AP CHEMISTRY • EXERCISE SHEET

7.1 Introduction to Equilibrium

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS dynamic equilibrium 动态平衡 • reversible reaction 可逆反应 • chemical equilibrium 化学平衡

Objective

Build the skills to answer exam questions on **chemical equilibrium** — the dynamic balance of a reversible reaction.

You must be able to:

- describe **dynamic equilibrium** 动态平衡 (forward rate = reverse rate)
- explain that concentrations stay **constant**, not equal
- recognise the ⇌ symbol

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.

■ Dynamic equilibrium

In a closed system a reversible reaction reaches **equilibrium** when the **forward and reverse rates are equal**. Both reactions still happen — it is **dynamic**, not stopped.

■ Concentrations are constant, not equal

At equilibrium the concentrations of reactants and products stay **constant** over time, but they are usually **not equal** to each other.

■ The reversible arrow

The ⇌ symbol means the reaction goes **both** ways at once. A reaction that goes essentially to completion uses a single arrow.

■ Reaching equilibrium

Starting from reactants, the forward rate is high and falls as reactants deplete; the reverse rate starts at zero and rises. They meet — that is equilibrium.

2 Practice

Now apply the methods above.

2.1 At equilibrium, how do the forward and reverse rates compare? [1]

2.2 Are reactant and product concentrations equal at equilibrium? [1]

2.3 What does “dynamic” mean in dynamic equilibrium? [1]

3 Exam-style questions

3.1 At equilibrium, the concentrations of reactants and products are [1]

A	B
C	D

A equal to each other
B constant over time
C zero
D always increasing

3.2 A reversible reaction is placed in a closed flask starting with only reactants.

(a) Describe how the forward and reverse rates change until equilibrium. [2]

(b) State what is true of the rates at equilibrium. [1]

3.3 Explain why equilibrium is called “dynamic” even though concentrations do not change. [2]