



Biology
Standard and Higher level
D2.3 Water potential
Paper 2

16 August 2026

Zone A afternoon | **Zone B** morning | **Zone C** afternoon

Candidate name

1 hour 45 minutes

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Instructions to candidates

- Write your candidate name in the boxes above.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- This paper only includes short and long answer questions; database questions for each topic are in separate worksheets.
- Most of the questions are original and written by me.
- Although most questions focus on this topic only, some are linked to other topics. A few questions have intentionally similar answers to show you how questions can be phrased differently but ask about the same concept(s).
- The duration of this paper was scaled according to the number of marks available and based on how much time, on average, each mark is worth in examination settings. Since this is a practice paper, expect to need more time to complete it.
- **None of the questions are from IB past papers.**
- The maximum mark for this paper is **[70 marks]**.

Section A

1. Chemical reactions in living systems depend on water as a solvent.

(a) Define solvation.

[1]

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(b) State **two** types of chemicals that can be solvated by water.

[2]

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(c) Describe how glucose in the cytosol of cells is solvated.

[3]

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2. Water is an important solvent in living organisms.

(a) State **one** class of biomolecules that **cannot** dissolve freely in water. [1]

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(b) Explain why hydration shells are important in solvation. [2]

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(c) Outline how the chemical properties of water make it suitable for dissolving polar and ionic particles. [3]

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3. Water movement is a vital aspect of life for cells.

(a) Define dynamic equilibrium

[1]

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(b) Distinguish between tonicity and osmolarity.

[2]

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(c) Explain why water moves from low to high solute concentration.

[3]

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4. Water movement affects cells in different ways.

- (a) Explain how turgor pressure develops in plant cells bathed in a hypotonic medium. [2]

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- (b) Outline how unicellular and multicellular organisms that lack a cell wall prevent harmful consequences of osmosis. [3]

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- (c) Discuss the importance of isotonic solutions in medical applications. [4]

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5. [AHL] Water potential drives osmosis.

(a) Define water potential.

[1]

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(b) Outline why it is impossible to measure the absolute quantity of the potential energy of water.

[2]

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(c) Explain why osmosis occurs from high to low water potential.

[3]

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6. [AHL] Water movement depends on potential differences.

(a) Define plasmolysis.

[1]

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(b) Distinguish between solute and pressure potentials.

[2]

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(c) Explain why solute potential is always less than or equal to zero whereas pressure potential can be positive, zero, or negative.

[4]

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Section B

There are not enough answer boxes for all the questions in this section in order to save on printing paper. You can use the few answer boxes for brainstorming your responses, and then record your answers on a separate sheet of paper.

7. Water movement is essential for living organisms.
- (a) A student uses changes in potato mass to determine the isotonic concentration of the tissue. Outline the role of standard deviation and standard error in determining the strength of the conclusion. [4]
 - (b) **[AHL]** Explain how solvation contributes to differences in water potential between two solutions. [4]
 - (c) **[AHL]** Discuss the role of water potential in plant physiology. [7]
8. Water movement can be detrimental to cells if not regulated.
- (a) Explain how responses of animal and plant cells to being placed in hypertonic and hypotonic solutions depends on their cellular structure. [7]
 - (b) **[AHL]** Outline the role of the Loop of Henle in establishing a water potential gradient that promotes reabsorption. [4]
 - (c) A patient is accidentally given an intravenous solution that is hypertonic to blood plasma. Explain the effects this could have on body physiology. [4]



[illegible]

[illegible]



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