

APOLLO

Counting particles by mass: The mole SL

Chemistry

First assessment 2025

8 questions | questions

5. What is the empirical formula of a compound with the following composition by mass?

C = 37.5% H = 12.5% O = 50.0%

- A. $\text{C}_4\text{H}_{12}\text{O}_5$
- B. $\text{C}_3\text{H}_{12}\text{O}_3$
- C. C_3HO_4
- D. CH_4O

1. How many oxygen atoms are present in 0.0200 mol $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$?
- A. 1.20×10^{22}
- B. 1.08×10^{22}
- C. 6.02×10^{23}
- D. 1.08×10^{23}

2. What is a possible empirical formula for a substance with $M_r = 58$?

- I. C_2H_5
- II. C_4H_{10}
- III. $\text{C}_3\text{H}_6\text{O}$

- A. I and II only
- B. I and III only
- C. II and III only
- D. I, II and III

5. An unknown organic compound contains only carbon, hydrogen and oxygen.

- (a) 4.32 g of the compound was combusted completely in oxygen and produced 9.49 g of CO_2 and 5.18 g of H_2O .
Determine the empirical formula of the compound, using sections 1 and 7 of the data booklet.

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- (b) The same organic compound was vaporized completely at a controlled temperature and pressure.

- (i) 0.108 g of the vaporized compound was found to have a volume of 55.7 cm^3 at 100°C and a pressure of $1.00 \times 10^5 \text{ Pa}$.
Calculate the amount, in moles, of the compound. Use sections 1, 2 and 4 of the data booklet.

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- (ii) Determine the molar mass of the organic compound, using section 1 of the data booklet.
If you did not get an answer to (i), use $n = 0.00220 \text{ mol}$, although this is not the correct value.

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4429-0212

4. 5.72 g of $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ ($M_r = 286 \text{ g mol}^{-1}$) is dissolved in water to prepare 0.4 dm^3 of aqueous solution.

What is the concentration of sodium ions, in mol dm^{-3} , in the resulting solution?

- A. 0.02
- B. 0.04
- C. 0.05
- D. 0.10

3. How many ions are present in 0.20 mol of $(\text{NH}_4)_2\text{SO}_4$?

A. $0.20 \times 1 \times 6 \times 10^{23}$

B. $0.20 \times 2 \times 6 \times 10^{23}$

C. $0.20 \times 3 \times 6 \times 10^{23}$

D. $0.20 \times 7 \times 6 \times 10^{23}$

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0020-0222

4. A container holds 30 g of argon and 60 g of neon.

What is the ratio of number of atoms of argon to number of atoms of neon in the container?

- A. 0.25
- B. 0.50
- C. 2.0
- D. 4.0

1. A monoprotic acid, HX, is found to have the following composition by mass:

C = 39.99 %

H = 6.73 %

O = 53.28 %

- (a) Determine the empirical formula of the compound HX.

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- (b) 25.00 cm³ of a solution, containing 1.51 g of HX is titrated with a 0.750 mol dm⁻³ solution of NaOH(aq). The HX(aq) solution is exactly neutralized by 22.30 cm³ of the NaOH(aq) solution. Determine the molar mass (*M*) of HX.

[2]

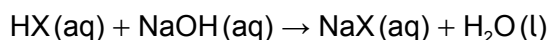
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- (c) State the molecular formula of HX.

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- (d) HX reacts with aqueous sodium hydroxide according to the equation:



Identify a functional group present in HX.

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