IB Biology A1.1 Water Worksheet 01 - Water as the Medium of Life

Trimester assessment practice with IB-style multiple choice, short answer, data response / case study, and extended response.

Level	Focus	Recommended time	Total marks
SL core / HL compatible	A1.1.1 - Water as the medium for life; aqueous solutions; origin of the first cells in water	35 to 40 minutes	25

Instructions: Answer all questions. Use precise biological vocabulary. Working should be shown where calculation or reasoning is required. These worksheets are original IB-style practice materials for classroom use.

Question mix: 4 multiple choice questions, 3 short-answer questions, 1 data response / case study question, and 1 extended response.

Section A - Multiple choice

Choose the best answer for each question. [1 mark each]

Q1. The first cells are thought to have evolved in water mainly because water provided a suitable ... [1]

A. source of intense heat for metabolism

B. solvent for complex biochemical reactions

C. supply of atmospheric oxygen

D. way to avoid forming membranes

Q2. Which statement best defines an aqueous solution? [1]

A. Any liquid inside a living organism

B. A mixture that contains oxygen atoms

C. A solution in which water is the solvent

D. A solution that contains salts only

Q3. Which structure is most directly described as a water-based medium for intracellular reactions? [1]

A. Wax cuticle

B. Cytoplasm

C. Cellulose wall

D. Chromosome

Q4. Why could life not begin on the earliest hot Earth? [1]

A. Hydrogen bonds had not evolved

B. Temperatures were too high for liquid water to exist

C. There were no minerals in the crust

D. Water molecules had no polarity

Section B - Short answer

Q5. Explain why water is often described as the medium of life. [3]

Q6. State two places in or around organisms where water acts as a solvent, and give one function for each place. [4]

Q7. Explain why the first cells were more likely to originate in oceans than on hot, dry land. [4]

Section C - Data response / case study

A class compared water content and biological roles in several structures to discuss how water supports life.

Structure or material	Approx. water content (%)	Main biological role
Dry seed	10	Dormant embryo with very low metabolic activity
Leaf mesophyll	80	Photosynthesis and gas exchange
Human blood plasma	90	Transport of dissolved substances
Jellyfish body tissue	95	Support and transport in an aquatic organism
Cartilage	65	Support and cushioning in joints

Q8. Use the data above to interpret the biological importance of water. [6]

(a) Identify the structure with the highest water content. [1]

(b) Suggest a relationship between water content and the type or intensity of biological activity. [2]

(c) Explain why both leaf mesophyll and blood plasma require large amounts of water. [3]

Section D - Extended response

Q9. Explain how water supports life both inside organisms and as an external habitat. [8]

Use clear biological examples from cells, transport systems or habitats.

Answer key and marking guidance

Award credit for scientifically accurate equivalent wording unless the markscheme specifies otherwise.

Section A answers

Question	Answer	Guidance
Q1	B	Water acted as the solvent in which early biochemical reactions could occur.
Q2	C	An aqueous solution is any solution with water as the solvent.
Q3	B	Most cellular reactions occur in the aqueous cytoplasm.
Q4	B	The earliest Earth was too hot to retain liquid water, so the medium of life was absent.

Section B guidance

Q5. Explain why water is often described as the medium of life. [3]

Award [1] for each valid point up to [3]. Responses may include: water is the solvent for most biochemical reactions; cytoplasm and organelle fluids are aqueous; tissue fluids and blood transport substances in solution; whole habitats such as oceans, rivers and lakes exist in water.

Q6. State two places in or around organisms where water acts as a solvent, and give one function for each place. [4]

Award up to [2] for each correct place plus function pair. Accept examples such as: cytoplasm - site of metabolic reactions; blood plasma - transport of nutrients, hormones or wastes; xylem sap - transport of mineral ions; tissue fluid - exchange medium between cells and blood; organelle fluid - medium for reactions inside organelles.

Q7. Explain why the first cells were more likely to originate in oceans than on hot, dry land. [4]

Award [1] for each valid point up to [4]. Points may include: oceans provided liquid water; water served as a solvent for reacting molecules; water buffered against rapid temperature change; dissolved substances could move and interact more easily; cell membranes could separate internal aqueous cytoplasm from the external medium.

Section C guidance

Q8. Use the data above to interpret the biological importance of water. [6]

Award marks as indicated. (a) [1] Jellyfish body tissue / jellyfish. (b) Award up to [2] for a valid trend plus support, such as: structures with active transport or metabolism tend to contain more water; dormant structures such as dry seeds contain much less water because metabolic activity is greatly reduced. (c) Award up to [3]. Leaf mesophyll requires water as a reactant / solvent in photosynthesis and to maintain cell processes; blood plasma requires water to dissolve and transport nutrients, wastes, hormones and ions.

Section D guidance

Q9. Explain how water supports life both inside organisms and as an external habitat. [8]

Indicative content includes: water is a polar solvent and forms aqueous environments for metabolism; cytoplasm, organelle fluids, tissue fluid and blood are water based; dissolved substances can move into and out of cells; most organisms depend on water for transport and chemical communication; early life likely evolved in water; lakes, rivers and oceans provide habitats; water's stable thermal conditions and buoyancy can benefit organisms; answers should link molecular and ecological roles.

Extended response markband

Marks	Descriptor
0	No relevant biological knowledge or no creditworthy response.
1-2	Limited knowledge. A few isolated facts may be stated but links to the question are weak or unclear.
3-4	Some correct biological ideas are included. Explanation is partial and may lack precision or development.
5-6	Clear understanding with relevant biological detail. Uses appropriate terminology and links most ideas to the question.
7-8	Accurate, well-structured and comprehensive response. Ideas are logically linked and supported with relevant examples or applications.