Unit 4: States of matter

Subunit 4.1: The gaseous state: ideal and real gases and pV = nRT

Topical Question No: 1

6 Which gas sample contains the **fewest** molecules?

A 1.00 dm^3 of carbon dioxide at 27 °C and 2.0 kPa

B 1.00 dm^3 of hydrogen at 100 °C and 2.0 kPa

C 1.00 dm^3 of nitrogen at 300 °C and 4.0 kPa

D 1.00 dm^3 of oxygen at 250 °C and 3.0 kPa

Topical Question No: 2

32 When a sample of a gas is compressed at constant temperature from 1500 kPa to 6000 kPa, its volume changes from 76.0 cm^3 to 20.5 cm^3.

Which statements are possible explanations for this result?

1 The gas does not behave ideally.

2 The gas partially liquefies.

3 Some of the gas is lost from the container.

Topical Question No: 3

7 The gas laws can be summarised in the ideal gas equation.

$$pV = nRT$$

0.960 g of oxygen gas is contained in a vessel of volume 7.00×10^{-3} m^3 at a temperature of 30 °C.

Assume that the gas behaves as an ideal gas.

What is the pressure in the vessel?

A 1.07 kPa **B** 2.14 kPa **C** 10.8 kPa **D** 21.6 kPa

Topical Question No: 4

32 A container is partially filled with hot water, sealed and left to cool.

Which statements are correct?

1 As the temperature decreases, water molecules lose kinetic energy.

2 As the temperature decreases, more water molecules move from vapour to liquid.

3 As the temperature decreases, the vapour pressure of the water decreases.

Topical Question No: 5

33 The gas laws can be summarised in the ideal gas equation.

$$pV = nRT$$

where each symbol has its usual meaning.

Which statements are correct?

1 One mole of an ideal gas occupies the same volume under the same conditions of temperature and pressure.

2 The density of an ideal gas at constant pressure is inversely proportional to the temperature, T.

3 The volume of a given mass of an ideal gas is doubled if its temperature is raised from 25 °C to 50 °C at constant pressure.

Topical Question No: 6

9 Which would behave the **least** like an ideal gas at room temperature?

A carbon dioxide

B helium

C hydrogen

D nitrogen

Topical Question No: 7

10 The general gas equation can be used to calculate the M_r value of a gas.

For a sample of a gas of mass m g, which expression will give the value of M_r?

A $M_r = \frac{mpV}{RT}$ **B** $M_r = \frac{pVRT}{m}$ **C** $M_r = \frac{mRT}{pV}$ **D** $M_r = \frac{pV}{mRT}$

Topical Question No: 8

7 Ethanol has a boiling point of 78 °C. At 101 kPa and 79 °C ethanol vapour does not perfectly obey the gas equation $pV = nRT$.

What is the reason for this?

A Ethanol vapour is in equilibrium with ethanol liquid at 79 °C.

B There are intermolecular forces between the molecules of ethanol vapour.

C The vapourisation of ethanol liquid is an endothermic process.

D Vapours will not obey the gas equation perfectly at such a low pressure.

Answer Key

1. Error
2. Error
3. Error
4. Error
5. Error
6. Error
7. Error
8. Error