

MOLE CONCEPT**MOLE:**

Mole is a physical quantity that is dimensionless.

1 Mole represents 6.022×10^{23} particles.

These particles can be atoms, molecules or ions.

This number was given by Avogadro's and is represented by N_A

Molar mass/gram atomic mass :

Mass of 1 mole atoms or 6.022×10^{23} atoms in gram is called molar mass or gram atomic mass.

A \rightarrow Mass Number

Atomic mass = Mass of 1 atom = A amu

= $A \times 1.66 \times 10^{-24}$ gm

Mass of 1 atom in gm = $A \times 1.6 \times 10^{-24}$ gm

Mass of 6.022×10^{23} atoms in gm = $A \times 1.6 \times 10^{-24} \times 6.022 \times 10^{23}$ gm

Mass Of 1 mole atoms in gm = A gm

NOTE 1: Molar Mass or Gram Atomic Mass = A gm

NOTE 2: $1.6 \times 10^{-24} \times N_A = 1$

Calculation of no. of moles

1. No. Of moles = mass given (gm) / molar mass (gm)
2. No. Of moles = no. of particles (atoms) / N_A
3. No. Of moles of gas = volume occupied by gas at (new)STP / 22.7L
 STP \Rightarrow T= 0 degrees; P=1bar = 0.987atm
 Volume occupied by 1 mole of ideal gas t STP is 22.7L
 Note: This formula is not valid for solids and liquids

Old STP \Rightarrow T= 0 degrees ; P= 1atm

So according to old STP, Vol. occupied by 1 mole of gas at 0 degrees and 1atm pressure is 22.4L.

NOTE: No. Of Moles = No. Of Gram Atoms

Q1. Calculate no. of moles for

- i. 224 gm of Fe (56)
- ii. 12.044×10^{24} atoms of O
- iii. 45.4 L of Ne at STP

Q2. Calculate mass of 3.011×10^{22} atoms of S.

Q3. A piece of copper weigh 0.635g. how many atoms of copper does it contain? (Cu (molar mass= 63.5)

Q4. How many grams of silicon is present in 20 **gram atoms** of silicon ? (M.M. of Si= 28)

Q5. Calculate volume occupied by 12.044×10^{24} atoms of He at STP?

Q6. How many grams are contained in 2 gram-atoms of Na?

- A) 13 g
- B) 23 g
- C) 46 g
- D) 1/23g

Q7. Calculate volume occupied by 60gm of Ne at STP?

Q8. Calculate the weight of 12.044×10^{23} atoms of carbon.

Q9. A sample of aluminium has a mass of 54 g. What is the mass of the same number of magnesium atoms ?

- A) 12 g
- B) 24 g
- C) 48 g
- D) 96 g

Q10. The dot at the end of this sentence has a mass of about one microgram. Assuming that the black stuff is carbon, Calculate the approximate number of atoms of carbon needed to make such a dot.

Q11. The density of liquid mercury is 13.6 g/cm³. How many moles of mercury are there in 1 litre of the metal ?

Q12. Which has maximum number of atoms :

- A) 24 g of C (12)
- B) 56 g of Fe (56)
- C) 27 g of Al (27)
- D) 108 g of Ag (108)

Q13. Calculate the number of moles in each of the following:

- (i) 9.0 grams of aluminium
- (ii) 1 metric ton of iron (1 metric ton = 10^3 kg)
- (iii) 4 mg of Ca (iv) 60 micro-gm of carbon.