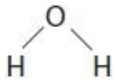
Questions

Q1.

Water is a polar molecule. The diagram shows a molecule of water.



Complete the diagram to show the dipole nature of this water molecule.

(Total for question = 2 marks)

Q2.

Sweating is a thermoregulatory mechanism.

A student stated that loss of heat when sweating is related to the dipole nature of water molecules.

Justify this statement.

(3)

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(Total for question = 3 marks)

Q3.

Explain how the properties of water make it an ideal transport medium.

(3)

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(Total for question = 3 marks)

Q4.

Name the type of reaction in which a molecule of water is involved in the breaking of a bond in another molecule.

(1)

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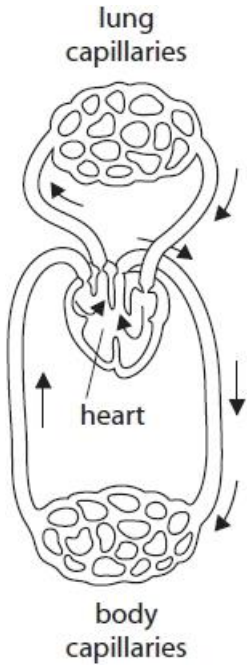
(Total for question = 1 mark)

Q5.

Many animals have a heart and circulatory system.

The diagram shows the structure of the heart and circulatory system of a snake.



(i) Compare and contrast the heart and circulatory system of a snake with that of a human.

(4)

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(ii) Explain why a snake needs a heart.

(2)

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(Total for question = 6 marks)

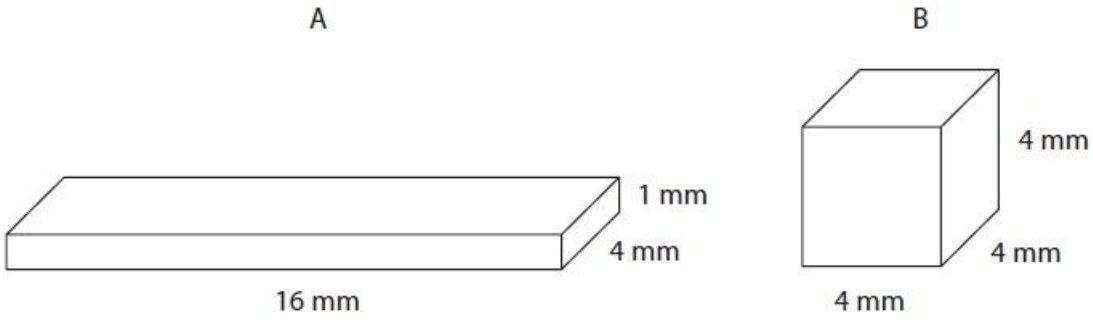
Q6.

Scientists can use models to explain the need for a circulation system in animals.

The shapes in the diagram represent two different animals that live in water.
The figures represent the height, width and breadth of the animals.

Determine why animal A does not need a circulation system but animal B does.

(4)



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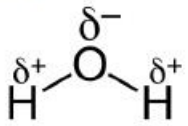
(Total for question = 4 marks)

Mark Scheme

Q1.

Question Number	Answer	Additional Guidance	Mark
	• correct symbol and charge on the oxygen atom (1) • correct symbol and charge on both hydrogen atoms (1)	e.g.  ALLOW one mark for all correct charges without symbols	(2)

Q2.

Question Number	Answer	Additional Guidance	Mark
	An answer that makes reference to three of the following: • the water has an uneven distribution of charge (making it a dipole) (1) • so water forms hydrogen bonds with other water molecules (1) • (and) it requires a lot of { heat / thermal } energy to break these bonds (1) • and allow water to evaporate (taking the heat energy with it) / high latent heat of evaporation (1)	ALLOW description of dipole ALLOW – a lot of heat energy is required to evaporate water	(3)

Q3.

Question Number	Answer	Additional Guidance	Mark
	An explanation that makes reference to the following: • water is a solvent (1) • because water molecules surround { polar molecules / ions } / hydrogen bonds form between water molecules and solute molecules (1) • water is liquid so has the ability to flow (1)	ALLOW allows { polar / ionic molecules / ions } to dissolve ALLOW separation of ions by water molecules ALLOW reference to cohesion between water molecules	**(3)**

Q4.

Question Number	Answer	Additional Guidance	Mark
	• hydrolysis (reaction)		**(1)**

Q5.

Question	Answer	Additional guidance	Mark
(i)	An answer which makes reference to the following: <u>Similarities</u> • both have a {double / closed} circulatory system (1) • both have two atria, arteries, veins and capillaries (1) <u>Differences</u> • snake heart has only one ventricle whereas human heart has two / snake heart does not have a (complete) {septum / wall} between the {ventricles / sides of heart} whereas human heart does (1) • in snake heart the oxygenated and deoxygenated blood mix (in the ventricle) whereas they do not mix in a human heart (1)	ALLOW both have two atria and blood vessels ALLOW piecing together ALLOW snake septum has a hole whereas human heart doesn't	(4)

Question Number	Answer	Additional guidance	Mark
(ii)	An explanation which makes reference to two of the following: • (to pump blood) to supply {oxygen / glucose} to body cells / to remove {carbon dioxide / wastes} from body (1) • by mass transport (1) • because a small surface area to volume ratio does not allow diffusion to occur at a sufficient rate (1)	ALLOW to ensure cells have sufficient {oxygen / glucose}	(2)

Q6.

Question Number	Answer	Additional guidance	Mark
	An answer the makes reference to four of the following: • both have same volume (1)	ALLOW both have a volume of 64 mm^3	
	• animal A has a larger surface area (1)	ALLOW converse ALLOW figures given (e.g. 168 mm^2 v 96mm^2) or difference given as 72 mm^2	
	• animal A has a larger surface area to volume ratio (1)	ALLOW {168:64 / 2.6:1} compared to {96:64 / 1.5:1}	
	• so sufficient (surface area in animal A) for diffusion (1)	ALLOW converse	
	• distance to cells in centre of A is shorter than for B allowing {quicker/sufficient} diffusion / shorter diffusion distance (in A) (1)	ALLOW converse	**(4)**