21/07/23 HoW Friday

Review Questions

Q2i) 58.5amu are term as formula mass and not molecular mass of NaCl. Why?

Answer

formula mass is used for ionic compounds.

Reason

NaCl as an ionic compound

58.5 amu is formula mass of NaCl & not molecular mass because formula mass is meant for ionic compound & molecular mass is meant for covalent compound. Since NaCl is an ionic compound & thus form crystals, so its classified into formula mass. They did not exist as molecules, independent molecules. So,.

formula mass of NaCl = Na + Cl

= 23 + 35.5

= 58.5 amu

Conclusion

Thus, we conclude that NaCl is ionic compound & for ionic compound formula mass is used.

ii) Concept of limiting reactant is not applicable for reverse reaction. Explain?

Answer

Product is not prominent.

Explanation

Limiting Reactant

The Reactant that is present in small amount & thus produces less product.

Non-Limiting Reactant

That reactant present in large amount & thus produces more product.

Reasons (In this heading, Reversible & irreversible c

Now In reversible reaction, not a stable condition is present. Reactant & product are continuously reacting that does not produces a prominent & proper product. As reversible reaction never stops, therefore no limiting react would be present in it. be adde

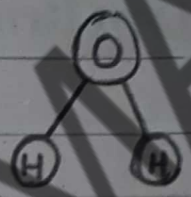
$$2SO_2 + O_2 \longrightarrow 2SO_3$$

Conclusion

Thus limiting reactant is only meant for irreversible reactant & not for reversible reaction.

iii) How many covalent bonds are present in 9g of H_2O.

Covalent bond consists of molecules. In order to find bond, we need to find that how many molecules is present in 9g of H_2O so,



Data

Mass of H_2O = 9g

Find

Bonds = ?

Calculation

first no. of molecules.

No. of moles = $\frac{\text{Particles (ions, atoms, molecules)}}{N_A}$

Molecules = No. of moles × N_A.

No. of moles = ?

$\therefore$ No. of moles = $\frac{\text{Mass}}{\text{Molar mass}}$

$$\text{Molecules} = \left(\frac{\text{mass}}{\text{molar mass}}\right) \times N_A$$

$$= \left(\frac{9}{18}\right) \times 6.022 \times 10^{23}$$

$$= 3.011 \times 10^{23} \text{ molecules}$$

Since in 1g of H_2O two bonds are present. So how many will be present in 9g.

Bonds = $2 \times 3.011 \times 10^{23}$

= 6.022×10^{23} bonds of H_2O.

Statement / Result

So No. of bonds in 9g of H_2O are 6.022×10^{23}.

iv)

Limiting Reactant	Non-Limiting Reactant
Definition	
The reactant that is present in lesser amount & produces less product.	The reactant that is present in excess amount & produces more product.
Cost	
It is expensive.	It is quite cheaper.
Consumption	
It is consumed completely & stops the reaction.	It is not consumed completely & doesn't stops the reaction.
Example	
$Mg + S \longrightarrow MgS$	
S is limiting reactant.	Mg is non-limiting reactant.

v) How many molecules of water are there in 12g of ice.

Data

Mass of ice = 12g

Find

No. of molecules = ?

Formula

No. of moles = $\frac{\text{Mass}}{\text{molar mass}}$, No. of moles = $\frac{\text{Particle (atoms, molecules)}}{N_A}$

Solve

No. of moles of ice = $\frac{12}{18}$

= 0.666 moles of ice.

Molecules = $0.666 \times 6.023 \times 10^{23}$

= 4.011×10^{23} molecules of ice

Result

The Molecules of H_2O in 12g of ice are 4.011×10^{23}.

vi) Which contain more atoms, 1 mole of Fe or 1 mole of H_2? Justify.

Answer

The H_2 contain more atoms.

Explanation

The atomic mass, formula mass, ions present in 1 mole is 1 mole.

The compaision between Fe & H_2 is not same. This is because Fe is an atom whereas H_2 is a moleaule. So, Fe contain 6.022×10^{23} atoms. But in H_2, two H combines to form the molecules. Hence $2 \times 6.023 \times 10^{23} = 1.2046 \times 10^{24}$.

Conclusion

H_2 contains more atoms.

vii) **Answer**

Moleaules of 1 mole does not depend on mass.

~~**Conclusion**~~

Explanation

The 1mole of any substance will be equal to Avagadro Number 6.023×10^{23}. It is direct relation between moles & NA. The diff compond have different mass, atomic mass, moleaules mass, But when it comes to 1mole of any substance, the mass doesn't depend or effect it ~~mus~~ must be equal to 6.023×10^{23}.

Eog

$18g$ of H_2O = 6.023×10^{23} molecules = 1mole

$32g$ of O_2 = 6.023×10^{23} molecules = 1mole

Conclusion

No. of molecules are independent of mass.

viii) **Answer**

23g of Na & 238g uranium have equal number of atoms.

Explanation

23gg Na = 1 mole & 238g uranium = 1 mole.

The atomic mass, formula mass, molecular mass expressed in g is 1 mole. Therefore, they all are equal to 1 mole. Now 1 mole is equal to Avagadro Number.

The Number of atoms, molecules, ionis in 1 mole of substance is N_A.

Therefore, when both atoms are equal to 1 mole, they both will have same no. of atoms.

moles $\propto$ Avagadro.

1 mole of every = 6.023×10^{23} (atoms, molecules---) Substance

Conclusion

It can be concluded, they had equal no. of atoms.

ix) **Mass to Mass**

Data

Mass of $KClO_3$ = 5.0g.

find

Mass of O_2 = ?

Equation

$$2KClO_3 \longrightarrow 2KCl + 3O_2$$

Solve

No. of moles of $KClO_3$ = $\frac{\text{mass}}{\text{molar mass}}$

$= \frac{5.0}{39 + 35.5 + 16 \times 3}$

= 0.040 moles of $KClO_3$.

COM Method:

2 moles of $KClO_3$ = 3 moles of O_2.

reacts to produce

1 mole of $KClO_3$ = $\frac{3}{2}$ moles of O_2

0.040 moles of $KClO_3$ = $\frac{3}{2} \times 0.040$ moles of O_2

= 0.06 moles of O_2.

Mass = moles × molar mass

= 0.06 × 32

= 1.92g of O_2

Result

The mass of O_2 is 1.92g.

x) **Answer**

No relation exists between mass & volume.

Explanation

Relations

There exists a relation between mole & volme.

That 1 mole of any gas occupies 22.414 dm^3 of volme at S.T.P. That is known as Molar volme relation.

But there's no relation b/w mass & ~~of~~ volme.

Conclusion

Relation exists b/w ~~mass~~ mole & volme Not b/w mass & volme.

xi) Refer to pg 14.

xii) **Representation of Particles in 1 mole of Gas**

The Molar Volme Relation tell us that :-

One of any gas at S.T.P occupies 22.414 dm^3 of space.

Therefore any gas at S.T.P (Temp = 0°C, Pressure =

180/1atm) will occupy 22.414 dm^3 space.

Examples

→ Volume of one mole of H_2 = 22.414 dm^3

→ Volume of one mole of NH_3 = 22.414 dm^3

→ Volume of one mole of Cl_2 = 22.414 dm^3

Q3b) **Data**

Density of $CHBr_3$ = 2.89 gcm^{-3}

No. of molecules of $CHBr_3$ = 4.8×10^{24}

Find

Volume = ?

Solve

$$d = \frac{m}{V}$$

$$V = \frac{m}{d}$$

we need to find ~~molecular~~ mass.

No. of moles = $\frac{\text{Particles (molecules, atoms ...)}}{N_A}$

No. of moles = $\frac{4.8 \times 10^{+24}}{6.023 \times 10^{23}}$

= 7.970 moles of $CHBr_3$.

Mass = moles × molar mass

= 7.970 × ~~283~~ 253.

$= 2016.4g$

$V = \frac{m}{d}$

$= \frac{2016.4g}{2.89 g\,cm^{-3}}$

$= 697.7\,cm^3$ of CH_2Br_2.

Q40)

Actual yield	Theoretical yield
Definition	
The quantity of product obtained from balanced chemical equation.	The quantity of product that produced by a chemical reaction.
Amount	
It is present in lesser amount.	It is present in greater amount.
Experiment	
It is actual experiment.	It is an ideal experiment

Eoq

$Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$.

Actual yied is 0.9392g Cu.	Theoretical yield is 0.5072 g.

b) **Data**

Mass of H_2 = 42.0g

Actual yield of NH_3 = 120.02g.

find

percentage yield = NH_3 = ?

Solve

$$N_2 + 3H_2 \longrightarrow 2NH_3.$$

No. of moles of H_2 = $\frac{mass}{molar\ mass}$

= $\frac{42.0}{2}$

= 21 moles of H_2.

COM.

No. of moles of H_2 : No of moles of NH_3

3 moles of H_2 = 2 moles of NH_3.

= $\frac{2}{3}$ moles of NH_3.

21 moles of H_2 = $\frac{2}{3} \times 21$ moles of NH_3.

= 14 moles of NH_3

Mass = mole × molar mass

= 14 × 17

= 238 g of NH_3.

Percentage yield of $NH_3 = \frac{120.62}{238} \times 100$

$= 50.5\%$

95a) Refer to pg # 11.

b) **Data**

$C_6H_{12}O_6$

Mass of C = 72 g

Mass of H = 12 g

Mass of O = 96 g

Molar mass = 180 g

Formula

$\% = \frac{\text{mass of 1 element}}{\text{molar mass of compound}} \times 100$

Find

% of each element.

Solve

$\% \text{ of } C = \frac{72}{180} \times 100$

$= 40\%$

$\% \text{ of } H = \frac{12}{180} \times 100$

$= 6.66\%$

$\% \text{ of } O = \frac{96}{180} \times 100$

$= 53.3\%$

Q6a) Pg # 14.

Q6b) **Data**

Volume of Al = $2.50\ cm^3$

density of Al = $2.70\ g\ cm^{-3}$

Find

mass of H = ?

Solve

Moles of Al.

So first we'll find the mass.

$m = d \times v$.

$m = 2.50 \times 2.70$

$= 6.75\ g$.

No. of moles $= \frac{6.75}{27}$

$= 0.25$ of Al.

C.O.M.

$2Al + 6HCl \longrightarrow AlCl_3 + 3H_2$.

$2Al \longrightarrow 3H_2$.

$Al = \frac{3}{2} H_2$.

0.25 moles of $Al = \frac{3}{2} \times 0.25$ moles of H_2.

$= 0.375$ moles of H_2.

Mass of H_2 = 0.375 × 2.
= 0.75g.

Q7) **Data**

Mass of $AgNO_3$ = 120.0g

Mass of NaCl = 52.0g

find

AgCl = ?

Solve

No. of moles = $\frac{120}{107.8+14+16\times3}$ ($AgNO_3$)

= 0.7067

No. of moles = 0.888 (NaCl).

C.O.M.

→ $AgNO_3$ = AgCl

0.7067 moles of $AgNO_3$ = 0.7067 moles of AgCl.

→ NaCl = AgCl

0.888 moles of NaCl = 0.888 moles of AgCl.

So, $AgNO_3$ is limiting reactant & NaCl is non-limiting reactant.

Mass of AgCl = 0.7067 × 143.3

= 101.27g of AgCl.