O$

4 $CaC_2 + 2H_2O \longrightarrow Ca(OH)_2 + C_2H_2$

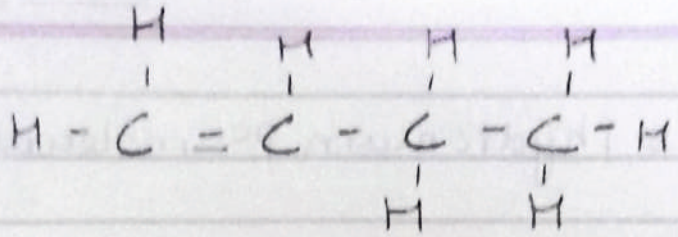
5 ~~$C_2H_4Br_2$~~

5 $C_2H_4 + Br_2 \xrightarrow{CCl_4} C_2H_4Br_2$

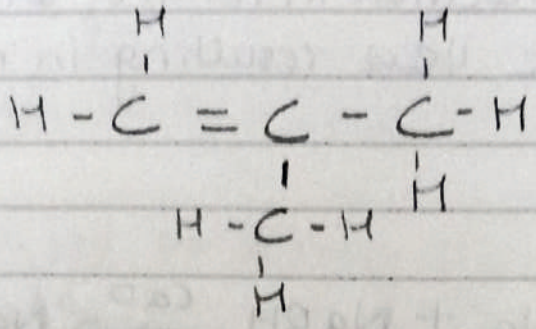
6 $CH_4 + Cl_2 \xrightarrow[\text{UV rays.}]{} CH_3Cl + HCl$

82.

1

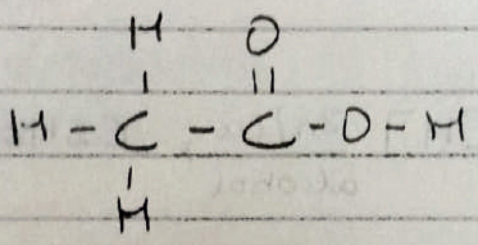


n-butene



Iso-butene

2



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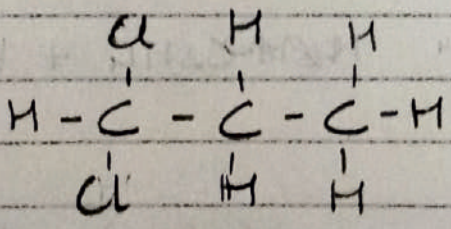

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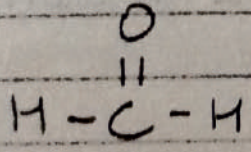

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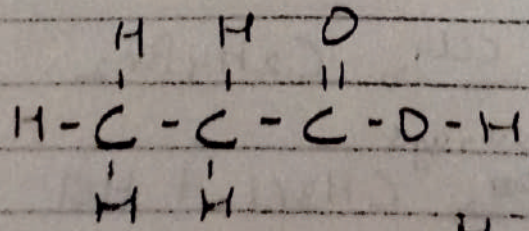

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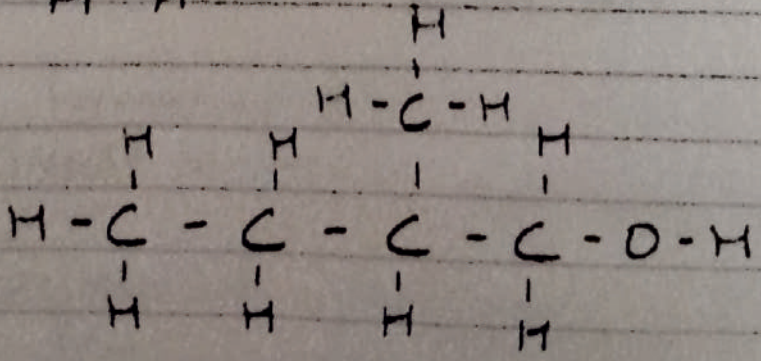

Q3

1 Propyne

2 ~~butano~~ butan-1-ol

3 Ethanal

4 Propene

5 1,2-dichloro propane

VII

i $Cu(OH)_2$ - ~~white~~ pale blue

ii $Fe(OH)_3$ - Reddish Brown

iii $Ca(OH)_2$ - white

2 a $CaCO_3 + 2HNO_3 \longrightarrow Ca(NO_3)_2 + H_2O + CO_2$

$PbCO_3 + 2HNO_3 \longrightarrow Pb(NO_3)_2 + H_2O + CO_2$

$ZnCO_3 + 2HCl \longrightarrow ZnCl_2 + H_2O + CO_2$

I would use Ammonium hydroxide solution.

$Ca(NO_3)_2$ soln	$Pb(NO_3)_2$ soln	$ZnCl_2$ soln.
Add Ammonium hydroxide soln to both.		
No precipitate is formed.	A chalky white ppt formed which is insoluble in excess of NH_4OH solution.	A gelatinous white ppt formed which gives colourless soln in excess of NH_4OH soln.

3i

$ZnCl_2$ soln	$ZnSO_4$ soln
Add $BaCl_2$ soln to both	
No precipitate is formed	A white precipitate is formed.

ii

$Ca(NO_3)_2$ soln	$Pb(NO_3)_2$ soln
Add NH_4OH soln to both	
No precipitate is formed	A chalky white ppt formed insoluble in excess

iii

NaCl soln	Na_2CO_3 soln.
Add dil HCl to both	
No gas is released.	A colourless gas released which turns lime water milky and has no effect on acidified $K_2Cr_2O_7$ soln

iv	Conc H_2SO_4	dil H_2SO_4
	Add Copper to both	
	A colourless gas released which turns lime water milky and has turns acidified $K_2Cr_2O_7$ soln orange to clear green	No gas released.

4i Ferrous Sulphate

ii Ammonium Chloride

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