Guiding Question revisited

How does the model of ideal gas behaviour help us to predict the behaviour of real gases?

We introduced the chapter with the kinetic model of an ideal gas, which can be used to explain the experimental gas laws that relate the pressure, volume and temperature of a real gas under typical conditions. The limitations of the model were also identified with real gases deviating from ideal behaviour at high pressure and low temperatures.

- ☐ The kinetic theory of gases defines an ideal gas as one in which the particles have negligible volume and move in random chaotic motion with no intermolecular forces.
- ☐ The absolute temperature of the gas is proportional to the average kinetic energy of the particles.
- ☐ Gases exert pressure due to the impact of their collisions on the walls of the container.
- ☐ The gas laws describe the relationship between the pressure, volume and temperature of gases. They are a very good approximation of real gases under most conditions but strictly apply to ideal gases only.
- ☐ The gas laws can be summarized by the combined gas law $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$
- ☐ The incorporation of Avogadro's hypotheses leads to the ideal gas law: $PV = nRT$
- ☐ The ideal gas law can be applied to predict the changes that occur when the conditions of temperature, pressure or volume are changed. The molar mass of a gas can be obtained by measuring the density of a gas:

$$M = (m/PV)RT$$

- ☐ Real gases behave differently from ideal gases especially at high pressure and low temperature. These differences are due to the presence of intermolecular forces which reduce the pressure compared with an ideal gas under the same conditions or the non-negligible volume of the particles which increase the pressure.