Helping you Achieve Highest Grades in IB

IB Biology SL First Assesment 2025

Question Paper

Multiple Choice and Short Answer Questions

Theme: A - Unity and Diversity

Sub Topic - Water

Marks: 40

Total Marks: / 40

Suitable for SL Students sitting exams 2025+ onwards. However, HL Students will also find this useful

Questions

Question 1
What property of water helps living organisms maintain their internal body temperature?
A. Thermal properties
B. Cohesive properties
C. Adhesive properties
D. Solvent properties

Question 2
Which of the following is not soluble in water?
A. Glucose
B. Amino Acids
C. Cholesterol
D. Sodium Chloride

Question 3
What substances are attracted to water and form intermolecular bonds with water molecules?
A. Insoluble substances
B. Hydrophobic substances
C. Hydrophilic substances
D. Non-polar substances

Questions

Question 4
What intermolecular bond is responsible for water's cohesive, adhesive and thermal properties?

- A. Covalent bond
- B. Hydrogen bond
- C. Ionic bond
- D. Metallic bond

Question 5
[Maximum mark: 6]

1. Outline how hydrogen bonds form between water molecules. [2]
2. State one of the ways how hydrophilic substances interact with water. [1]
3. State one of the ways how non-polar molecules interact with water. [1]
4. Distinguish cohesion and adhesion. [2]

Question 6
Which property of water enables marine animals such as the ringed seal (Pusa hispida) to stay afloat in water without expending large amounts of energy?

- A. Thermal properties
- B. Specific heat capacity
- C. Viscosity
- D. Buoyant force

Questions

Question 7
The cohesive and adhesive properties of water allow xylem vessels to transport water inside plants.
Which of the following are correct descriptions of how these properties are related to water transport in plants?

Cohesive
A.
Polar water molecules are attracted to one another and bind through hydrogen bonds
B.
Water molecules are polar so are able to dissolve ions
C.
Polar water molecules are attracted to one another and bind through oxygen bonds
D.
Polar water molecules are attracted to the hydrophilic parts of the cell walls in xylem

Adhesive
A
Polar water molecules are attracted to the hydrophilic parts of the cell walls in xylem
B.
Polar water molecules are attracted to one another and bind through hydrogen bonds
C.
Water molecules are polar so are able to dissolve ions
D.
Polar water molecules are attracted to one another and bind through hydrogen bonds

Question 8
Which of the following statements about the dipolarity of the water molecule are true?

- I. Oxygen attracts the shared electrons stronger than hydrogen.
- II. Hydrogen atoms are partially negative.
- III. The shared electrons spend more time closer to oxygen.

- A. I and II
- B. II and III
- C. I and III
- D. I, II, and III

Questions

Question 9
[Maximum mark: 4]

The image shows a ringed seal (Pusa hispida) that lives in the Arctic Sea.

[Source: Adapted from: Kingfisher. (2021, May 29). Pusa hispida. Wikimedia Commons. Retrieved from July 07, 2023, from https<no link>://commons.wikimedia.org/wiki/Pusa_hispida. Copyright free]

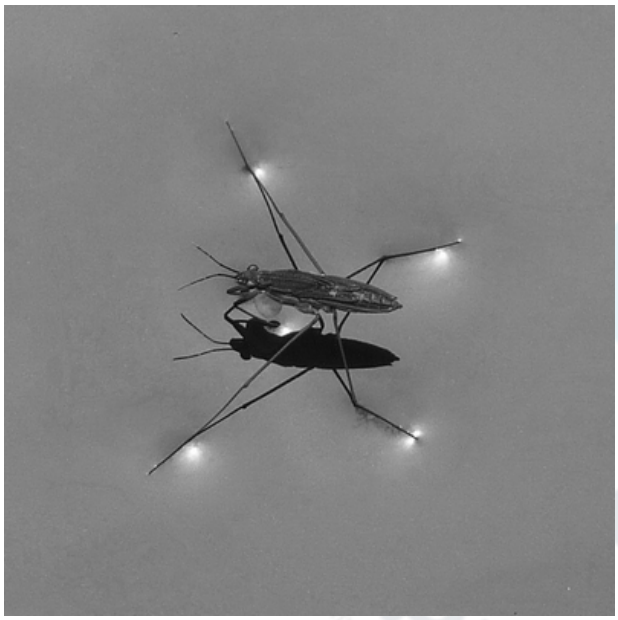
1. Distinguish between the physical properties of air and water that allow the seal to mostly live in the sea. [2]
2. Ringed seals glide into the water head first from ice shelves, rather like humans diving into a pool head first. Explain the advantage of entering the water in this way rather than ‘belly-flopping’ into the water. [2]

Questions

Question 10

[Maximum mark: 5]

Below is a picture of a water strider (Gerris sp.Gerris sp.).



[Source: Schnobby. (2010). Water Strider. Wikimedia Commons. Retrieved April 27, 2022, from https<nolink>://commons.wikimedia.org/wiki/File .jpg. Copyright by CC BY-SA 3.0]

1.Explain why the water strider (Gerris sp.Gerris sp.) does not sink. [2]

2. Describe, using an example, the importance of water as a solvent in living organisms. [3]

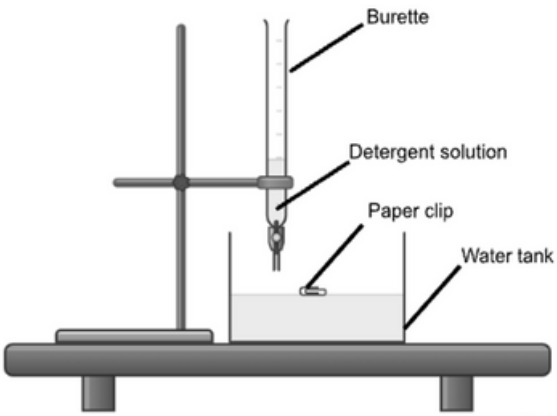
Questions

Question 11

[Maximum mark: 10]

An investigation was carried out into the effects of household detergents on aquatic habitats. Scientists tested the effect of different household detergents on the surface tension of water in order to better understand the impact they may have on organisms living on the surface.

A paper clip was folded slightly on one side and rested on the surface of the water, maintained at a constant temperature and contained within a water tank. Drops of detergent solution were slowly added to the water tank until the paperclip sank to the bottom. The volume of detergent solution taken to sink the paperclip was recorded. Detergent solutions were made by adding 5 ml of detergent to 15 ml of water.



[© Revision Village 2022. Created with Chemix (https<NO LINK>://chemix.org)]

The results are shown in the table.

Detergent Brand	Volume detergent solution taken to sink paperclip /ml			
	Trial 1	Trial 2	Trial 3	Trial 4
Deterobubble	4	4	5	5
Easy Clean	8	10	10	9
Dish Shine	13	13	12	13

Questions

1. Describe the relationship between the volume of detergent solution added and the surface tension of water. [1]
2.
    1. For the Easy Clean detergent, calculate the mean number of drops of detergent needed to sink the paper clip. [1]
    2. Estimate how many drops of Easy Clean detergent solution it would take to sink 5 paper clips. [1]

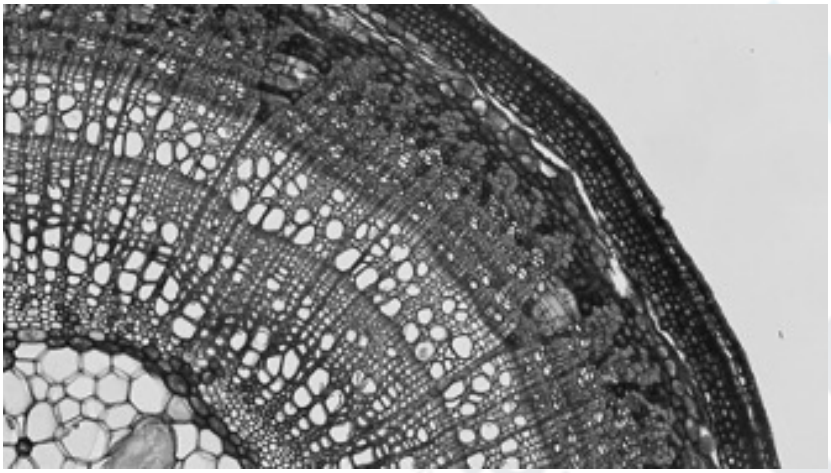
3.
    1. State one variable, other than those given, which would need to be controlled in this experiment in order to achieve a valid result. [1]
    2. Suggest one method that could be used to keep the water at a constant temperature. [2]
    3. Explain the importance of maintaining water at a constant temperature. [1]
    4. Identify one potential source of error in the methodology. [1]

4. Suggest why different numbers of drops of detergent solution were needed to sink the paperclip between each type of detergent. [2]

Questions

Question 12
[Maximum mark: 6]

The image shows a cross-section of the vascular tissue of a woody dicot stem, showing the annual rings of phloem and xylem.



[Source: Adapted from: Berkshire Community College Bioscience Image Library. (2014, February 10). File
Dicot stem primary xylem in late one year - wikimedia. Wikimedia commons. Retrieved July 07, 2023, from https<NO LINK>://commons.wikimedia.org/wiki/File:Woody_Dicot_Stem_Ray_System_in_Two_Year_Tilia_%2834997659262%29.jpg. Copyright free]

1. Explain how the properties of water allow it to be transported in the xylem. [3]
2. Describe a physical property of water, other than those that are important for the movement of water through the plant, that makes water essential for the survival of plants. [1]
3. Outline why plants cannot use water to transport lipids. [1]
4. If the temperature drops to -1
   o
   C for a few hours suggest a reason why the water in xylem may not freeze. [1]

Questions

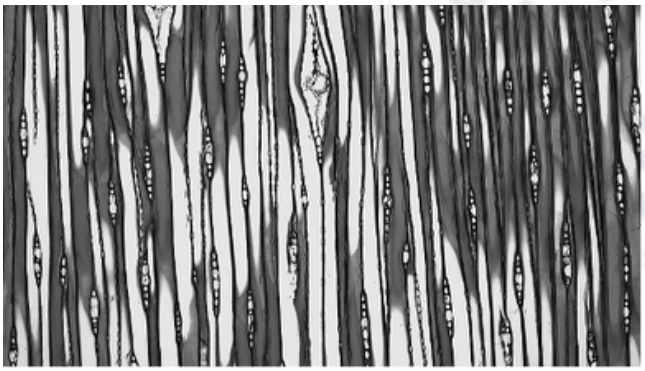
Question 13

The black-throated loon (Gavia arctica) is a bird that lives near large bodies of water in cold climates. Which of the following is a correct description of how the properties of water may make winter temperatures more moderate for the black-throated loon?

A. Water can store large amounts of heat which warms cooler air.
B. Ice floats on water so insulates the liquid water beneath the ice.
C. Water has a low specific heat capacity which warms the surrounding air.
D. Water is dense which enables the black-throated loon to float.

Question 14

The micrograph below shows the longitudinal cross-section of a stem from a plant in the Pinus genus. Xylem vessels are clearly visible.



Magnification: 100X
[Source: From Berkshire Community College Bioscience Image Library. (2014). Radial section: Pinus stem magnification: 100x iron-alum hematoxylin and safranin stain. Wikimedia Commons. Retrieved April 29, 2022, from https<NO LINK>://commons.wikimedia.org/wiki/File:Gymnosperm_Stem_Soft_Wood_in_Pinus_(36087426450).jpg. Copyright by CC BY CC0 1.0]

The xylem is composed of hollow, tube-like tissues that transport water through capillary action. What property of water explains capillary action?
A. Melting point
B. Adhesive properties
C. Specific heat capacity
D. Buoyant forces