

2.7 Tonicity, Water Potential, and Osmoregulation

Name: _____ Class: _____ Date: _____ **Total: 10 marks**

KEY WORDS hypotonic 低渗 • water potential 水势 • osmosis 渗透 • hypertonic 高渗
• isotonic 等渗

Objective

Build the skills to answer exam questions on **tonicity, water potential, and osmoregulation**.

You must be able to:

- classify a solution as **hypertonic** 高渗, **hypotonic** 低渗, or **isotonic** 等渗
- predict the direction of **osmosis** 渗透 and the effect on a cell
- use the idea of **water potential** 水势

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.

■ Tonicity

Compared with the cell:

- **Hypertonic** solution — more solute outside → water **leaves** the cell (shrinks).
- **Hypotonic** solution — less solute outside → water **enters** the cell (swells, may burst).
- **Isotonic** — equal solute → no net movement.

■ Osmosis direction

Water moves by **osmosis** from **high water potential** (dilute) to **low water potential** (concentrated) — toward the side with more solute.

■ Water potential

Water potential measures the tendency of water to move. Adding solute **lowers** water potential; water moves from higher to lower water potential.

■ A worked prediction

A red blood cell in a hypotonic solution: water enters (the outside has higher water potential), so the cell swells and may lyse (burst).

2 Practice

Now apply the methods above.

2.1 In a hypertonic solution, which way does water move relative to the cell? [1]

2.2 Does adding solute raise or lower water potential? [1]

2.3 What happens to an animal cell in a hypotonic solution? [1]

3 Exam-style questions

3.1 Water moves by osmosis from a region of [1]

- | | |
|---|---|
| A | B |
| C | D |
- A** low to high water potential
B high to low water potential
C high to high water potential
D it does not move

3.2 A plant cell is placed in a very concentrated salt solution.

(a) State whether the solution is hypertonic or hypotonic. [1]

(b) Predict the direction of water movement and the effect on the cell. [3]

3.3 Explain why a freshwater organism must actively remove excess water (osmoregulation). [2]