

Counting atoms with the mole

Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · Test answers (mark scheme)

Score your paper out of 20 with the model answers and marking points. If you lost marks on a calculation, redo it using units at each step and check whether you used the correct molar mass for the whole particle.

Level: Chemistry grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** HS-PS1-7, GCSE C3

Question 1 Avogadro constant (2 marks)

It is 6.02×10^{23} per mole, the number of particles in one mole of a substance.

Marking: 1 mark for the value, 1 mark for the meaning.

Question 2 Aluminium nitrate (3 marks)

a. $27 + 3 \times (14 + 48) = 27 + 186 = \mathbf{213}$.

b. $21.3 \div 213 = \mathbf{0.100 \text{ mol}}$.

Marking: 1 mark for the bracket method, 1 mark for 213, 1 mark for 0.100 mol.

Question 3 Mass of copper oxide (3 marks)

$M = 63.5 + 16 = 79.5 \text{ g/mol}$. $m = n \times M = 0.40 \times 79.5 = \mathbf{31.8 \text{ g}}$.

Marking: 1 mark for M , 1 mark for the formula, 1 mark for 31.8 g.

Question 4 Molecules in water (3 marks)

$M = 18 \text{ g/mol}$. $n = 3.6 \div 18 = 0.20 \text{ mol}$. $N = 0.20 \times 6.02 \times 10^{23} = \mathbf{1.20 \times 10^{23} \text{ molecules}}$.

Marking: 1 mark for M , 1 mark for n , 1 mark for N .

Question 5 Oxygen error (2 marks)

Oxygen gas is made of O_2 molecules, so the molar mass is 32 g/mol, not 16. The correct amount is $8.0 \div 32 = \mathbf{0.25 \text{ mol}}$.

Marking: 1 mark for the molar mass of O_2 , 1 mark for 0.25 mol.

Question 6 Moles in 10 g (3 marks)

- a. Water.
- b. Water has the smallest molar mass (18 g/mol), so 10.0 g is the largest number of moles.
- c. $0.556 \times 6.02 \times 10^{23} = \mathbf{3.34 \times 10^{23} \text{ molecules.}}$

Marking: 1 mark for each part.

Question 7 Nitrogen in fertiliser (2 marks)

$M_r = 14 + 4 + 14 + 48 = 80$. Nitrogen mass = 28. Percentage = $28 \div 80 \times 100 = \mathbf{35.0 \%}$.

Marking: 1 mark for $M_r = 80$, 1 mark for 35.0 %.

Question 8 Chloride ions (2 marks)

Each CaCl_2 gives two Cl^- ions, so $2 \times 0.30 = \mathbf{0.60 \text{ mol.}}$

Marking: 1 mark for the factor of 2, 1 mark for 0.60 mol.