

Moles, formulae, gas volumes and atom economy

Chemistry grades 11-12 (A Level · IB · Class 11-12) · Test

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

This test covers moles, formulae, the ideal gas equation, atom economy and yield. Show your working and give units. Use $R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$ where needed. The total is 20 marks.

Level: Chemistry grades 11-12 (A Level · IB · Class 11-12) · **Curriculum:** A Level 3.1.2

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

Question 1 Mass of potassium carbonate (2 marks)

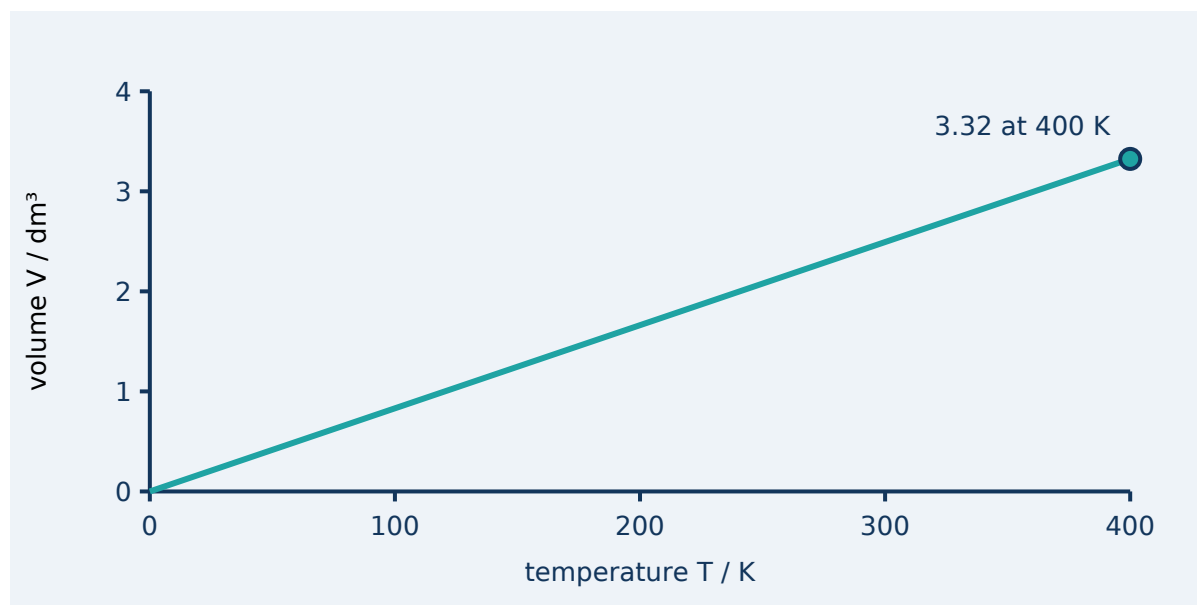
Calculate the mass of 0.0300 mol of potassium carbonate, K_2CO_3 (Ar: K 39.1, C 12.0, O 16.0). (2 marks)

Question 2 Formula of an oxide of lead (3 marks)

A sample of an oxide of lead contains 2.07 g of lead and 0.32 g of oxygen (Ar: Pb 207, O 16.0). Calculate its empirical formula. (3 marks)

Question 3 Graph of gas volume (4 marks)

The graph shows the volume of a fixed amount of gas at 100 kPa.



Volume of a fixed sample of gas at 100 kPa.

- a. Read the volume at 300 K. (1 mark)
- b. State the relationship between V and T. (1 mark)
- c. Calculate the amount of gas, using the point at 400 K. (2 marks)

Question 4 Atom economy of oxygen (3 marks)

Hydrogen peroxide decomposes: $2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2$. The useful product is oxygen (Mr: H_2O_2 34.0, H_2O 18.0, O_2 32.0). Calculate the atom economy and say whether it is high or low. (3 marks)

Question 5 Molecular formula (2 marks)

A hydrocarbon has empirical formula CH_2 and relative molecular mass 84.0. Deduce its molecular formula. (2 marks)

Question 6 Volume of a gas (3 marks)

Calculate the volume in dm^3 of 0.500 mol of an ideal gas at 300 K and 200 kPa ($R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$). (3 marks)

Question 7 Percentage yield (2 marks)

A chemist expects 6.00 g of product but obtains 4.50 g. Calculate the percentage yield. (2 marks)

Question 8 Why atom economy matters (1 mark)

State one advantage of a reaction with a high atom economy. (1 mark)