InkChemistry

QUESTION WORKBOOK

# Gases and the ideal gas equation

Amount of substance · Unit C02

AQA 3.1.2.3 · OCR A 2.1.3 (f); PAG 1

16 questions · 48 marks

NAVY SCREEN EDITION

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## SECTION A · Short, 1 to 2 marks

**A1** GI-Q1 State the ideal gas equation, and state the SI unit of each quantity in it. [2]

**A2** GI-Q8 Explain why one mole of hydrogen and one mole of carbon dioxide occupy almost the same volume at the same temperature and pressure. [2]

**A3** GI-Q11 Suggest why the Mr of ethanoic acid measured from its vapour just above its boiling point comes out close to 120 rather than 60. [2]

## SECTION B · Standard, 3 to 5 marks

**B1** GI-Q2 Give each of these values in the unit used in pV = nRT: 350 $cm^3$, 2.50 $dm^3$ and -23 °C. [3]

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**B2** GI-Q3 Calculate the amount, in moles, of gas in a 1.20 $dm^3$ flask at 101 kPa and 20 °C. R = 8.31 J $K^{-1}$ $mol^{-1}$. [3]

**B3** GI-Q4 Calculate the pressure, in kPa, of 0.500 mol of gas in a 10.0 $dm^3$ container at 300 K. R = 8.31 J $K^{-1}$ $mol^{-1}$. [3]

**B4** GI-Q5 Calculate the volume of carbon dioxide, in $dm^3$ at room temperature and pressure, formed when 2.50 g of calcium carbonate reacts with excess hydrochloric acid. The molar gas volume at RTP is 24.0 $dm^3$ $mol^{-1}$; Mr of $CaCO_3$ is 100.1. [3]

**B5** GI-Q7 Calculate the temperature, in K, at which 0.100 mol of gas occupies 3.00 $dm^3$ at 100 kPa. R = 8.31 J $K^{-1}$ $mol^{-1}$. [3]

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**B6** GI-Q9 Explain why a student's graph of the volume of a fixed amount of gas at constant pressure against its temperature in °C is a straight line that does not pass through the origin, and why pV = nRT needs the temperature in kelvin. [3]

**B7** GI-Q10 Explain why the gas syringe in the method for finding the Mr of a volatile liquid is kept well above the boiling point of the liquid. [3]

**B8** GI-Q12 Suggest why the mass of liquid injected is found by weighing the hypodermic syringe before and after injection, rather than by reading the volume of liquid on the syringe. [3]

**B9** GI-Q13 Compare finding the amount of a gas from its volume using pV = nRT with using the molar gas volume of 24.0 $dm^3\ mol^{-1}$. [3]

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**B10** GI-Q14 Evaluate a student's claim that a gas syringe result of Mr = 81.7 for hexane, whose true Mr is 86.0, is accurate to within 1%. [3]

**B11** GI-Q16 Calculate the volume of oxygen needed to burn 0.500 $dm^3$ of propane completely, and the volume of carbon dioxide formed, all volumes at room temperature and pressure: $C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(l)$. [3]

**B12** GI-Q19 Explain why ammonia departs further from ideal gas behaviour than helium at the same temperature and pressure. [3]

## SECTION C · Long, 6 marks or more

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**C1**
GI-Q15

Describe how to find the relative molecular mass of a volatile liquid using a gas syringe. Include how the result is calculated and how the method keeps it accurate. [6]

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