A-LEVEL CHEMISTRY • HOLIDAY HOMEWORK 假期作业

4 Gases and structures – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)		
ideal gas	理想气体			
colliding	碰撞			
pressure	压强			
real gas	实际气体			
kelvin	开尔文			

Recall

At IGCSE you learned that a gas is made of fast-moving particles spread far apart. Now we model a gas with numbers, using one neat equation.

- Gas particles move fast in all directions and hit the walls.
- We treat a gas as an **ideal gas** 理想气体 — a simple model.

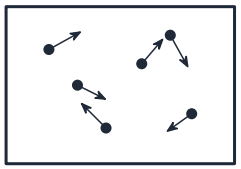
Nothing here is harder than IGCSE — it just adds one equation and the right words.

New ideas

Read these first, then do the Practice.

■ 1 Where gas pressure comes from

Gas molecules move fast and keep **colliding** 碰撞 with the walls of the container. Each hit gives a tiny push. The **pressure** 压强 is the overall result of all these collisions.



particles hit the walls

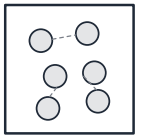
■ 2 The ideal gas model

An **ideal gas** 理想气体 assumes two things:

- the particles take up **zero volume**.
- there are **no forces** of attraction between the particles.

A **real gas** 实际气体 follows this best at **low pressure and high temperature**, and worst at high pressure and low temperature (when the particles are crowded).

ideal
(points, no forces)



real
(crowded, attractions)

■ 3 The ideal gas equation

$$pV = nRT$$

- p = pressure (Pa), V = volume (m^3), n = moles,
- T = temperature in **kelvin** 开尔文 (add 273 to °C), $R = 8.31$ J $K^{-1}mol^{-1}$.

Worked example. Volume of 0.50 mol at 27 °C (= 300 K) and 100 kPa (= 1.0×10^5 Pa):

$$V = \frac{nRT}{p} = \frac{0.50 \times 8.31 \times 300}{1.0 \times 10^5} = 0.0125 \text{ m}^3.$$

Watch out: in $pV = nRT$ everything must be in SI units — p in Pa, V in m^3, n in mol, and especially T in kelvin (add 273 to °C). Leaving T in °C is the most common slip.

Practice

Try these in order. Use $R = 8.31\ \text{J K}^{-1}\text{mol}^{-1}$.

4.1 Explain, in terms of particles, how a gas creates pressure on the walls of its container. [2]

4.2 State the two assumptions of an ideal gas. [2]

4.3 Under what conditions does a real gas behave most like an ideal gas? [1]

4.4 Convert (a) 27 °C to kelvin, (b) 127 °C to kelvin. [2]

4.5 Find the volume of 2.0 mol of an ideal gas at 300 K and 1.0×10^5 Pa. [3]

4.6 Challenge. A 0.10 m^3 container holds an ideal gas at 1.0×10^5 Pa and 400 K. Find the amount, in moles, of gas present. [3]