

Counting atoms with the mole

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

Name: _____ Date: _____ Class: _____ Mark: ____ / 20

This test lasts 45 minutes and carries 20 marks. A periodic table of relative atomic masses is provided in each question, and the Avogadro constant is 6.02×10^{23} per mole. Show your working clearly, because marks are given for the method as well as the answer.

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

Time: 45 minutes · 8 questions · Total: 20 marks · Calculator allowed

Question 1 Avogadro constant (2 marks)

State the value of the Avogadro constant and say what it represents. (2 marks)

Question 2 Aluminium nitrate (3 marks)

A_r values: Al 27, N 14, O 16.

- Calculate the relative formula mass of $\text{Al}(\text{NO}_3)_3$. (2 marks)
- Calculate the amount in 21.3 g of the compound. (1 mark)

Question 3 Mass of copper oxide (3 marks)

Calculate the mass of 0.40 mol of copper(II) oxide, CuO . A_r values: Cu 63.5, O 16. (3 marks)

Question 4 Molecules in water (3 marks)

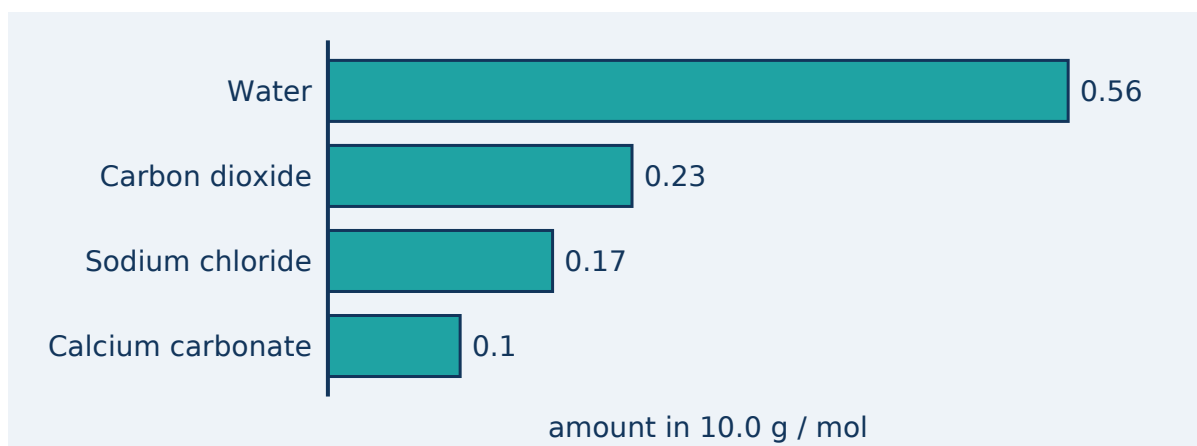
Calculate the number of molecules in 3.6 g of water. A_r values: H 1, O 16. (3 marks)

Question 5 Oxygen error (2 marks)

A student calculates the amount in 8.0 g of oxygen gas as $8.0 \div 16 = 0.50$ mol. Explain the mistake and give the correct answer. (2 marks)

Question 6 Moles in 10 g (3 marks)

The chart shows the amount in moles in 10.0 g of four substances.



Amount in 10.0 g of four substances.

- State which sample contains the most molecules or formula units. (1 mark)
- Explain why. (1 mark)
- Calculate the number of molecules in the water sample. (1 mark)

Question 7 Nitrogen in fertiliser (2 marks)

Calculate the percentage by mass of nitrogen in ammonium nitrate, NH_4NO_3 . A_r values: N 14, H 1, O 16. (2 marks)

Question 8 Chloride ions (2 marks)

Calculate the amount of chloride ions in 0.30 mol of calcium chloride, CaCl_2 . (2 marks)