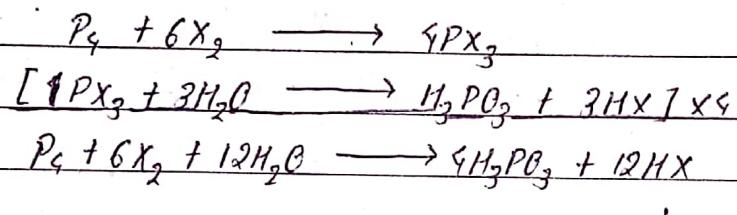


Second-Term Practice Questions

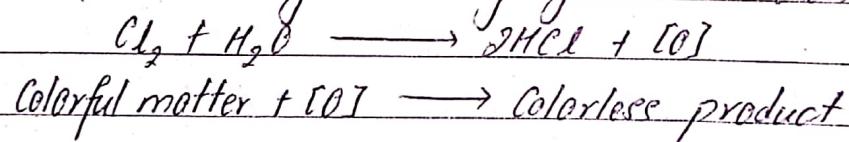
Non-metals.

How would you prepare HBr and HI gas in lab? Give reactions
HBr and HI gas can be prepared by the action of moist red phosphorus
on liquid bromine and solid iodine



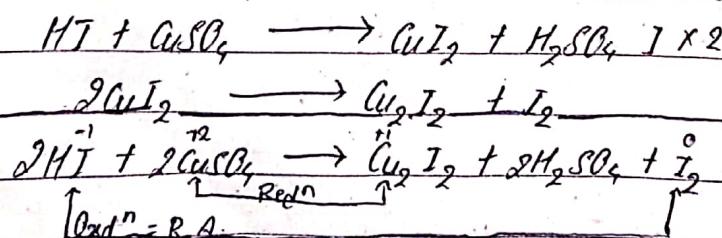
where, $X = Br, I$.

How does chlorine bleaches colorful matter to colorless product? Give rxn.
Chlorine is a strong bleaching agent and bleacher by oxidation.



Give a reaction to show HI is the most powerful reducing agent than
HBr and HCl?

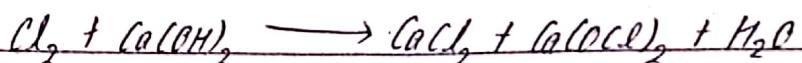
HI can reduce $CuSO_4$, but HCl and HBr cannot



What happens when chlorine is treated with cold and dilute $Ca(OH)_2$?
When chlorine is treated with cold & dil. $Ca(OH)_2$, following reaction takes
place:

Date: _____

Page: _____

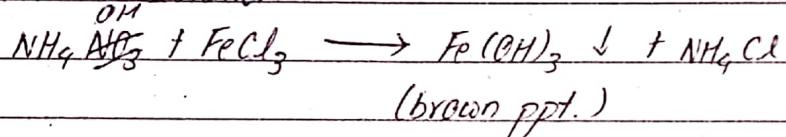


5. Why is nitrogen molecule inert compared to other diatomic molecules?

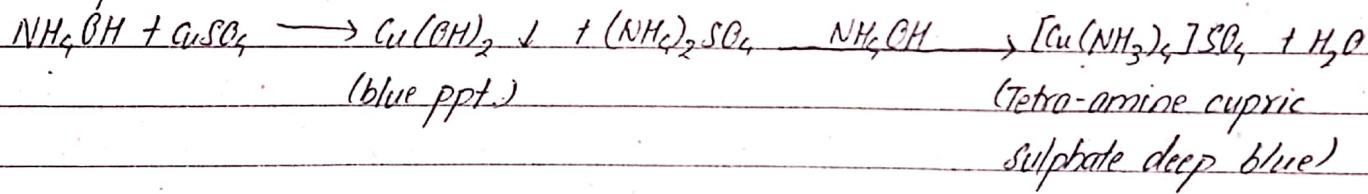
→ The triple bond between two N atoms ($N=N$) in a N_2 molecule and its half-filled electric configuration of p-orbital makes the compound stable and inert compared to other diatomic molecules.

6. What happens when ammonia gas is passed through:

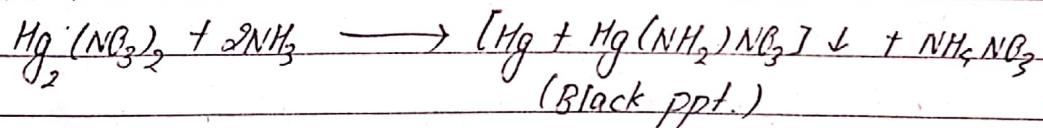
a. Ferric chloride solution



b. Copper sulphate solution till saturation

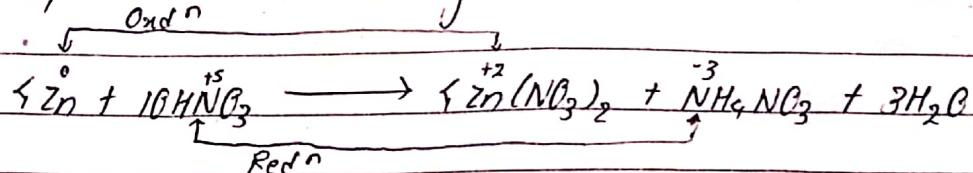


c. Mercurous nitrate solution



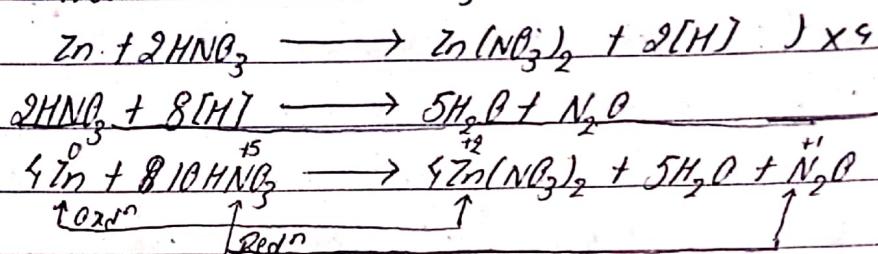
7. Which metals liberate hydrogen gas from very dilute nitric acid? Write their name and give one reaction.

→ Metals above hydrogen in electrochemical series displace hydrogen gas from very dilute nitric acid. Eg: Zinc, Iron

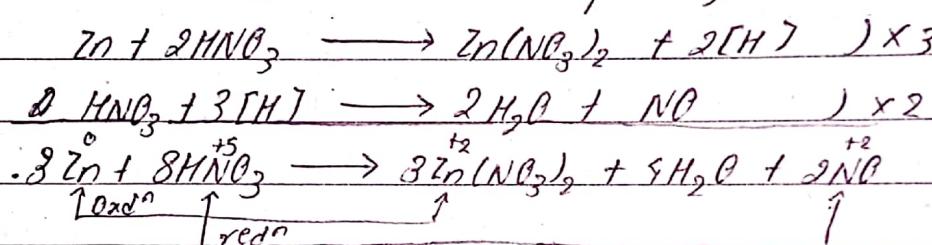


8. What happens when:

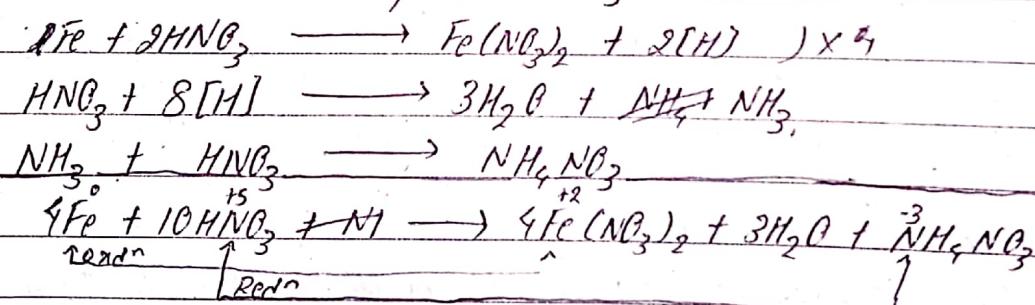
a. Zinc is treated with dil. HNO_3



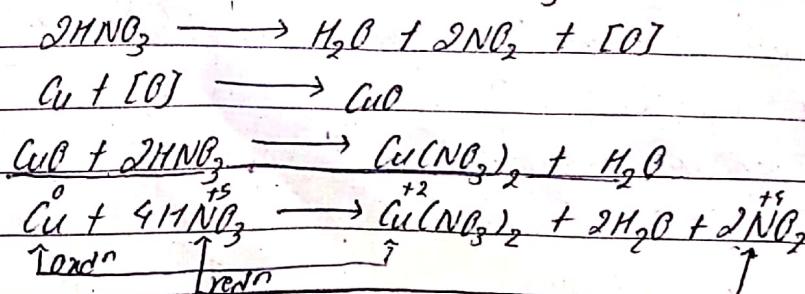
b. Zinc is treated with moderate conc. of HNO_3



c. Iron is treated with very dil. HNO_3



d. Copper is treated with conc. HNO_3



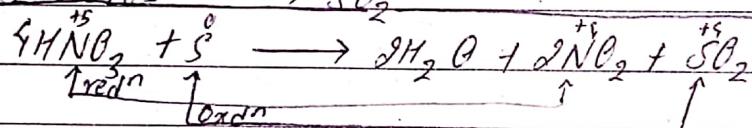
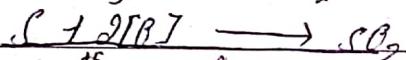
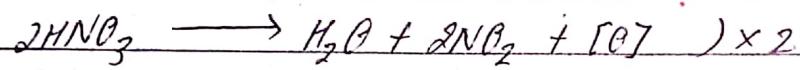
Date:

Page:

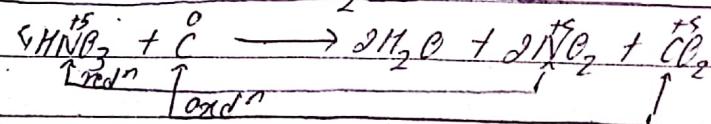
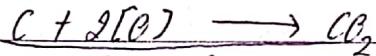
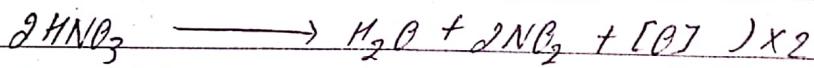
9 Iron becomes passive with hot & conc. HNO_3 . Why?

→ Iron becomes passive with hot and conc. HNO_3 due to formation of ferric ferric oxide (Fe_2O_3) which gets deposited on the surface of iron and stops the further contact between iron and nitric acid.

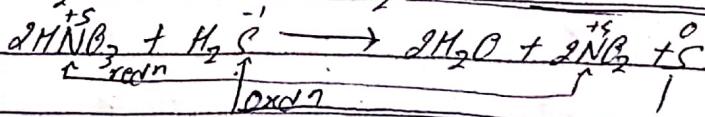
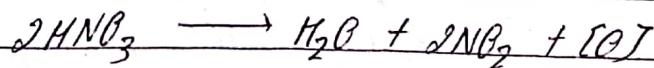
10. What happens when conc. HNO_3 is treated with
i) Sulphur



ii) Carbon

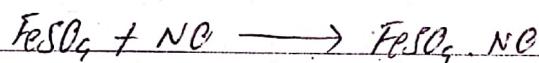
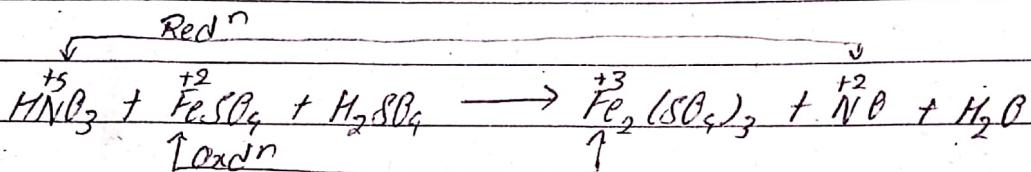
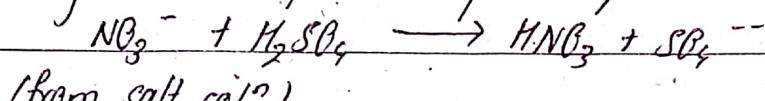


iii. H_2S gas



1. Q. How would you test nitrate ion in the lab?

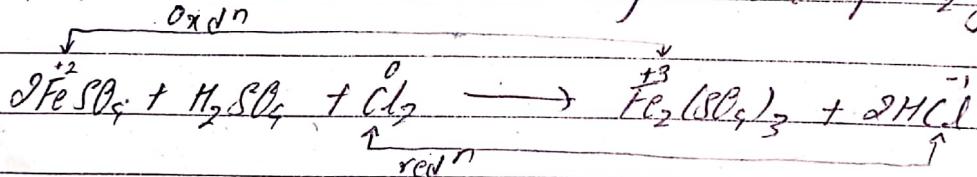
→ To about 1 ml of original solution, add double volume of conc. H_2SO_4 and cool it under water. Freshly prepared $FeSO_4$ is slowly added from innerwall of test tube. $FeSO_4$ traps NO and a ring is formed at the junction of two liquid layers.



(nitrosoyl ferrous sulphate)

brown ring

12. Give a reaction to show oxidizing nature of Cl_2 gas.



13. What happens when I_2 is treated with NaOH solution?

→ with cold & dil. NaOH



(sodium iodide) (hypiodous acid)

→ with hot & conc. NaOH

doesn't react

Periodic Table

Fig - 66.

5 Give reason

- a. Which group element in the periodic table have highest E.A. & why?
→ Group 17 (Halogens) have highest E.A. because they have smaller at. size & higher nuclear force of attraction which makes them favorable to gain e^- .
- b. Alkaline earth metals have almost zero E.A. Why?
→ Because they have bigger at. size & lower nuclear force of attraction which makes them unable to gain e^- & lose e^- (less positive nature)
- c. Which compound is formed more easily among NaCl & KCl? Give reason.
→ KCl is formed more easily than NaCl because Na have smaller at. size and higher nuclear force of attraction than K i.e. the I.E. of Na is greater than K, which makes K to lose e^- more easily than Na during bond formation.
- d. Polarity of hydrogen halides decreases from HF to HBr. Give reason on the basis of electronegativity of halogens.
→ It is because F is more electronegative Br due to its small at. size & greater nuclear force of attraction which causes F to attract the bonded e^- more strongly than Br in hydrogen halides so, polarity of hydrogen halides decreases from HF to HBr.

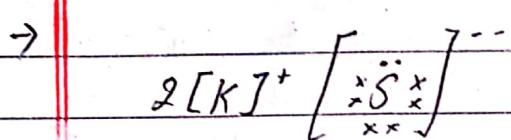
6. Consider one element with at. number 19 & another element Y with valence shell e⁻ configuration $3s^2 3p^4$

a. Identify X & Y with their electronic config

→ X - Potassium - $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^1$

Y - Sulphur - $1s^2, 2s^2, 2p^6, 3s^2, 3p^4$

b. Write lewis dot structure formed by combination of X & Y.



c. What type of ions are formed by X & Y? Compare the size of ions formed with their parent atoms respectively.

→ X forms cation. i.e. K^+

$K^+ < K$: K^+ is smaller in at. size than K as it is formed by loss of e⁻ & ^{eff.}nuclear charge increases which decreases at. size.

→ Y forms anion. i.e. S^{--}

$S^{--} > S$. S^{--} is bigger in at. size than S as it is formed by gain of e⁻ & eff. nuclear charge decreases which increases at. size.

d. Are these ions of X & Y isoelectric? Why? compare their sizes

→ Yes, they are iso electric as both ions have same no. of e⁻ i.e. 18 e⁻.

$$K^+ < S^{--}$$

At-size increases

7 Give reason.

a. Nitrogen is bigger than Oxygen

→ Because Oxygen have higher no. of e^- , so nuclear charge is higher than that of nitrogen and at. size is smaller.

b. Sodium is bigger than magnesium but smaller than potassium.

→ Na & Mg lies on the same period since, no. of e^- in Mg is more than Na, nuclear force of attraction is high on Mg and the at. size of Mg is smaller than Na.

→ Na & K lies on the same group. Since, no. of shells in K is greater than Na, effective nuclear force of attraction is low on K and the at. size of K is bigger than Na.

c. Ferric ion is smaller than ferrous ion.

→ It is because ferric ion is formed by loss of $3e^-$ whereas ferrous ion is formed by loss of $2e^-$. Since, nuclear charge of an ferric ion is greater than ferrous ion, ferric ion is smaller than ferrous ion.

d. Chloride ion is bigger than chlorine atom.

→ Because chloride ion is formed by gain of e^- , so nuclear charge on chloride ion is less than on chlorine. Hence, chloride ion is bigger than chlorine atom.

e. $N^{--} > O^{--} > F^- > Na^+ > Mg^{++} > Cl^{+++}$

→ In iso electric ions, at. size decreases with increase in ${}^{eff.}$ nuclear charge. Since, nuclear charge increases of the ions follow the above series, at. size decreases in following series.

Modern Chemical Manufacturers

3.

- i. What is brine solution?
→ NaCl solution

- ii. What are the sources of CO_2 & NH_3 in this process?
→ The source of CO_2 is lime kiln & NH_3 is the ammonia recovery tower.

- iii. What is the final product obtained from carbonation tower?
→ $\text{NaHCO}_3 + \text{NH}_4\text{Cl}$

- iv. Draw the flowsheet diagram of this process.

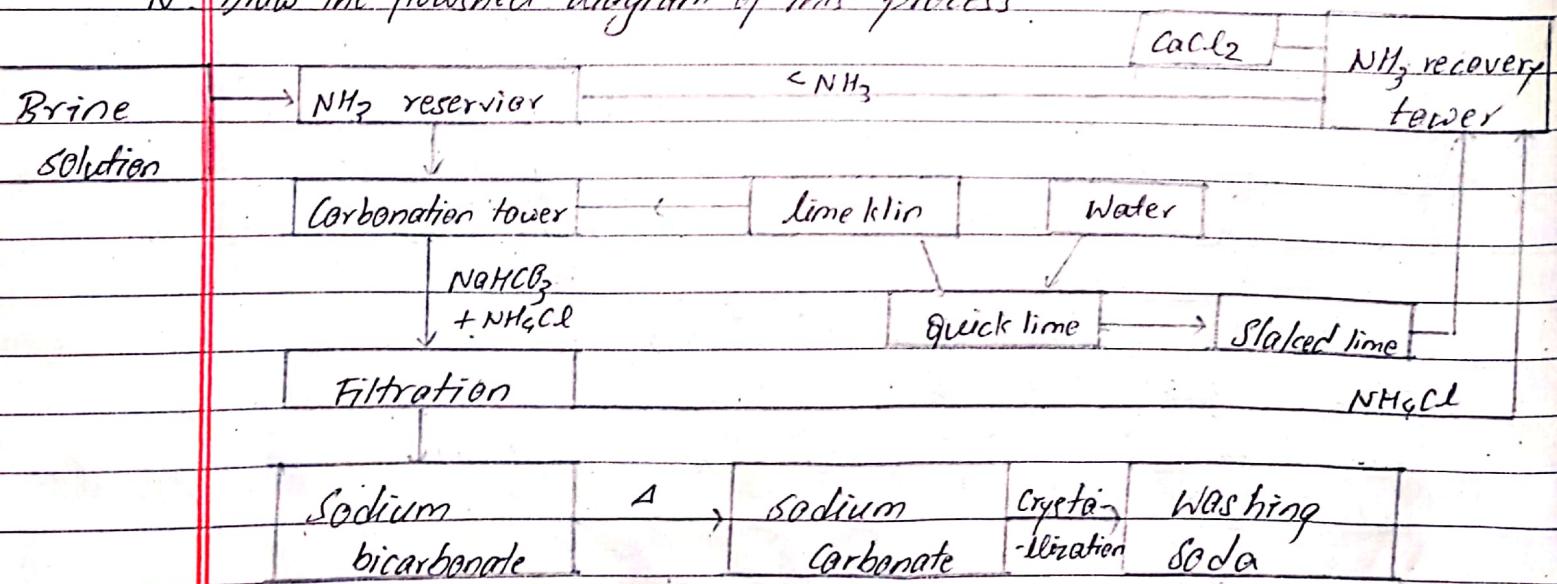
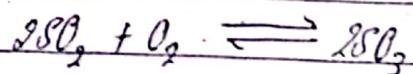


Fig: Flowsheet diagram of prepⁿ of Washing Soda by Solvay Process.

4.



i. How is yield of SO_3 maximized?

→ The yield of SO_3 is maximized by le Chatelier's principle.

a. low temp^r (450°C)

b. High Pressure (2 atm)

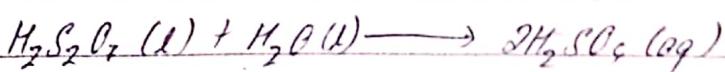
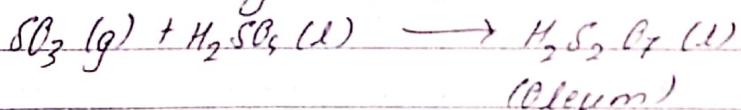
c. Excess of oxygen

d. Use of catalyst (V_2O_5)

e. Purity of gases.

ii. How is SO_3 converted into H_2SO_4 in the process.

→ SO_3 is first treated with conc. H_2SO_4 to form oleum which is later on reacted with water to give H_2SO_4 .



iii. Why V_2O_5 replaced Pt - asbestos in this process?

→ V_2O_5 replaced Pt - asbestos to remove catalytic poisoning as Pt is easily poisoned by impurities.

iv. Write the name of mechanism to test purification of SO_2 in test box.

→ Tyndall effect.

v. What is fuming sulphuric acid?

→ The SO_3 produced by the process is absorbed by conc. H_2SO_4 and a liquid is formed which is known as fuming sulphuric acid.

Identify A, B, C and D.

A - diaphragm membrane

B - graphite anode

C - steel or nickel cathode

D - Saturated brine

Write the uses of 'A' in this cell.

To separate anode & cathode, doesn't let H_2 & Cl_2 combine

It prevents flow of OH^- ion from cathode to anode

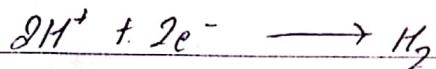
Why mercury cathode is replaced by the cell above to prepare NaOH.

~~eff~~ High efficiency, easy to handle

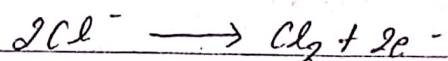
Prevents health hazards as mercury is poisonous

Show the reaction that takes place at cathode & anode compartment.

At cathode,



At anode,



Explain the recovery of sodium hydroxide from this cell.

~~During~~ After electrolysis, the salt from the cathode compartment is periodically removed & concentration whereby NaCl gets crystallized leaving behind the concentrated salt of NaOH. Evaporation of conc. NaOH salt upto the dryness gives solid NaOH, as per the requirement, the solid NaOH is

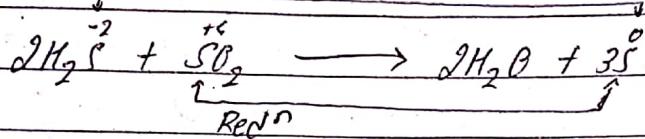
Date:

Page:

Non-metals (Sulphur)

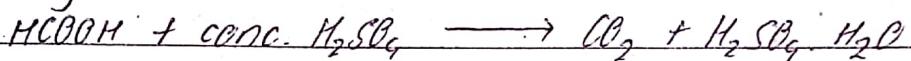
1. What happens when H_2S gas is passed through SB_2 water?

→ When H_2S gas is passed through SB_2 water, get H_2S oxidized to sulphur.

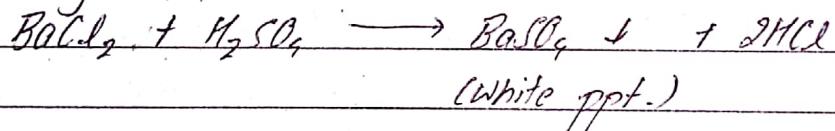


2. Give one / one example to show the following nature of H_2SO_4 .

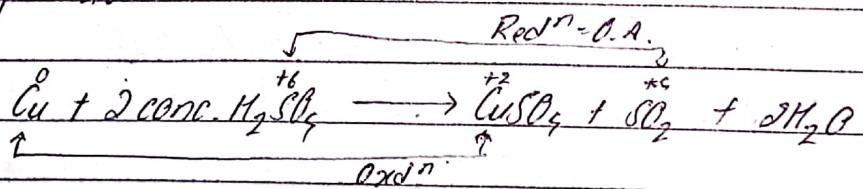
a. dehydrating nature



b. precipitating nature



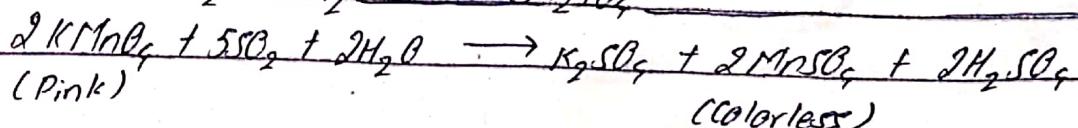
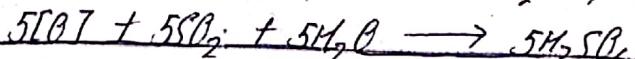
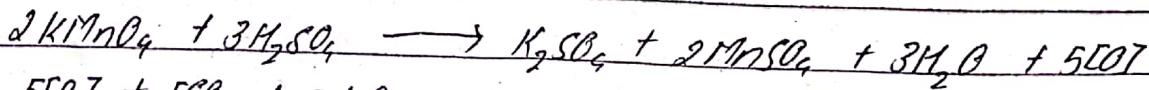
c. Oxidizing nature



3. What happens when SB_2 gas is passed through

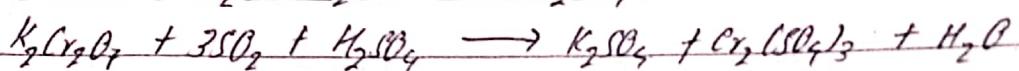
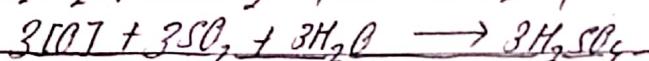
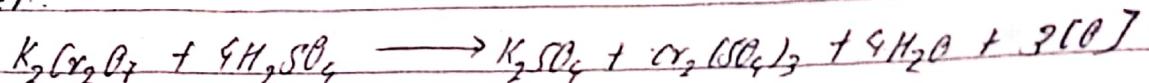
a. acidified $KMnO_4$

→ SB_2 discharges ^{pink} color of acidified $KMnO_4$ by reduction



b. acidified $K_2Cr_2O_7$

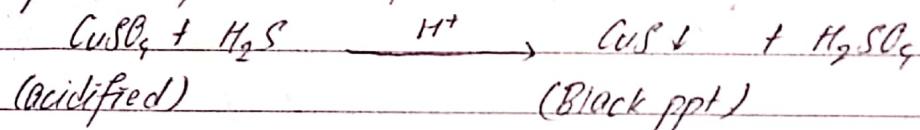
→ SO_3^{2-} reduces acidified $K_2Cr_2O_7$ soln & discharges its orange color to green.



(Orange) (Green)

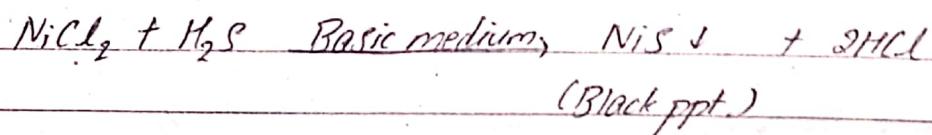
5. What happens when H_2S gas is passed through copper sulphate in acidic medium?

→ When H_2S is passed through $CuSO_4$ soln in acidic medium, black ppt of cupric sulphide is formed

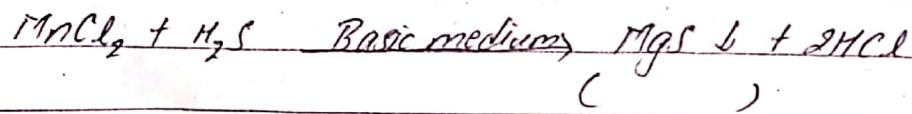


5. What happens when H_2S gas is passed through in basic medium

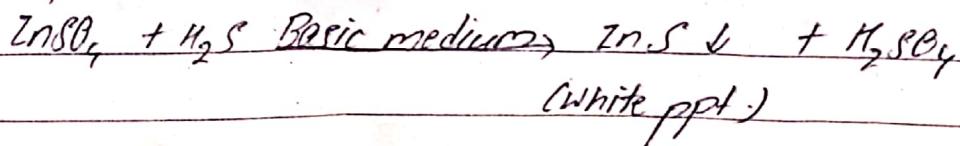
a. $NiCl_2$



b. $MnCl_2$

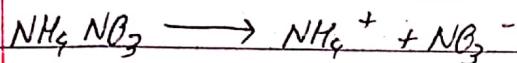


c. ~~CaC₂~~ $ZnSO_4$



Redox Reaction

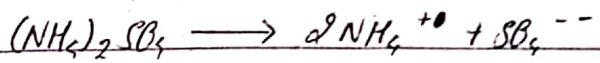
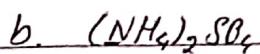
1. Calculate the O.N. of following underline elements



let the O.N. of N be x

$$x + 1x(+4) = +1$$

$$\therefore x = -3$$

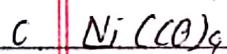


let the O.N. of N be x

$$2(x + 1x4) = +2$$

$$2x = -6$$

$$\therefore x = -3$$



let the O.N. of Ni be x

$$x + 0 = 0$$

$$\therefore x = 0$$



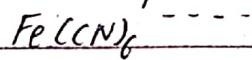
let the O.N. of C be x

$$2x + (+1)x2 + (-2)x4 = 0$$

$$\therefore x = +3$$

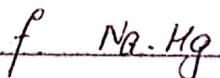


let the O.N. of Fe be x



$$\text{Or, } x + (-1)x6 = -4$$

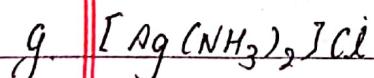
$$\therefore x = +2$$



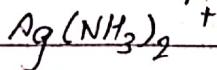
let the O.N. of Na be x

$$\therefore x = 0$$

(Only physical bonding)



let the O.N. of Ag be x .



$$\text{Or, } x + 0 = +1$$

$$\therefore x = +1$$



let the O.N. of Fe be x

$$x + (-1)x6 = -6$$

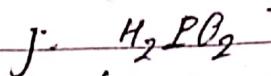
$$\therefore x = +2$$



Let the O.N. of Cl be x

$$(+1) + x + (-2) \times 3 = 0$$

$$\therefore x = +5$$

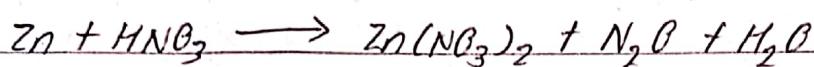


Let the O.N. of P be x

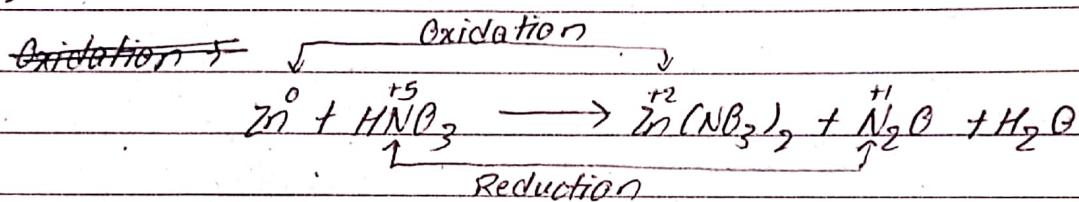
$$(+1) \times 2 + x + (-2) \times 2 = -1$$

$$\therefore x = +1$$

3.



a. b

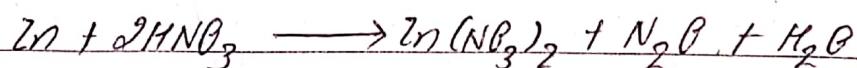


Oxidant $\rightarrow \text{HNO}_3$

Reducant $\rightarrow \text{Zn}$

b.

Step 3:

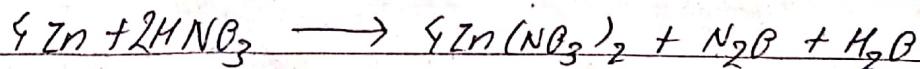


Step 4:

Change in O.N. in oxidⁿ = $(+2) - 0 = +2 = +1$

Change in O.N. in redⁿ = $2[(+1) - (+5)] = -8 = -4$

Step 5:



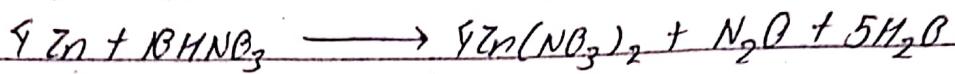
Step 6:



Date:

Page:

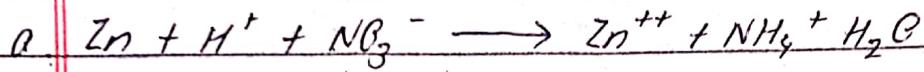
Step 7 :



C

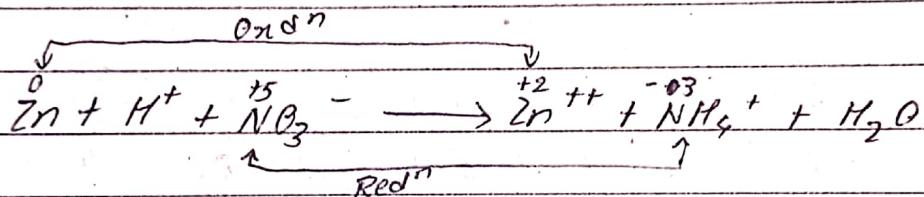
→ 10 molecules

4.

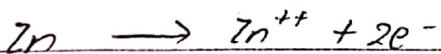
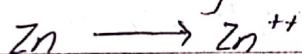


(Ion electron method)

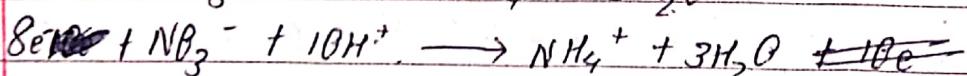
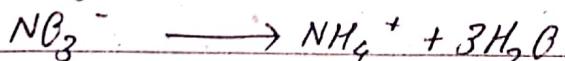
Solⁿ:



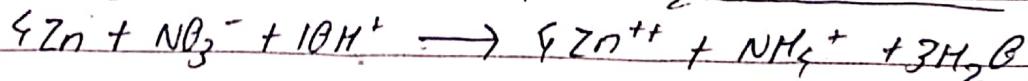
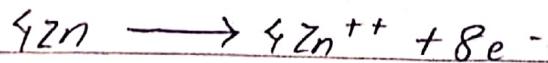
Splitting & balancing oxidⁿ half



Balancing redⁿ half

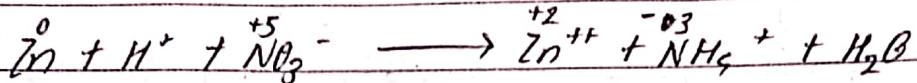


Then,

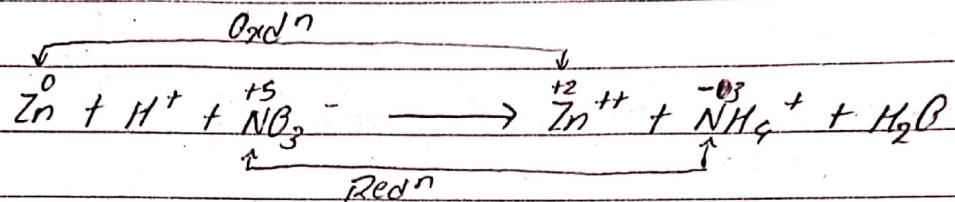


Oxidation number method

Step 1:



Step 2:



Step 3 : Skip

Step 4:

$$\text{Change in O.N. in } \text{Oxidn} = (+2) - 0 = +2 = +1$$

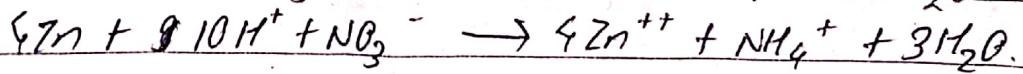
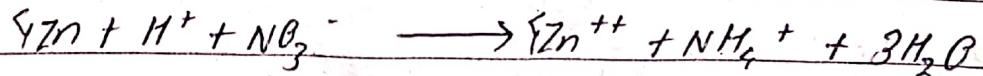
$$\text{Change in O.N. in red}^n = (\bar{0}3) - (+5) = -\cancel{0}8 = -4$$

Step 5:

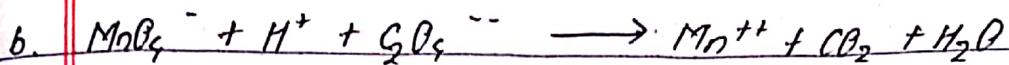


Step 6: Skip

Step 4:

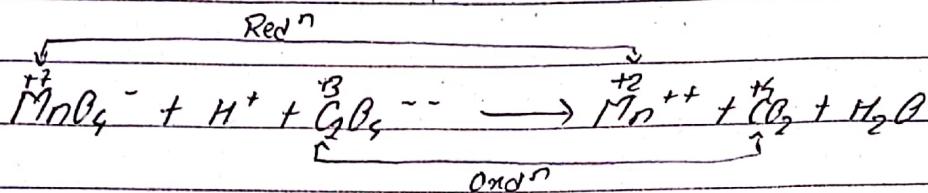


(Balanced)

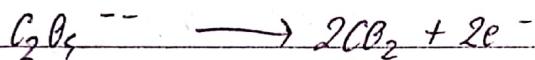


(Ion electron method)

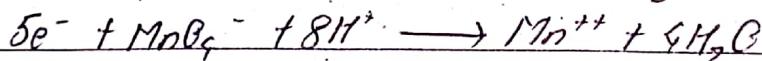
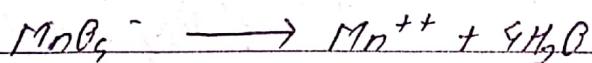
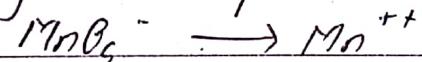
SOL:



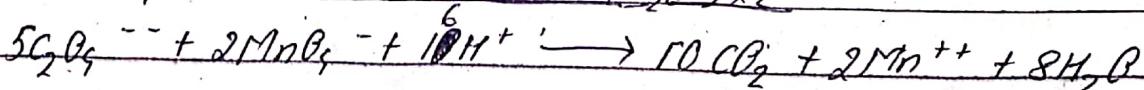
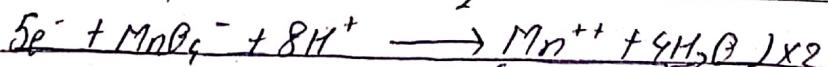
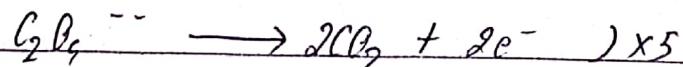
Splitting & balancing oxid^n half



Balancing red^n half



Then,



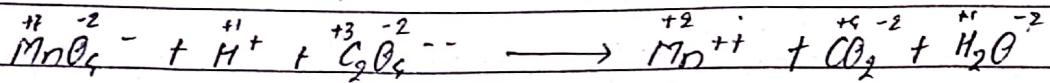
(Balanced)

Date:

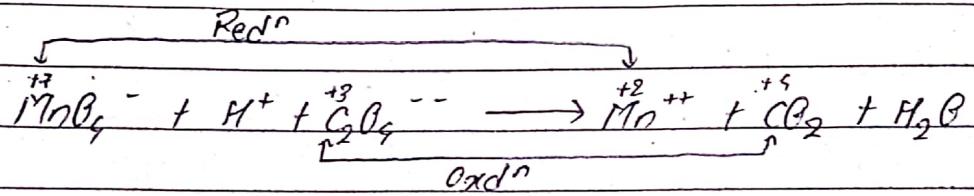
Page:

(Oxidⁿ Number method)

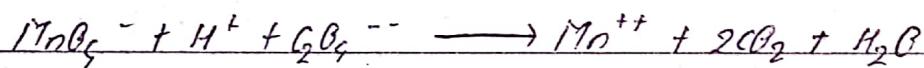
Step 1:



Step 2:



Step 3:

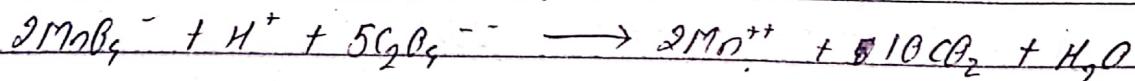


Step 4:

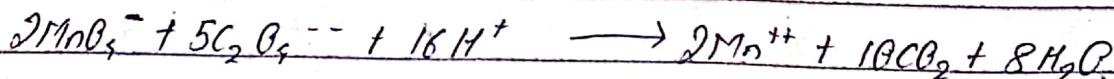
$$\text{Change in O.N. in Oxid}^n = 2[(+4) - (+3)] = +2$$

$$\text{Change in O.N. in Red}^n = (+2) - (+7) = -5$$

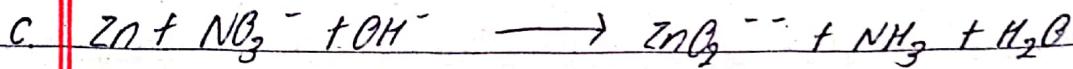
Step 5:



Step 6:

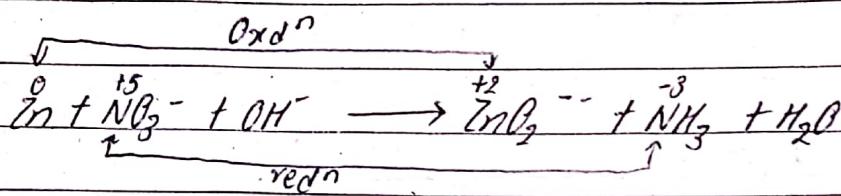


(Balanced)

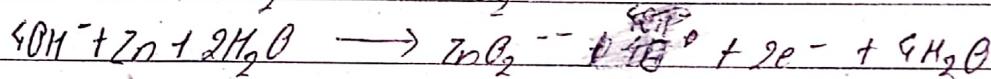
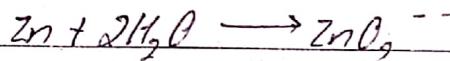


(Ion electron method)

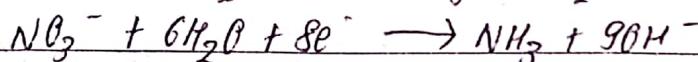
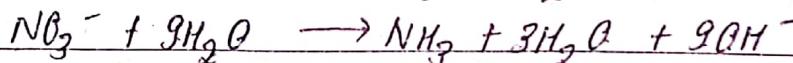
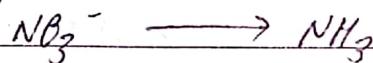
$8e^-$



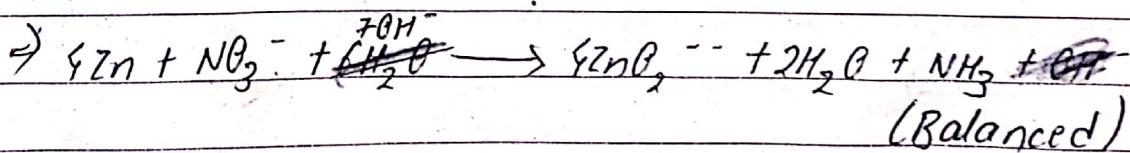
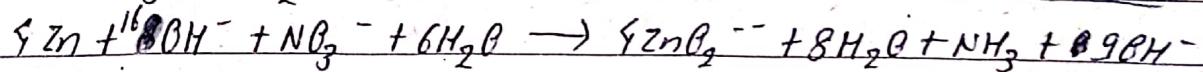
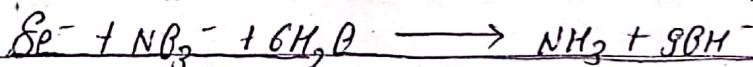
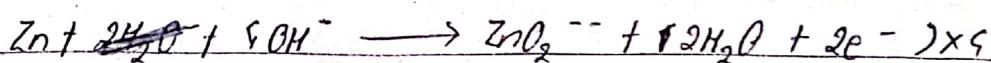
Splitting and balancing oxidn half



Balancing redn half

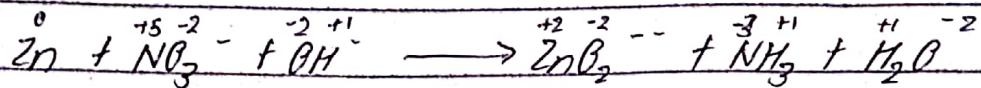


Then,

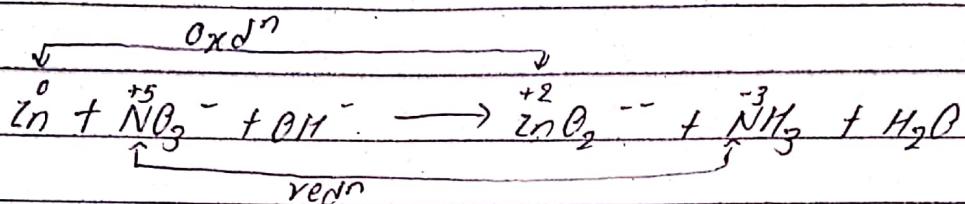


(B.N. method)

Step 1:



Step 2:



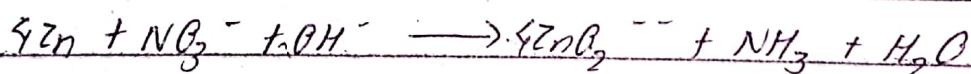
Step 3: Skip

Step 4:

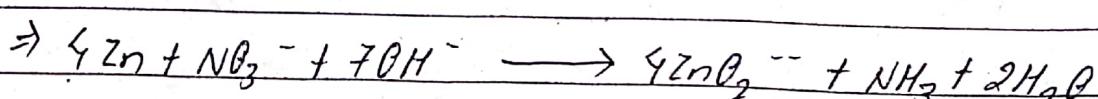
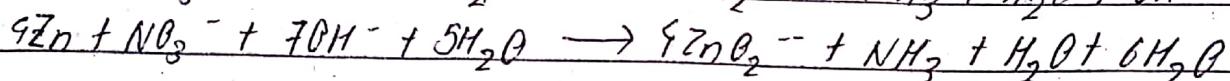
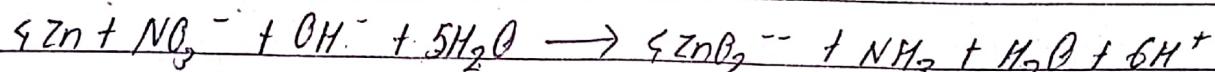
$$\text{Change in O.N. in } \text{Oxid}^n = (+2) - 0 = +2 \quad = +1$$

$$\text{Change in O.N. in rev'n} = (-3) - (+5) = -8 = -\$$$

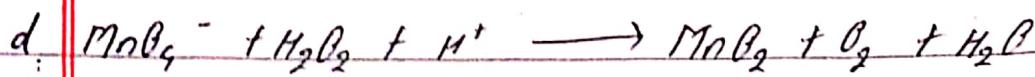
Step 5:



Step 6:

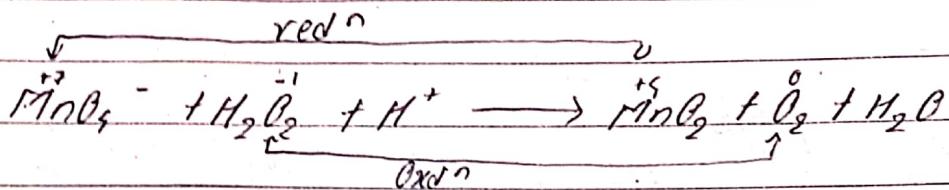


(Balanced)

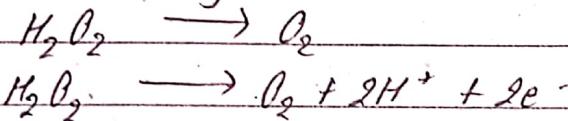


(ion electron method)

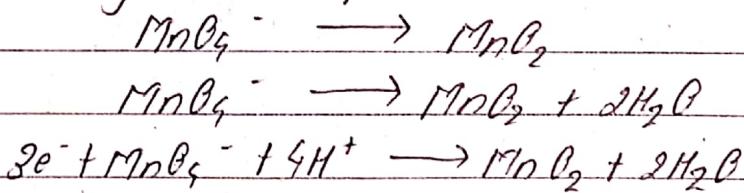
Sol'n:



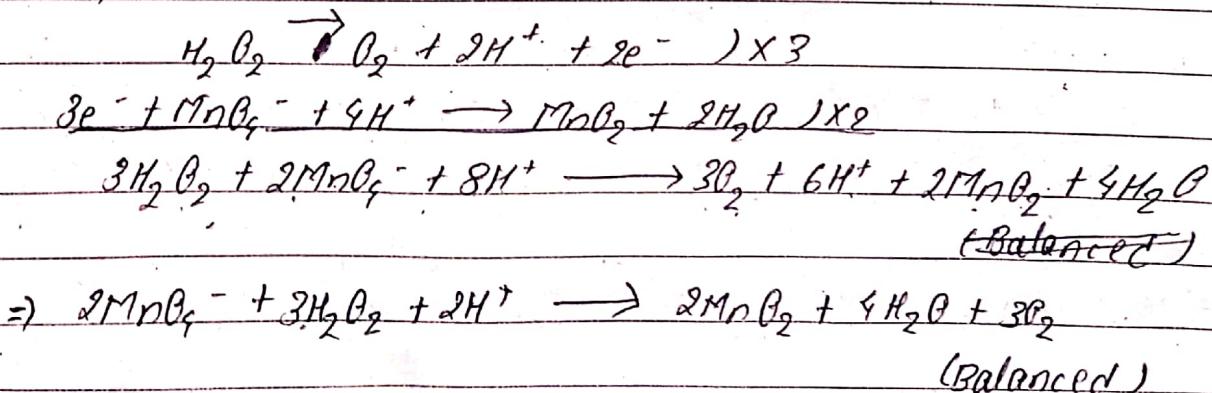
Splitting & balancing oxidⁿ half



Balancing redⁿ half



Then,

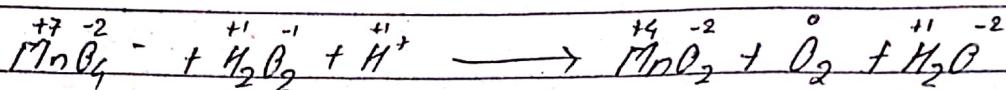


Date:

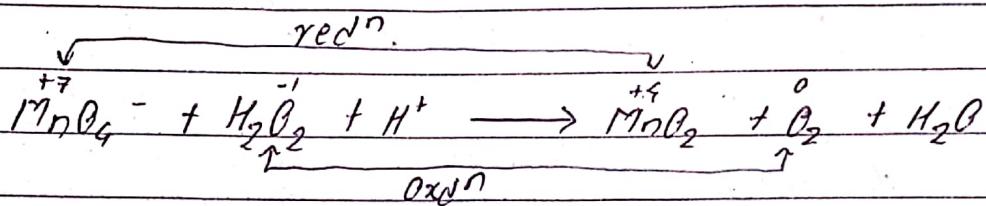
Page:

(O.N. number method)

Step 1:



Step 2:



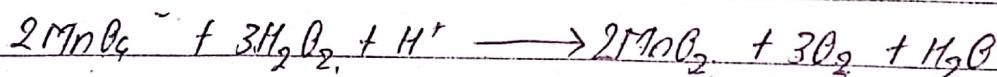
Step 3: Skip

Step 4:

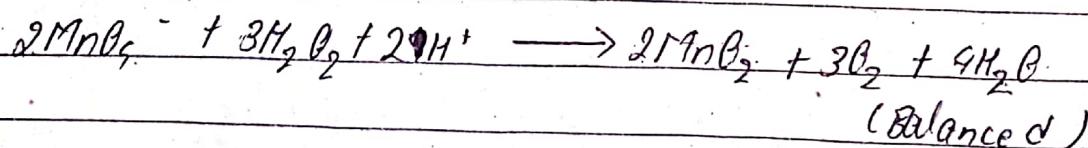
$$\text{Change in O.N. in oxd}^n = 0 - (-1) = +1 \times 2 = +2$$

$$\text{Change in O.N. in red}^n = (+5) - (+7) = -3$$

Step 5:



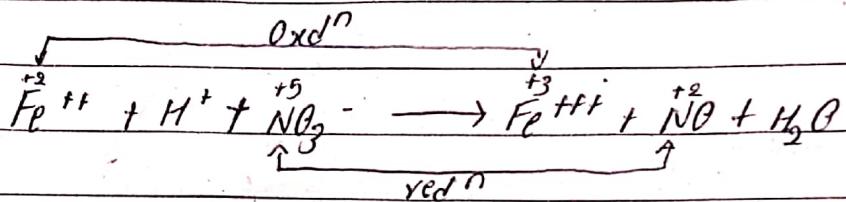
Step 6



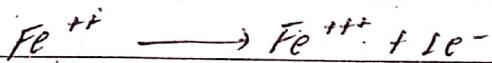
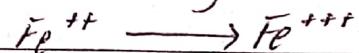


(Ion electron method)

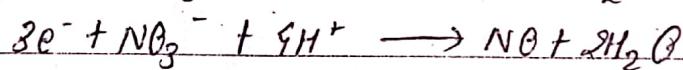
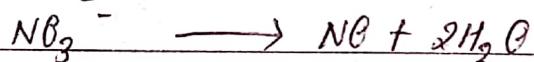
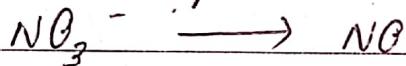
So;



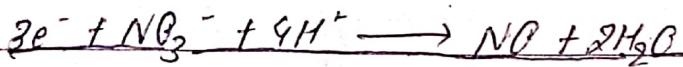
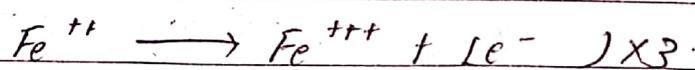
Splitting & balancing oxidⁿ half



Balancing redⁿ half



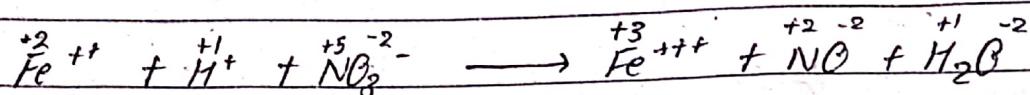
Then;



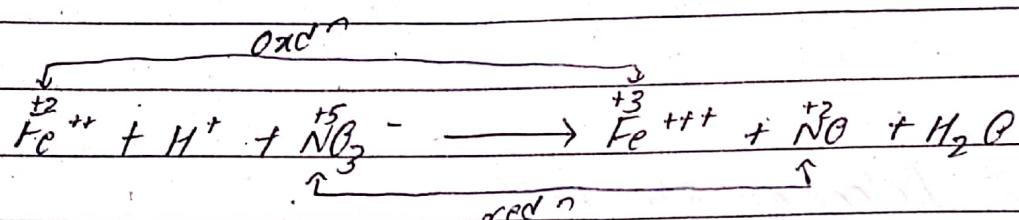
(Balanced)

(O.N. method)

Step 1:



Step 2:



Step 3: Skip

Step 4 :

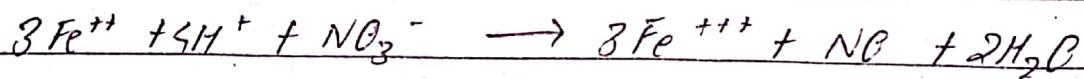
Change in O.N. in $\text{O}_2\text{N}^+ = (+3) - (+2) = +1$

$$\text{Change in O.N. in } \text{red}^n = (+2) - (+5) = -3$$

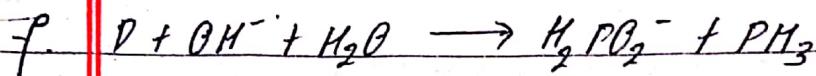
Step 5:



Step 6:

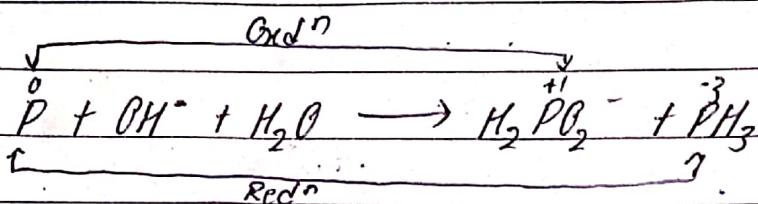


(Balanced)

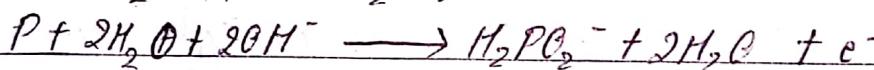
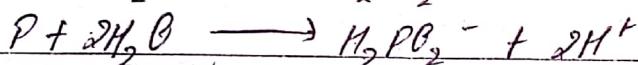
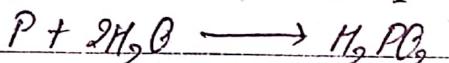
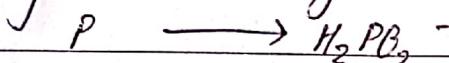


(Ion electron method)

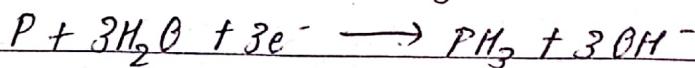
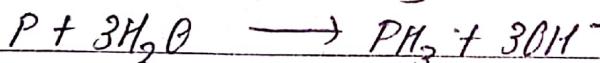
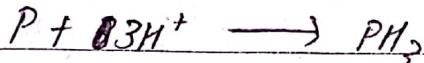
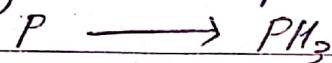
SOL:



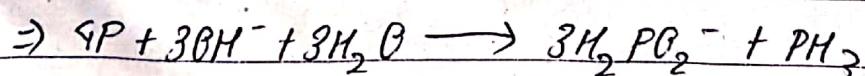
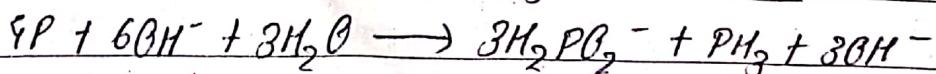
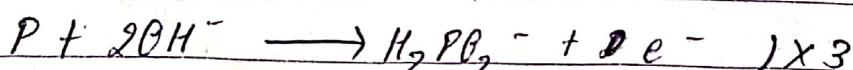
Splitting & balancing oxidⁿ half



Balancing redⁿ half



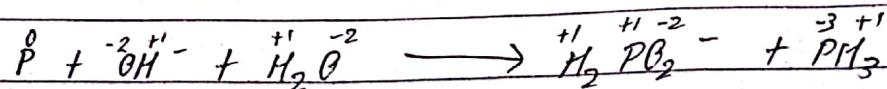
Then,



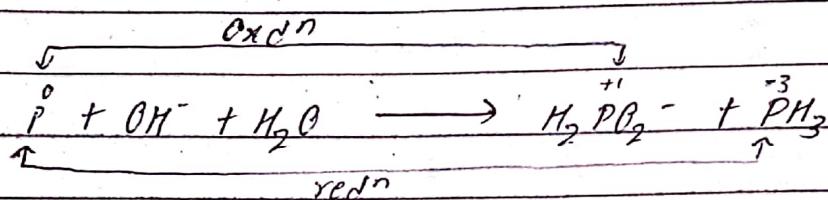
(Balanced)

(O.N. method)

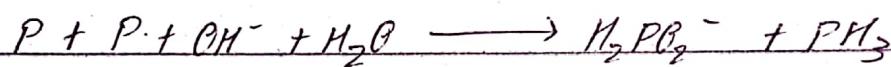
Step 1:



Step 2:



Step 3:

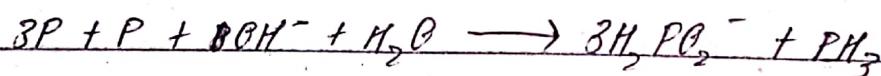


Step 4:

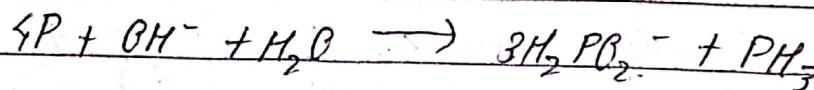
$$\text{Change in O.N. in oxidn} = (+1) - 0 = +1$$

$$\text{Change in O.N. in redn} = (-3) - 0 = -3$$

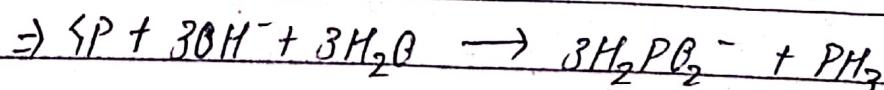
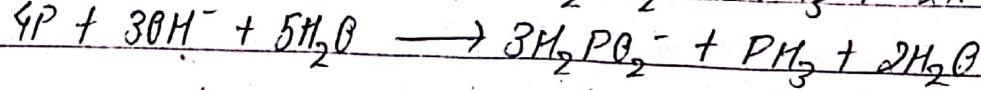
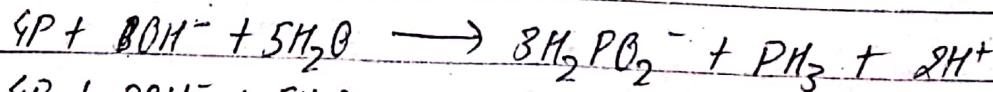
Step 5:



Step 6:

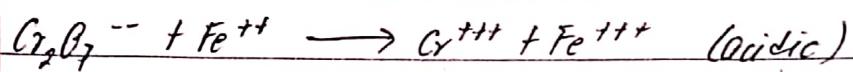


Step 7:



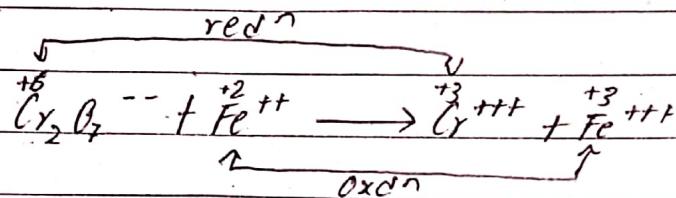
(Balanced)

Date: _____
Page: _____

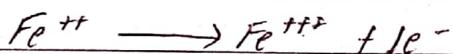
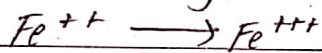


(Ion electron method)

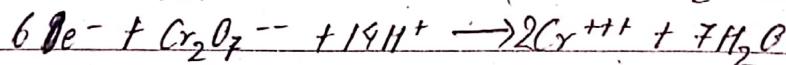
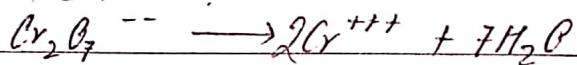
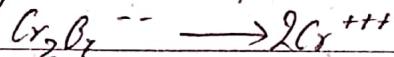
SOL:



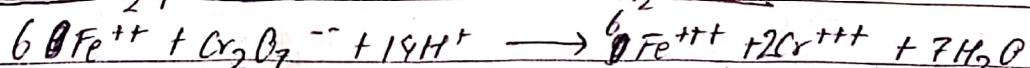
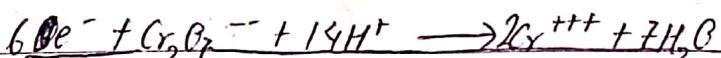
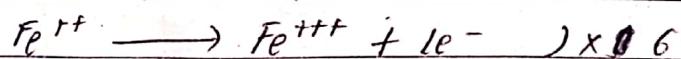
Splitting & balancing oxdn half



Balancing redⁿ half



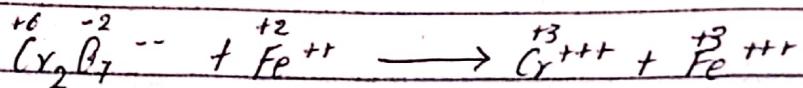
Then,



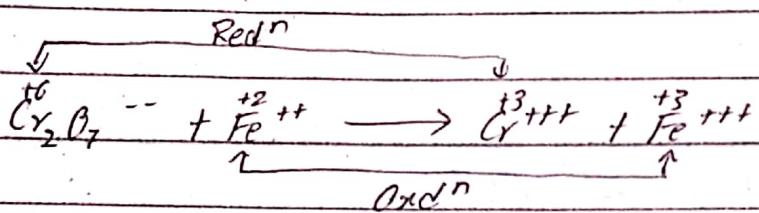
(Balanced)

(O.N. method)

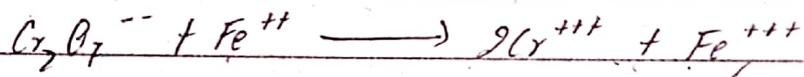
Step 1:



Step 2:



Step 3:



Step 4:

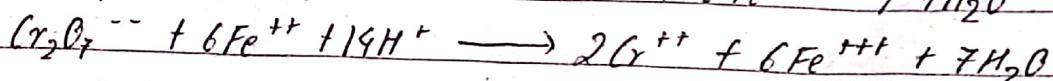
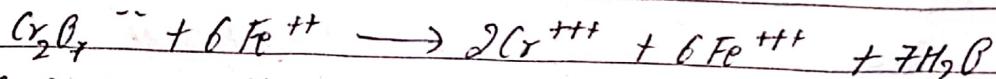
$$\text{Change in O.N. in Oxid}^n = (+3) - (+2) = +1$$

$$\text{Change in O.N. in Red}^n = 2[(+3) - (+6)] = -6$$

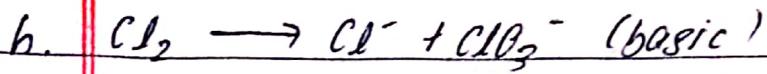
Step 5:



Step 6:

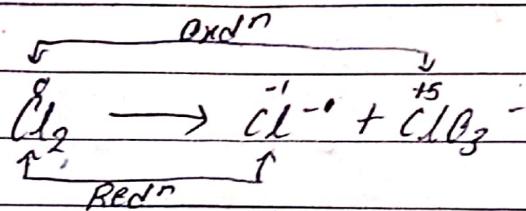


(Balanced)

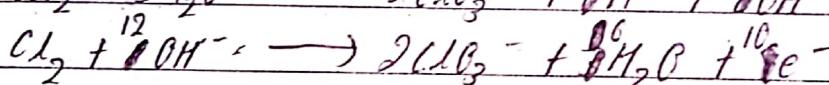
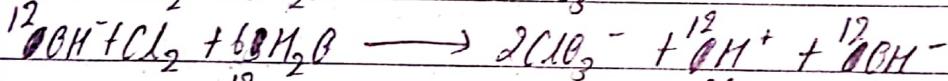
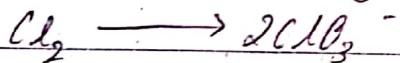
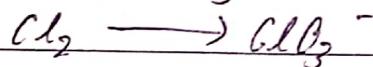


(Ion-electron method)

Soln:



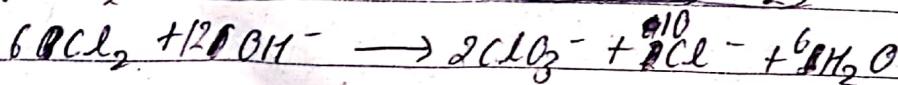
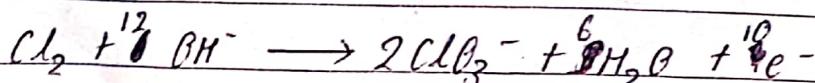
Splitting & balancing oxidn half



Balancing redn half



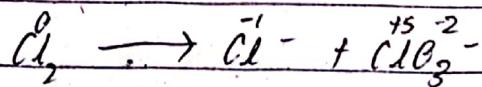
Then,



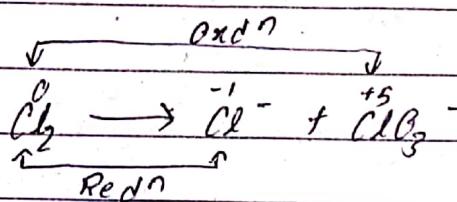
(Balanced)

(O.N. method)

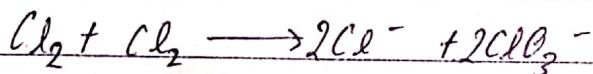
Step 1:



Step 2:



Step 3:

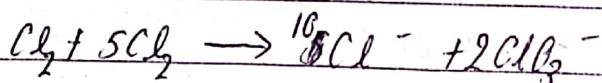


Step 4:

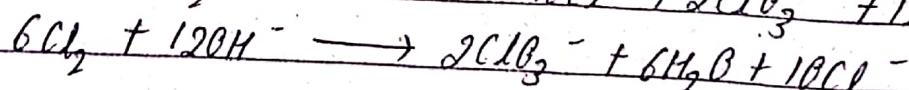
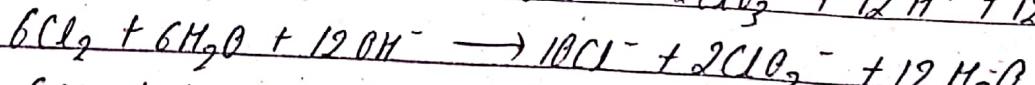
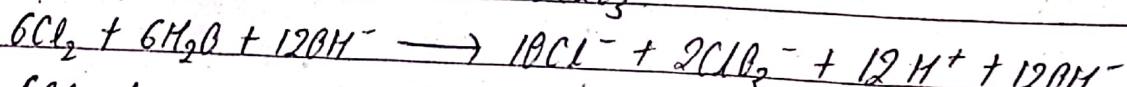
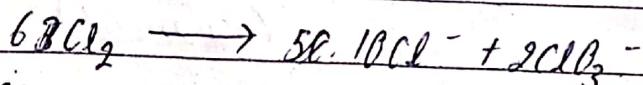
$$\text{Change in O.N. in oxidn} = (+5) - 0 = +5 \times 2 = +10 = +5$$

$$\text{Change in O.N. in redn} = (-1) - 0 = -1 \times 2 = -2 = -2$$

Step 5:



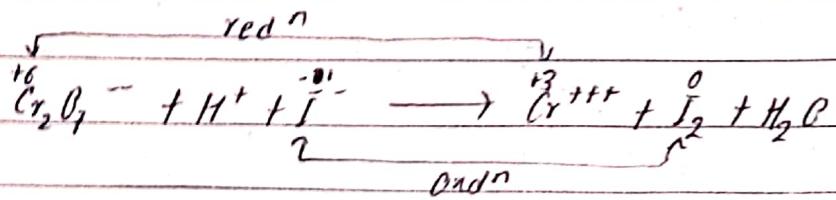
Step 6:





(Ion - electron method)

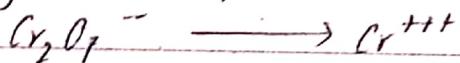
So 1/2,



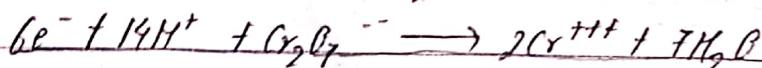
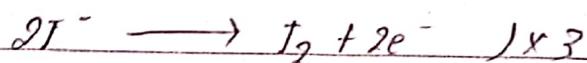
Splitting & balancing oxid^n half



Balancing redⁿ half



Then,

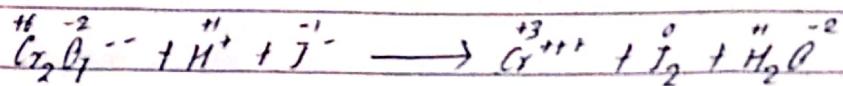


(Balanced)

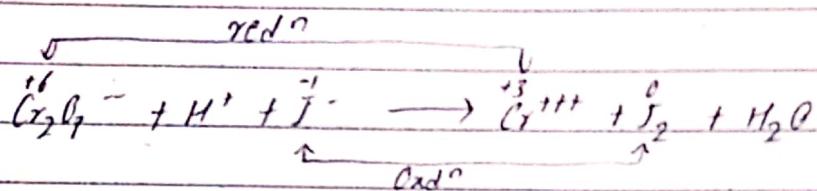
Date: _____
Page: _____

(O.N. method)

Step 1:



Step 2:



Step 3:



Step 4:

$$\text{Change in O.N. in oxidn} = 2[0 - (-1)] = +2 = +1$$

$$\text{Change in O.N. in redn} = 2[(+3) - (+1)] = -6 = -3$$

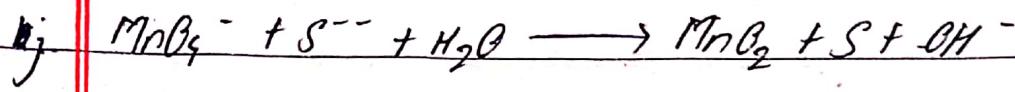
Step 5:



Step 6:

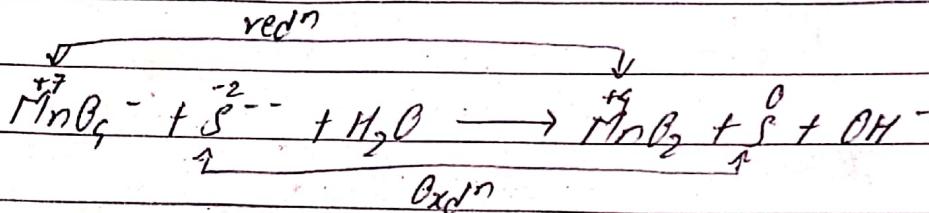


(Balanced)

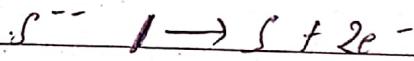
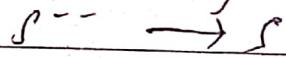


(Ion-electron method)

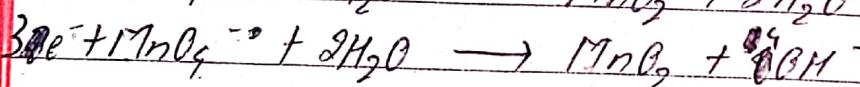
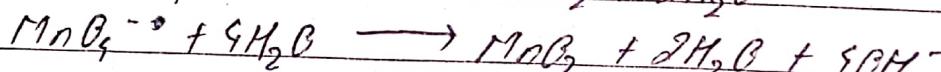
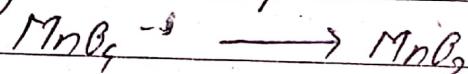
SOP:



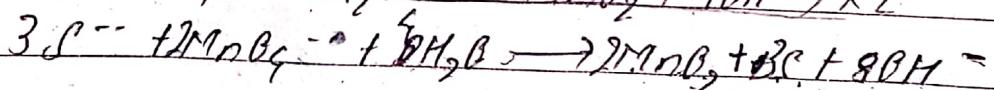
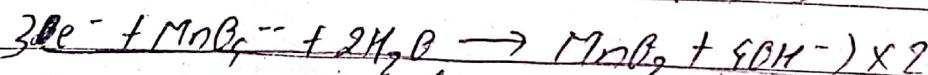
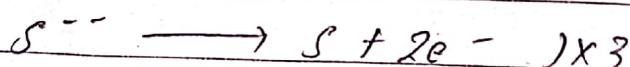
Splitting & balancing oxidn half



Balancing redn half



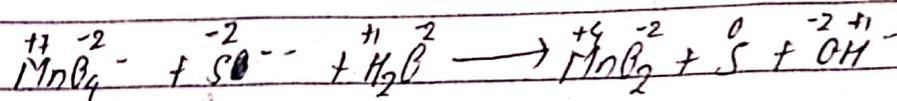
Then,



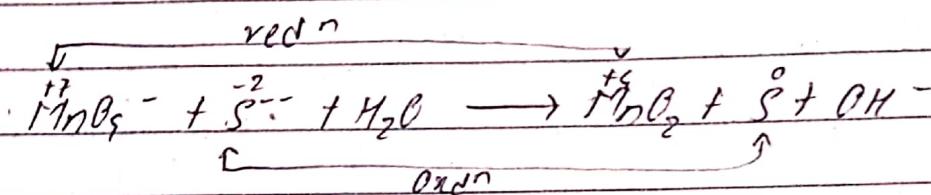
(Balanced)

(O.N. method)

Step 1:



Step 2:



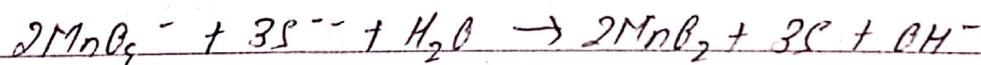
Step 3: Skip

Step 4:

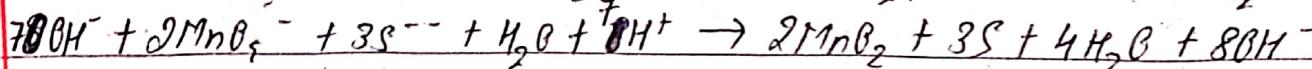
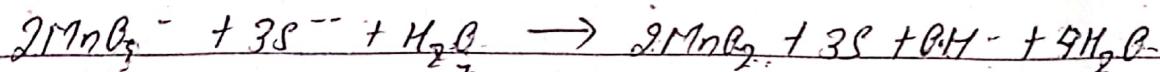
$$\text{Change in O.N. in Oxidn} = 0 - (-2) = +2$$

$$\text{Change in O.N. in redn} = (+9) - (+7) = -2$$

Step 5:



Step 6:



(Balanced)

Mole concept Combination

1. Soln:

From case a,

$$\text{mass of metal} = 0.46\text{g}$$

$$\text{mass of metal oxide} = 0.77\text{g}$$

$$\begin{aligned}\text{mass of oxygen} &= 0.77\text{g} - 0.46\text{g} \\ &= 0.31\text{g}\end{aligned}$$

Here,

0.46g metal combines with 0.31g of oxygen

$$1\text{g of metal combines with } \frac{0.31}{0.46} = 0.67\text{g of oxygen}$$

From case b,

$$22400 \text{ cc of H}_2 \text{ gas at NTP} = 2\text{g}$$

$$760 \text{ cc of H}_2 \text{ gas at NTP} = \frac{2}{22400} \times 760$$

$$= 0.067\text{g}$$

Here,

0.806g of same metal displaces 0.067g of Hydrogen

$$1\text{g of metal displaces } \frac{0.067}{0.806} = 0.083\text{g of Hydrogen}$$

Now,

Combining mass ratio of H and O that combines with constant mass of metal i.e. 1g is $0.083 : 0.67 = 1 : 8 = R_1$

From case c,

Date:

Page:

$$\text{mass of } H_2O = 1.26 \text{ g}$$

$$\text{mass of O} = 1.12 \text{ g}$$

$$\begin{aligned}\text{mass of H} &= 1.26 - 1.12 \text{ g} \\ &= 0.14 \text{ g}\end{aligned}$$

Here,

combining mass ratio of H:O is $0.14 : 1.12 = 1:8 = R_2$

Since,

$R_1 = R_2$. It illustrates law of reciprocal proportion.

Q. Sol:

For marsh gas.

75g of C combines with 25g of H

$\Rightarrow 1 \text{ g of C combines with } \frac{25}{75} = 0.33 \text{ g of H}$

For carbon monoxide

92.86g of C combines with 54.5718g of O

$\Rightarrow 1 \text{ g of C combines with } \frac{54.5718}{92.86} = 1.33 \text{ g of O}$

Now,

Combining mass ratio of H and O with constant mass of C i.e. 1g
is $0.33 : 1.33 = 1:4 = R_1$

For Water,

11.11g of H combines with 88.89g of O

Combining ratio of H and O = $11.11 : 88.89 = 1:8 = R_2$

R_1 & R_2 are in simple whole no. ratio which illustrates law of reciprocal proportion.

3. Soln:

In H_2S ,

94.11g of S combines with 5.89g of H

$$\Rightarrow 1g \text{ of S combines with } \frac{5.89}{94.11} = 0.062g \text{ of H}$$

In CO_2 ,

50g of S combines with 50g of O

$$\Rightarrow 1g \text{ of S combines with } \frac{50}{50} = 1g \text{ of H}$$

Now,

Combining mass ratio of H and O with constant mass of S i.e. 1g
is $0.062 : 1 = 1 : 16 = R_1$.

In H_2O ,

11.11g of H combines with 88.89g of O

$$\Rightarrow 1g \text{ of H combines with }$$

$$\text{Combining mass ratio of H and O} = 11.11 : 88.89 = 1 : 8 = R_2$$

R_1 & R_2 are in simple whole no. ratio which illustrates law of reciprocal proportion.

4. Soln

In first oxide (M_2O_3)

Percentage of Oxygen = 30%

$$\text{or, } \frac{(2M + 16 \times 3)}{100} = 30$$

5. Soln:

In first oxide (M_2O_3)

$$\text{Percentage of Oxygen} = \frac{16 \times 3}{(2M + 16 \times 3)} \times 100\%$$

$$\text{or, } 30\% = \frac{4800}{2M + 48}$$

$$\text{or, } 6M + 48 \times 3 = 960$$

$$\therefore M = 56g$$

In second oxide (M_xO_y)

$$\text{Percentage of Oxygen} = \frac{16 \times y}{(Mx + 16y)} \times 100\%$$

$$\text{or, } 27.6 = \frac{16y}{56x + 16y} \times 100$$

$$\text{or, } 27.6 (56x + 16y) = 1600,$$

$$\text{or, } 1595.6x + 432.6y = 1600,$$

$$\text{or, } 1595.6x = 1158.4,$$

$$\text{or, } \frac{x}{y} = \frac{1158.4}{1595.6}$$

$$\therefore \frac{x}{y} = \frac{3}{4}$$

$$\therefore (M_xO_y) = (M_2O_3)$$

45. Soln:

In first oxide,

$$\text{mass of oxygen} = 11.9\text{g}$$

$$\text{mass of } \frac{\text{metal}}{\text{hydrogen}} = 88.1\text{g}$$

Here,

88.1g of metal combines with 11.9g of O

$$1\text{g of metal combines with } \frac{11.9}{88.1} = 0.135\text{g of O}$$

In second oxide,

$$\text{mass of oxygen} = 21.2\text{g}$$

$$\text{mass of metal} = 78.8\text{g}$$

Here,

78.8g of metal combines with 21.2g of O

$$1\text{g of metal combines with } \frac{21.2}{78.8} = 0.269\text{g of O}$$

Then,

Combining mass ratio of Oxygen that combines with constant mass of metal is $0.135 : 0.269 = 1 : 2$ which shows law of multiple proportion.

6. Soln:

In H_2O_2 ,

$$\text{mass of hydrogen} = 5.93\text{g}$$

$$\text{mass of oxygen} = 99.07\text{g}$$

Here,

5.93g of hydrogen combines with 99.07g of oxygen

Date:

Page:

$$1\text{g of hydrogen combines with } \frac{94.07}{5.93} = 15.86\text{g of O}$$

In H_2O ,

$$\text{mass of hydrogen} = 11.2\text{g}$$

$$\text{mass of oxygen} = 88.8\text{g}$$

Here,

$$11.2\text{g of hydrogen combines with } 88.8\text{g of Oxygen}$$

$$1\text{g of hydrogen combines with } \frac{88.8}{11.2} = 7.93\text{g of O}$$

Then,

Combining mass ratio of oxygen that combines with constant mass of hydrogen i.e. 1g is $15.86 : 7.93 = 2 : 1$ which illustrates law of multiple proportion.

7. SO_3 :

In first case (CaO)

$$\text{mass of Ca} = 71.47\text{g}$$

$$\text{mass of O} = 28.53\text{g}$$

In second case,

$$\text{mass of O} = 16\text{g}$$

$$\text{mass of Ca} = ?$$

By law of definite proportion,

$$\frac{71.47}{28.53} = \frac{\text{Ca}}{16}$$

$$\therefore \text{Ca} = 50.08\text{g}$$

8. Soln:

$$I = 2.5 \text{ A}$$

$$t = 50 \text{ min} = 0.3000 \text{ s}$$

$$Z = \frac{E}{F} = \frac{63.5/2}{96500}$$

Then,

$$\text{Mass of Cu deposited} = ZIt$$

$$= \frac{63.5/2 \times 2.5 \times 3000}{96500}$$

$$= 2.468 \text{ g}$$

9. Soln:

$$A = 80 \text{ cm}^2$$

$$t = 0.005 \text{ mm} = 0.05 \text{ cm} \quad 0.0005 \text{ cm}$$

We know,

$$d = \frac{m}{V} \Rightarrow m = d \times V = d \times A \times t$$

$$= 10.5 \times 80 \times 0.0005$$

$$= 0.42 \text{ g}$$

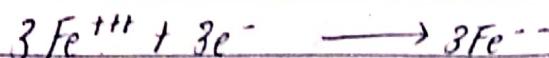
Now,

$$m = ZIt$$

$$\text{or, } 0.42 = \frac{108}{96500} \times 3 \times t$$

$$\therefore t = 125 \text{ s}$$

10. Soln.



Here,

$$\text{Charge required} = 3F$$

$$= 3 \times 96500$$

$$= 289500 \text{ C}$$

Then,

$$q = It$$

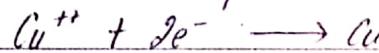
$$\text{or, } 289500 = 2 \times t$$

$$\text{or, } t = 144750 \text{ s}$$

$$\therefore t = 40.21 \text{ hr}$$

11.

a. To reduce 1.5 mole of Cu^{++} to Cu



1 mole Cu^{++} requires $2e^-$ to get reduced to Cu

1.5 mole Cu^{++} requires $1.5 \times 2 = 3e^-$ to get reduced to Cu

Then,

$$\text{Mole of } e^- \text{ involved} = 3e^-$$

$$\text{Charge required} = 3F$$

$$= 3 \times 96500 = 289500 \text{ C}$$

b. To reduce 1 mole of MnO_4^- to Mn^{++}



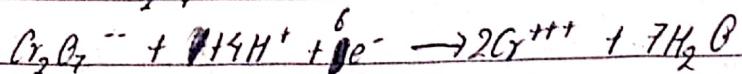
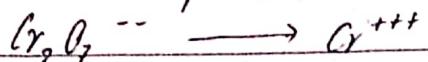
Then,

$$\text{Mole of } e^- \text{ involved} = 5e^-$$

$$\text{Charge required} = 5F$$

$$= 5 \times 96500 = 482500 \text{ C}$$

c. To reduce 1 mole of $\text{Cr}_2\text{O}_7^{2-}$ to Cr^{+++}



Now,

Total mole of e^- involved = $6e^-$

Charge required = $6F$

$$= 6 \times 96500 \text{ C} = 579000 \text{ C}$$

d. To oxidize 7.1g of Cl^- to Cl_2



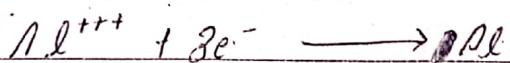
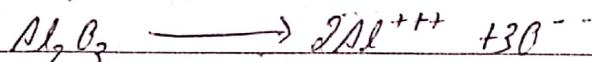
$$71 \text{ g} \quad 2 \text{ mole}$$

For, 7.1g of Cl^- , 0.2 mole of e^- is required

Charge required = $0.2F$

$$= 0.2 \times 96500 \text{ C} = 19300 \text{ C}$$

e. To produce 50g of Al from Al_2O_3



$$3 \text{ mole} \quad 1 \text{ mole} = 27 \text{ g}$$

Here,

27g of Al is deposited by 3 mole of e^-

50g of Al is deposited by $\frac{3}{27} \times 50$

$$= \frac{50}{9} \text{ mole of } e^-$$

∴ Charge required = $\frac{50}{9} F$

12. Soln:

$$2.25 \text{ L of } O_2 \text{ gas} = 3.2 \text{ g} = m$$

$$\text{Time (t)} = 1 \text{ hr} = 3600 \text{ s}$$

$$\text{Current (I)} = ?$$

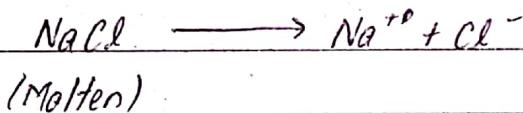
We know,

$$m = 2It$$

$$\text{or, } 3.2 = \frac{16/2}{96500} \times I \times 3600$$

$$\therefore I = 18.72 \text{ A}$$

13. Soln:



Here,

$$\text{Current (I)} = 300 \text{ mA} = 0.3 \text{ A}$$

$$\text{Time (t)} = 1 \text{ min} = 60 \text{ s}$$

Now,

$$m = 2It$$

$$= \frac{35.5}{96500} \times 0.3 \times 60$$

$$= 6.69 \times 10^{-3} \text{ g}$$

Then,

$$\text{No. of molecules} = n \times n_A$$

$$= 6.69 \times 10^{-3} \times 6.023 \times 10^{23}$$

~~6.69271~~

$$= 5.6 \times 10^{19} \text{ molecules of Cl}_2$$

15. Soln:

$$22400 \text{ cc of H}_2 \text{ at NTP} = 2g$$

$$203 \text{ cc of H}_2 \text{ at NTP} = 0.018125 \text{ g}$$

From 2nd law of Faraday

$$\frac{M_m}{E_{\text{eqm}}} = \frac{M_H}{E_{\text{eqH}}}$$

$$\frac{E_{\text{eqm}}}{E_{\text{eqH}}} = \frac{1.008}{1}$$

$$\text{Or, } \frac{0.573}{E_{\text{eqm}}} = \frac{0.018125}{1}$$

$$\frac{E_{\text{eqm}}}{1} = \frac{0.018125}{0.573}$$

$$\therefore E_{\text{eqm}} = 31.86 \text{ g}$$

Then,

$$\text{At. mass} = E_{\text{eq}} \times \text{Valency}$$

$$= 31.86 \times 2$$

$$= 63.73 \text{ g}$$

15. Soln:

$$\text{Current (I)} = 1.5 \text{ A}$$

$$\text{mass of Ag} = 1.45 \text{ g}$$

Now,

$$m = ZIt$$

$$\text{or, } 1.45 = \frac{108}{96500} \times 1.5 \times t$$

$$\therefore t = 863.73 \text{ s.}$$

From second law,

$$\frac{M_{\text{Zn}}}{E_{\text{Zn}}} = \frac{M_{\text{Ag}}}{E_{\text{Ag}}} = \frac{M_{\text{Cu}}}{E_{\text{Cu}}}$$

$$\text{or, } \frac{M_{\text{Zn}}}{32.7} = \frac{1.45}{108} = \frac{M_{\text{Cu}}}{31.75}$$

From first two ratios.

$$\frac{M_{Zn}}{32.7} = \frac{1.45}{108}$$

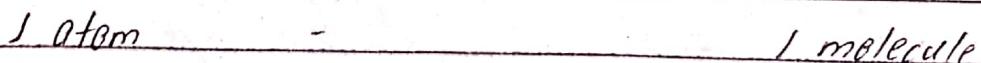
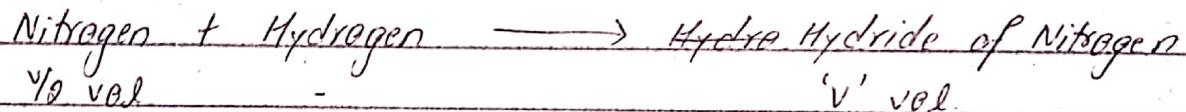
$$\therefore M_{Zn} = 0.439 \text{ g}$$

From last two ratios

$$\frac{1.45}{108} = \frac{M_{Cu}}{31.75}$$

$$\therefore M_{Cu} = 0.426 \text{ g}$$

Ques. 16. Soln:



Let the no. of Hydrogen atoms be x , so the formula becomes NH_x .
 Here,

$$\text{molecular mass} = 2 \times V.D$$

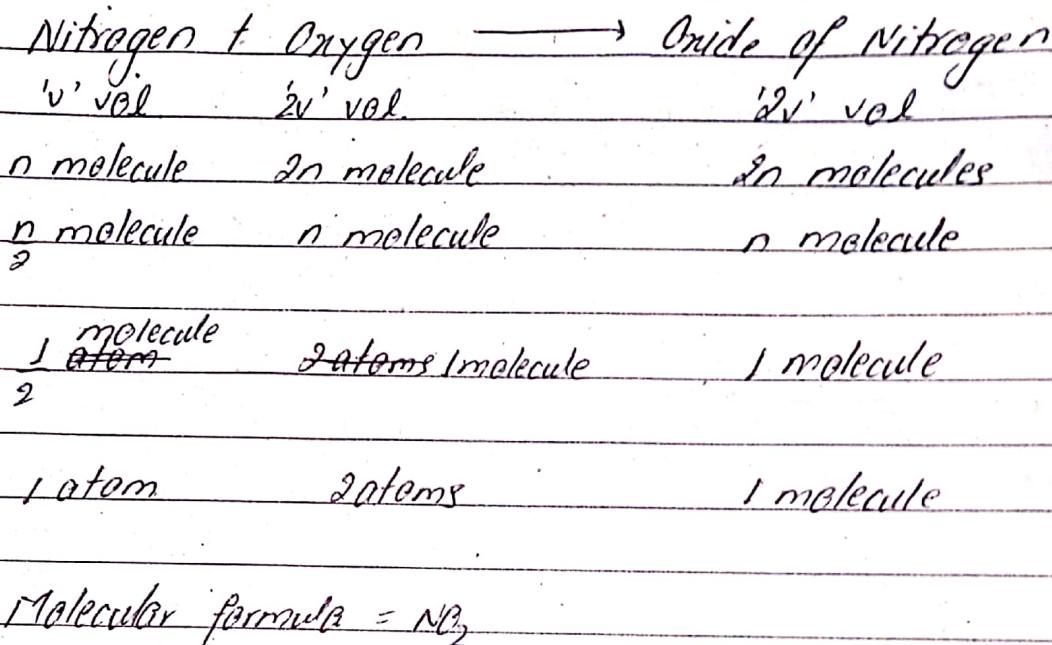
$$\text{or, } 14 \times 1 + H \times x = 2 \times 8.5$$

$$\text{or, } 14 + 1 \times x = 17$$

$$\therefore x = 3$$

The molecular formula of hydride is NH_3 .

17. Soln:



18. Soln:

$$9\text{L of gas at NTP} = 5.178\text{g}$$

$$9\text{L of H}_2 \text{ at NTP} = \frac{2}{22.4} \times 2 = 0.178\text{g}$$

Now,

$$\begin{aligned} \text{V.D.} &= \frac{\text{mass of certain vol. of gas}}{\text{mass of same vol. of H}_2 \text{ at same temp.}} \\ &= \frac{5.178}{0.178} \\ &= 29 \end{aligned}$$

$$\begin{aligned} \text{Molecular mass} &= 2 \times \text{V.D.} \\ &= 2 \times 29 \\ &= 58 \text{ amu} \end{aligned}$$

Date:

Page:

19. Sol:

For gas Y,

$$V.D = 32$$

$$\text{mass} = 0.16 \text{ g}$$

We know,

$$V.D = \frac{\text{mass of gas}}{\text{mass of } H_2 \text{ at same temp}}$$

$$\text{Or, } 32 = \frac{0.16}{\text{mass of } H_2}$$

mass of H_2 ,

$$\therefore \text{mass of } H_2 = 5 \times 10^{-3} \text{ g}$$

For gas X,

$$\text{mass} = 0.2 \text{ g}$$

We know,

$$V.D = \frac{\text{mass of gas}}{\text{mass of } H_2}$$

$$= \frac{0.2}{5 \times 10^{-3}}$$

$$= 40$$

And,

$$\text{molecular mass} = 2 \times V.D$$

$$= 2 \times 40$$

$$= 80 \text{ amu}$$

20. Sol:

$$6.023 \times 10^{23} \text{ molecules of hydrogen} = 2 \text{ g}$$

$$\text{Or, } 1.51 \times 10^{21} \text{ molecules} = \frac{2}{6.023 \times 10^{23}} \times 1.51 \times 10^{21} = 0.0005 \text{ g}$$

Then,

$$\begin{aligned}
 V.D &= \frac{\text{mass of certain vol. of gas}}{\text{mass of same vol. of } H_2 \text{ at same } T \& P} \\
 &= \frac{0.195}{0.005} \\
 &= 39
 \end{aligned}$$

$$\begin{aligned}
 \therefore \text{Molecular mass} &= 2 \times V.D = 2 \times 39 \\
 &= 58
 \end{aligned}$$

And,

$$C_nH_{2n+2} = 58$$

$$\text{Or, } 12n + 2 + 1 \times (2n + 2) = 58$$

$$\text{Or, } 18n = 58 - 2$$

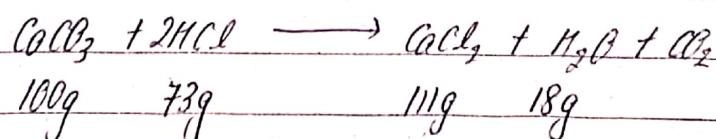
$$\therefore n = 4$$

$$\therefore \text{Formula} = C_4H_{10}$$

Q1. Soln:

$$20\text{g of 100% pure } CaCO_3 = \frac{20 \times 50}{100} = 8\text{g}$$

Here,



100g of $CaCO_3$ reacts with 73g of HCl.

$$8\text{g of } CaCO_3 \text{ reacts with } \frac{73}{100} \times 8 = 5.84\text{g of HCl}$$

But only 5g of HCl is given which is deficit.

→ HCl is limiting reactant.

ii. 73g of HCl forms 111g of CaCl_2

$$5\text{g of HCl forms } \frac{111}{73} \times 5 = 7.602\text{g of } \text{CaCl}_2$$

iii. 73g of HCl forms 1 mole of water.

$$5\text{g of HCl forms } \frac{1}{73} \times 5 \times 6.023 \times 10^{23} = 4.12 \times 10^{22} \text{ molecules of water.}$$

iv. 73g of HCl forms 22.4L of CO_2 at NTP

$$5\text{g of HCl forms } \frac{22.4}{73} \times 5 = 1.53\text{L of } \text{CO}_2 \text{ at NTP}$$

At NTP,

$$P_1 = 1\text{atm}$$

$$V_1 = 1.53\text{L}$$

$$T_1 = 273\text{K}$$

At given condition,

$$P_2 = 0.5\text{atm}$$

$$V_2 = ?$$

$$T_2 = (273 + 27) = 300\text{K}$$

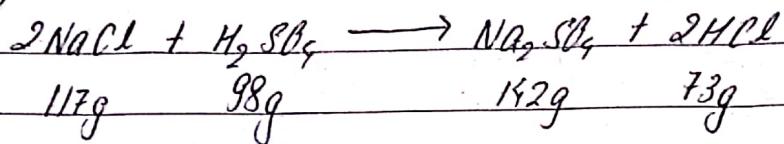
From combined gas eqn

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\text{Or, } \frac{1 \times 1.53}{273} = \frac{0.5 \times V_2}{300}$$

$\therefore V_2 = 3.36\text{ L of } \text{CO}_2 \text{ is formed at given cond'}$

22. Soln:



Here,

$$500 \text{ kg of } 80\% \text{ pure HCl} = 500 \times \frac{80}{100}$$

$$= 400 \text{ kg}$$

N.B.,

73g of HCl is formed by 98g of H_2SO_4

$400 \text{ kg of HCl is formed by } \frac{98}{73} \times 400 = 536.98 \text{ kg of pure } \text{H}_2\text{SO}_4$

Then,

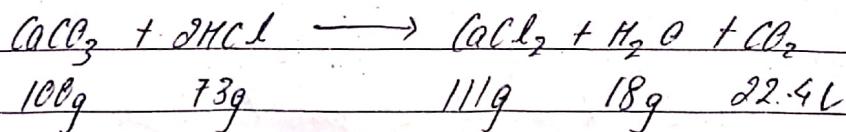
$$80\% \text{ of } x = 536.98 \text{ kg}$$

$$\text{or, } x = \frac{536.98}{0.8} \text{ kg}$$

$$\therefore x = 671.225 \text{ kg}$$

671.225 kg of H_2SO_4 containing 80% pure H_2SO_4 forms 500 kg of 80% pure HCl.

23. Soln:



Here,

100g of CaCO_3 reacts with 73g of HCl

5g of CaCO_3 reacts with $\frac{73}{100} \times 5 = 3.65 \text{ g of HCl}$

Date:
Page:

But 5g of HCl is given which is excess.

i) CaCO_3 is limiting reactant

ii) 100g of CaCO_3 forms 111g of CaCl_2

5g of CaCO_3 forms $\frac{111}{100} \times 5 = 5.55\text{g}$ of CaCl_2 .

iii) 100g of CaCO_3 forms 1 mole of H_2O

5g of CaCO_3 forms $\frac{1}{100} \times 6.023 \times 10^{23} = 3.015 \times 10^{22}$ molecules of H_2O

iv) 100g of CaCO_3 produces 22.4L of CO_2 at NTP

5g of CaCO_3 produces $\frac{22.4}{100} \times 5 = 1.12\text{L}$ of CO_2 at NTP



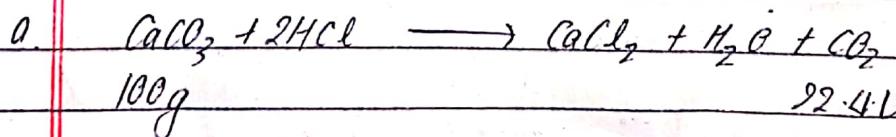
80g 22.4L

Here,

22.4L of CO_2 is absorbed by 80g of NaOH

∴ 1.12L of CO_2 is absorbed by $\frac{80}{22.4} \times 1.12\text{L} = 5\text{g}$ of NaOH

Q.



100g 22.4L

ANSWER NOW,

At NTP

$$P_1 = 1 \text{ atm}$$

$$V_1 = ?$$

$$T_1 = 273 \text{ K}$$

At given condition

$$P_2 = 2 \text{ atm}$$

$$V_2 = 1000 \text{ L}$$

$$T_2 = (273 + 25) = 298 \text{ K}$$

From combined gas eqⁿ

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\text{Or, } \frac{1 \times V_1}{273} = \frac{2 \times 1000}{298}$$

$\therefore V_1 = 1832.21 \text{ L of } \text{CO}_2 \text{ is required}$

Here,

22.4 L of CO_2 is produced by 100g of pure CaCO_3

1832.21 L of CO_2 is produced by $\frac{100}{22.4} \times 1832.21 = 8179.51 \text{ g of } \text{CaCO}_3$

Let required amt of CaCO_3 be x .

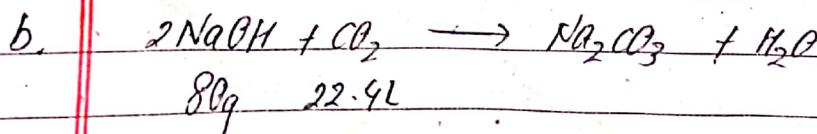
$$80 \text{ L of } x = 8179.51$$

$$\text{Or, } x = 8179.51$$

$$0.8$$

$$\therefore x = 10224.38 \text{ g}$$

$$= 10.22 \text{ kg}$$



Here,

22.4 g of CO_2 produces 80g of Na_2CO_3

$$\frac{22.4}{100} \times 8179.51 = 1832.21 \text{ g of } \text{CO}_2$$

Date: _____

Page: _____

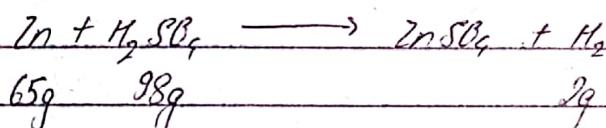
And,

22.4 L of CO_2 is absorbed by 80 g of NaOH

$$1832.21 \text{ L of } \text{CO}_2 \text{ is absorbed by } \frac{80}{22.4} \times 1832.21 = 6543.61 \text{ g}$$
$$= 6.54 \text{ kg of NaOH}$$

25. Soln:

$$\begin{aligned}\text{mass of } \text{H}_2\text{SO}_4 &= \text{density} \times \text{volume} \\ &= 1.84 \times 50 \\ &= 92 \text{ g}\end{aligned}$$



Here,

65 g of In reacts with 98 g of H_2SO_4

$$65 \text{ g of In reacts with } \frac{98}{65} \times 25 = 37.69 \text{ g of } \text{H}_2\text{SO}_4$$

but 92 g of H_2SO_4 is given which is excess.

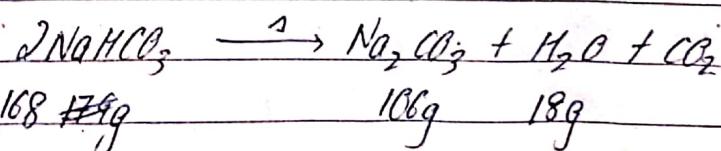
∴ In is limiting reactant

and,

65 g of In liberates 2 g of H_2 gas at NTP

$$65 \text{ g of In liberates } \frac{2}{65} \times 25 = 0.77 \text{ g of } \text{H}_2 \text{ gas at NTP}$$

26. Soln:



Now,

~~168g of NaHCO_3 gives 22.4 l of CO_2 at NTP~~

~~2.5g of NaHCO_3 gives $\frac{22.4 \times 2.5}{168} = 0.33\text{g}$ of CO_2 gas at NTP~~

~~At given condition:~~

$$V_1 = 310\text{cc}$$

$$T_1 = 273\text{K}$$

At NTP

$$P_1 = 760\text{ mm Hg}$$

$$V_1 = ?$$

$$T_1 = 273\text{K}$$

N.B.:

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$760 \quad T_2$$

$$\text{Or, } V_1 = \frac{310 \times 273}{760}$$

$$\therefore V_1 = 282.1\text{ cc}$$

At given condition

$$P_2 = 760\text{ mm Hg}$$

$$V_2 = 310\text{cc}$$

$$T_2 = (273 + 27) = 300\text{K}$$

Here,

22500 cc of CO_2 is given by 168g of NaHCO_3 .

282.1cc of CO_2 is given by $\frac{168}{22500} \times 282.1 = 2.115\text{g}$ of NaHCO_3

Then,

$$\therefore \text{purity of } \text{NaHCO}_3 = \frac{2.115}{2.5} \times 100\%.$$

$$= 84.6\%$$

27. Soln:

Element	1 comp	At mass	relative mole	simplest ratio	whole n	of mole
C	26.6	12	$26.6 / 12 = 2.22$	1	1	1
H	2.22	1	$2.22 / 2.22 = 1$	1	1	1
O	71.18	16	$71.18 / 16 = 4.45$	2	2	2

Now,



$$\begin{aligned}\text{Empirical mass} &= 12 + 1 + 16 \times 2 \\ &= 45 \text{ amu}\end{aligned}$$

Then,

$$n = \frac{\text{molecular mass}}{\text{empirical mass}}$$

$$= \frac{2}{45}$$

$$= 2$$

$$= 2$$

$$= 2$$

$$\text{Molecular formula} = n \times \text{Empirical formula}$$

$$= 2 \times \text{CH}_2$$

$$= \text{C}_2\text{H}_4$$

28 Soln,

Total mass of substance = 1.89 g

Here,

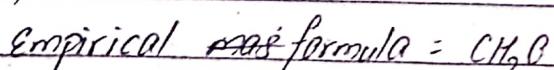
$$\% \text{ comp of C} = \frac{0.7360}{1.89} \times 100\% = 40\%$$

$$\% \text{ comp of H} = \frac{0.1221}{1.89} \times 100\% = 6.66\%$$

$$\% \text{ comp of O} = \frac{0.9813}{1.89} \times 100\% = 53.33\%$$

Element	% comp	M mass	relative mole	simplest ratio	Whole no. of mole
C	40	12	40 = 3.33	1	1
H	6.66	1	6.66 = 0.66	2	2
O	53.33	16	53.33 = 3.33	1	1

Here,



$$\text{Empirical mass} = 12 + 2 \times 1 + 16 = 30 \text{ amu}$$

Then,

$$\frac{n}{\text{empirical mass}} = \frac{\text{molecular mass}}{30} = 6$$

$$\begin{aligned} \therefore \text{Molecular formula} &= n \times \text{Empirical formula} \\ &= 6 \times \text{CH}_2\text{O} \\ &= \text{C}_6\text{H}_{12}\text{O}_6 \end{aligned}$$

Date: _____

Page: _____

29. Q1^n:

mass of alcohol sample = 1g

mass of CO_2 = 1.913g

mass of H_2O = 1.174g

We know,

44g of CO_2 contains 12g of C

1.913g of CO_2 contains $\frac{12}{44} \times 1.913 = 0.52$ g of C

∴ % comp of C = $0.52 \times 100\% = 52\%$

And,

18g of H_2O contains 2g of H

1.174g of H_2O contains $\frac{2}{18} \times 1.174 = 0.13$ g of H

% comp of H = $0.13 \times 100\% = 13\%$

% comp of O = $100\% - 52\% - 13\% = 35\%$

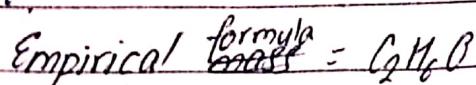
Element % comp At mass relative mole simplest ratio whole no
of mole

C	52	12	$\frac{52}{12} = 4.33$	1.98	2
---	----	----	------------------------	------	---

H	13	1	$\frac{13}{1} = 13$	5.93	6
---	----	---	---------------------	------	---

O	35	16	$\frac{35}{16} = 2.19$	1	1
---	----	----	------------------------	---	---

Here,



$$\begin{aligned}\text{Empirical mass} &= 12 \times 2 + 1 \times 6 + 16 \\ &= 46 \text{ amu}\end{aligned}$$

Then,

$n = \text{molecular mass}$

empirical mass

$$\begin{array}{rcl} = & 46 \\ & 46 \\ & \cdot \\ & = 1 \end{array}$$

Molecular formula = $n \times \text{Empirical formula}$

$$= 1 \times \text{C}_2\text{H}_6\text{O}$$

$$= \text{C}_2\text{H}_6\text{O}$$

30. So 1ⁿ:

mass of organic substance = 0.0794 g

We know

44g of CO₂ contains 12g of C

0.1807 of CO₂ contains $\frac{12}{44} \times 0.1807 = 0.099$ g of C

1. comp of C = $0.099 \times \frac{100}{0.0794} = 61.71\%$

Now,

18g of H₂O contains 2g of H

0.0739g of H₂O contains $\frac{2}{18} \times 0.0739 = 0.00829$ g of H

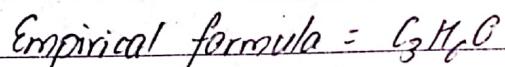
$$\% \text{ comp of H} = \frac{0.0082}{0.0794} \times 100\% = 10.33\%$$

Then,

$$\begin{aligned}\% \text{ comp of O} &= 100\% - 10.33\% - 10.33\% \\ &= 79.34\%\end{aligned}$$

Element	% comp	Molar mass	Relative mole	Simplest ratio of mole	Whole n of mole
C	10.33	12	$\frac{10.33}{12} = 0.86$	$0.86 : 1 = 5.14$	$5.14 \times 2 = 10.28$
H	10.33	1	$\frac{10.33}{1} = 10.33$	$10.33 : 1 = 10.33$	$10.33 \times 1 = 10.33$
O	79.34	16	$\frac{79.34}{16} = 4.96$	$4.96 : 1 = 1.75$	$1.75 \times 1 = 1.75$

Now,



$$\text{Empirical mass} = 12 \times 3 + 1 \times 6 + 16 = 58 \text{ amu}$$

And,

$$\text{molecular mass} = 2 \times 58 = 116 \text{ amu}$$

$n = \frac{\text{molecular mass}}{\text{empirical mass}}$

$$= \frac{116}{58}$$

$$= 2$$

$$\begin{aligned}\therefore \text{Molecular formula} &= n \times \text{Empirical formula} \\ &= 2 \times C_3H_6O \\ &= C_6H_{12}O_2\end{aligned}$$