



Answer all the questions below then check your answers

1. *Why do chemists use the mole?*

- a) To count individual atoms directly*
- b) To link the number of particles to a measurable mass*
- c) To make elements lighter*
- d) To compare one element to another*

2. *How is a mole similar to a ream of paper?*

3. *Fill-in-the-blanks to complete the sentences below:*

*The standard isotope used to define the relative atomic mass scale is _____
and it has a relative atomic mass of _____.*

4. *Explain why it is impossible to count individual atoms in the lab.*

5. *Calculation*

How many atoms are in 1.2 g of carbon? (Ar of carbon = 12)

6. True or False?

a) 1 mole of magnesium atoms has the same number of atoms as 1 mole of carbon atoms.

b) 1 mole of carbon weighs more than 1 mole of magnesium.

7. Why is the number 6.022×10^{23} called Avogadro's number?

8. If you weigh out 24 g of magnesium, how many moles of magnesium atoms do you have and how many atoms is that?

9. Explain why 12 g of carbon and 1 g of hydrogen contain the same number of atoms, even though their masses are very different.

Answers:

1. Why do chemists use the mole?

- a) To count individual atoms directly
- b) To link the number of particles to a measurable mass
- c) To make elements lighter
- d) To compare one element to another

Answer: b) To link the number of particles to a measurable mass

2. How is a mole similar to a ream of paper?

Answer: Both are standard units that represent a fixed number of items. A ream is always 500 sheets of paper, and a mole is always 6.022×10^{23} particles.

3. Fill-in-the-blanks to complete the sentences below:

The standard isotope used to define the relative atomic mass scale is _____ and it has a relative atomic mass of _____.

Answer: carbon-12 (^{12}C); 12 units

4. Explain why it is impossible to count individual atoms in the lab.

Answer: Atoms are far too small and numerous to count individually. Instead, chemists measure a mass of the substance, which corresponds to a known number of atoms using the mole.

5. Calculation

How many atoms are in 1.2 g of carbon? (Ar of carbon = 12)

Answer:

$$\text{Moles} = 1.2 \div 12 = 0.1 \text{ mol}$$

$$\text{Atoms} = 0.1 \times 6.022 \times 10^{23} = 6.022 \times 10^{22} \text{ atoms}$$

6. True or False?

a) 1 mole of magnesium atoms has the same number of atoms as 1 mole of carbon atoms.

b) 1 mole of carbon weighs more than 1 mole of magnesium.

Answers:

a) True – both contain 6.022×10^{23} atoms.

b) False – 1 mole of magnesium (24 g) is heavier than 1 mole of carbon (12 g).

7. Why is the number 6.022×10^{23} called Avogadro's number?

Answer: It's named after Amedeo Avogadro, the Italian scientist who proposed that equal volumes of gases contain equal numbers of particles.

8. If you weigh out 24 g of magnesium, how many moles of magnesium atoms do you have and how many atoms is that?

Answer:

$$\text{Moles} = 24 \div 24 = 1 \text{ mol}$$

$$\text{Atoms} = 1 \times 6.022 \times 10^{23} = 6.022 \times 10^{23} \text{ atoms}$$

9. Explain why 12 g of carbon and 1 g of hydrogen contain the same number of atoms, even though their masses are very different.

Answer: Because the relative atomic mass of carbon is 12 and the relative atomic mass of hydrogen is 1. One mole of each element always contains 6.022×10^{23} atoms, so their masses differ, but the number of atoms is the same.