

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 dm³ of carbon dioxide at 27 °C and 2.0 kPa
 - B 1.00 dm³ of hydrogen at 100 °C and 2.0 kPa
 - C 1.00 dm³ of nitrogen at 300 °C and 4.0 kPa
 - D 1.00 dm³ 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 cm³ to 20.5 cm³.

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 $7.00 \times 10^{-3} \text{ m}^3$ 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