# SECOND-YEAR HL CHEMISTRY

## Final Review: States of Matter

1    N03
2    M03
3    N02/3

A balloon, which can hold a maximum of $1100 \text{ cm}^3$ of air before bursting, contains $955 \text{ cm}^3$ of air at 5 °C.

(a)   Determine whether the balloon will burst if the temperature is increased to 25 °C. Assume that the pressure of the gas in the balloon remains constant.                                                                    [3]

(b)   Use the kinetic theory to explain what happens to the air particles inside the balloon as the temperature is increased to 25 °C.                                                                                                   [2]

4    M02
5
6    N01/3. This question deals with gases and liquids.

(a) The mass of a gas sample is measured under certain conditions. List the variables that must be measured and show how these can be used to determine the molar mass of the gas. [4]

(b) As a volatile liquid in an isolated container evaporates, its temperature drops. Account for this observation in terms of the behaviour of the molecules. [2]

(c) A small amount of a volatile liquid is added to a $50.0 \text{ cm}^3$ evacuated container. Twice the amount of the same liquid is added to a second $50.0 \text{ cm}^3$ evacuated container, and separately to a $100 \text{ cm}^3$ evacuated container. The three systems are allowed to reach equilibrium at the same temperature, and some liquid remains in each flask. Compare the pressure due to the vapour in the three containers and explain your answer. [3]

7    93/8. A sample of a monatomic gas was maintained at a constant pressure (1 atm) while its temperature was raised. The data recorded below show the resulting changes in volume.

| Temperature (°C) | 20 | 40 | 60 | 80 |
|---|---|---|---|---|
| Volume (cm³) | 241 | 258 | 274 | 290 |

(a) [2 marks] Plot an accurate, properly labelled graph of volume against temperature for the gas

(b) [5 marks] Give a mathematical statement of the particular gas law represented by the graph and explain the shape of the graph using the kinetic molecular theory. What additional information could be obtained by extrapolation of the graph to lower temperatures? Explain your answer.