AP CHEMISTRY • EXERCISE SHEET

3.6 Deviation from the Ideal Gas Law

Name: _____ Class: _____ Date: _____ **Total: 11 marks**

KEY WORDS solution 溶液 • hydrogen bonding 氢键 • intermolecular forces 分子间作用力

Objective

Build the skills to answer exam questions on **deviations from the ideal gas law**.

You must be able to:

- state when real gases deviate (**high pressure, low temperature**)
- explain the two causes (particle **volume** and **attractions**)
- predict which gas is more ideal

1 Worked examples

Study these first. Each one shows the method for a question type used later — follow the steps and you can do the Practice and Exam-style questions yourself.

When deviations matter

Real gases behave most **ideally** at **high temperature** and **low pressure**. They deviate most at **low temperature** and **high pressure**, where the ideal assumptions break down.

The two causes

The ideal law assumes zero particle volume and no attractions. In reality:

- particles **do** take up volume — matters at high pressure (crowded);
- particles **do** attract — matters at low temperature (slow-moving, so attractions pull them together).

Effect on pressure

Attractions make real particles hit the walls a little **less** hard, so the real pressure is slightly **lower** than ideal. Particle volume makes the available space smaller, raising pressure at very high compression.

Which gas is more ideal

Small, nonpolar gases with weak IMFs (like He, H_2) behave most ideally. Large or polar gases (with strong attractions) deviate more.

2 Practice

Now apply the methods above.

2.1 Under what conditions do real gases behave most ideally? [1]

2.2 Name the two properties of real particles that the ideal law ignores. [2]

2.3 Which behaves more ideally: He or NH_3? Give a reason. [2]

3 Exam-style questions

3.1 Real gases deviate most from ideal behavior at [1]

A	B
C	D

A high temperature and low pressure
B low temperature and high pressure
C standard conditions
D any temperature

3.2 A gas is cooled to near its boiling point at high pressure.

(a) State whether it behaves more or less ideally. [1]

(b) Explain the role of intermolecular attractions at low temperature. [2]

3.3 Explain why He behaves more ideally than H_2O vapor, in terms of intermolecular forces. [2]