2. Biological Molecules

2.4 Water

Paper 2

Question Paper

1 The olive plant, *Olea europaea*, is grown in many parts of the world. The fruits of the plant (olives) and the oil that can be obtained from the fruits (olive oil), provide food for humans.

Triglycerides are the main type of lipid in olive oil. They are synthesised in the olive plant from glycerol and fatty acids.

Scientists can analyse samples of different olive oils to identify:

- the fatty acids used to synthesise triglycerides
- the composition of the different triglycerides present.

(b) Glycerol is soluble in water. Triglycerides are insoluble in water.

Explain why water is a good solvent for some substances such as glycerol, but is a poor solvent for substances such as triglycerides.

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2 **(b)** Water is the main component of blood. It has an important role in the transport of substances around the body.

Fig. 2.2 shows the ionic compound sodium chloride dissolving in water.

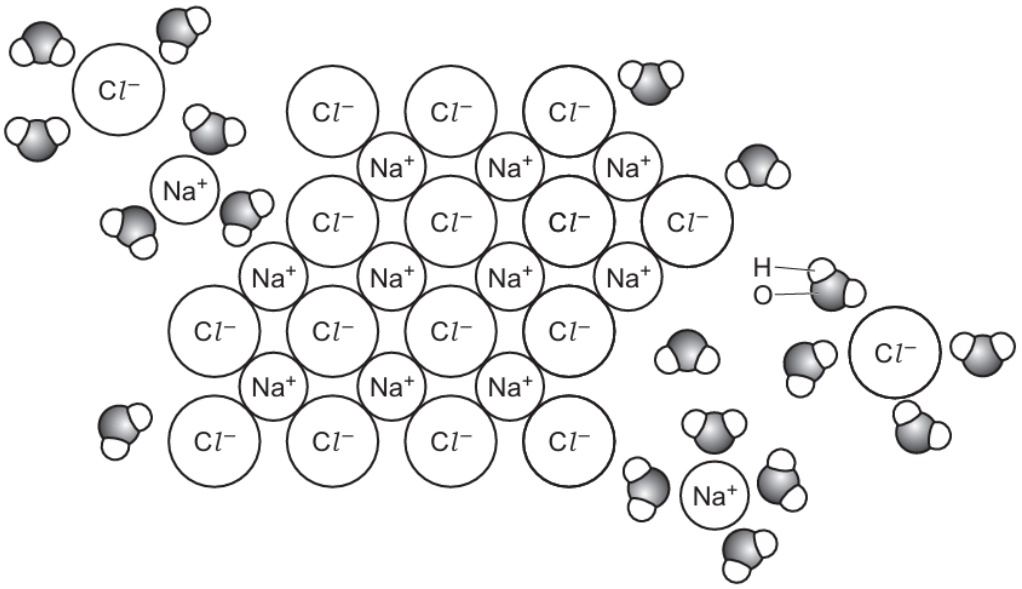


diagram not to scale

Fig. 2.2

With reference to Fig. 2.2, explain how water acts as a solvent for sodium chloride.

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3 Fig. 2.1 is a photomicrograph of a longitudinal section (LS) through a root tip. Two different regions are visible:

- the root apical meristem
- the root cap.

Cells in the root cap synthesise a gel-like, sticky secretion known as mucilage, which is important in reducing friction between soil and the growing root. It is composed mainly of polysaccharides and also contains some amino acids and enzymes.

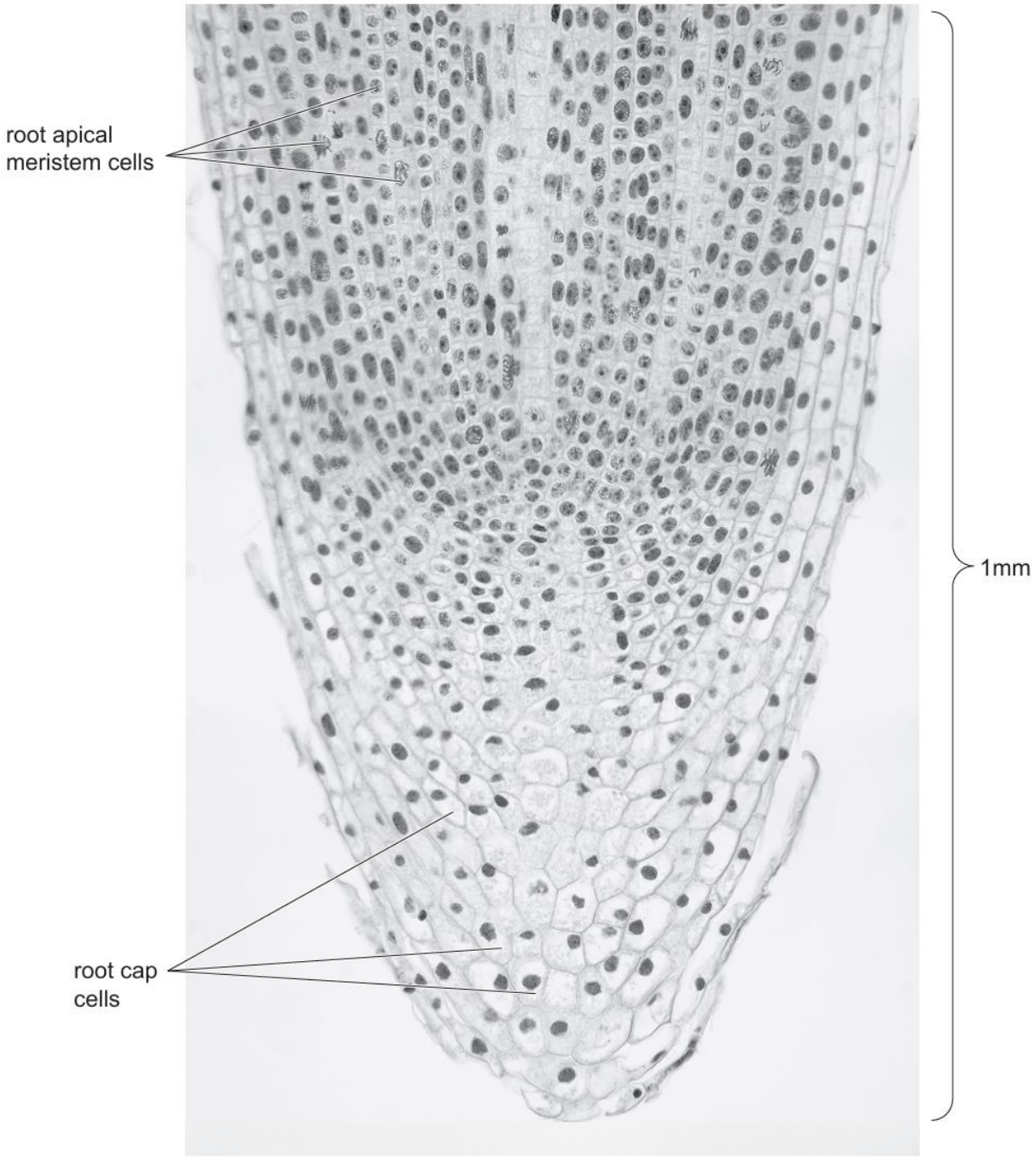


Fig. 2.1

(b) Mucilage acts as a glue to bind tiny soil particles together, forming small clumps close to the root. These small clumps help to maintain the soil water around the root tip and prevent the loss of water.

With reference to the cohesive **and** adhesive properties of water, suggest **and** explain how the formation of small clumps of soil helps to maintain the soil water around the root tip.

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4 Plants have specialised cells for the efficient transport of assimilates.

(d) Water that has travelled through xylem vessels reaches the leaves. Cooling of the leaf occurs as a result of the evaporation of water during transpiration.

Water has a high latent heat of vaporisation because water molecules form hydrogen bonds.

With reference to hydrogen bonding, suggest why cooling of the leaf occurs as a result of evaporation of water during transpiration.

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5 Xylem and phloem are the transport tissues of plants. Both tissues have more than one cell type.

The conducting cells of xylem contain xylem sap and those of phloem contain phloem sap. The composition of xylem sap differs from the composition of phloem sap.

(a) The main component of xylem sap and phloem sap is water.

Explain why water is the main component of xylem sap and phloem sap.

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6 Fig. 2.1 shows three molecules of water.

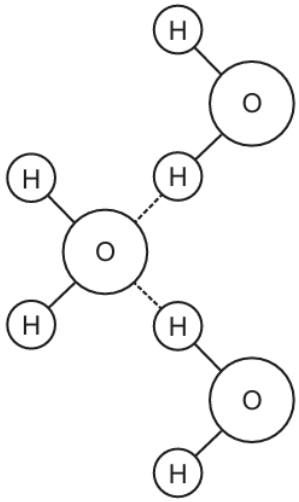


Fig. 2.1

(a) Describe the hydrogen bonding that occurs between the water molecules shown in Fig. 2.1.

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(c) Outline the importance of water as a solvent in **plants**.

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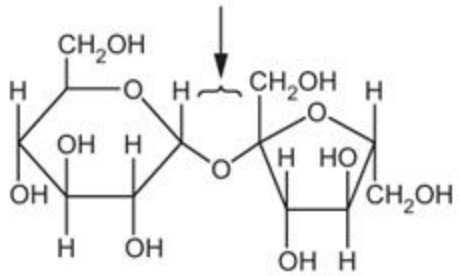
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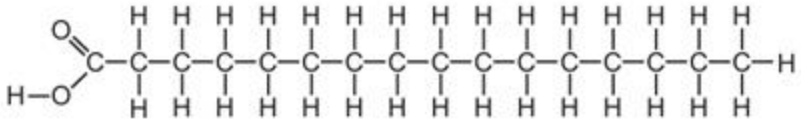
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7 Fig. 1.1 shows five biological molecules.

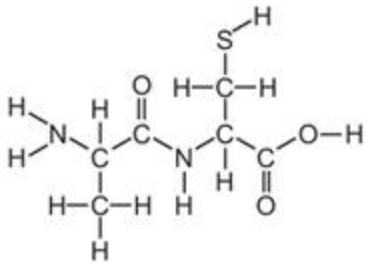
A



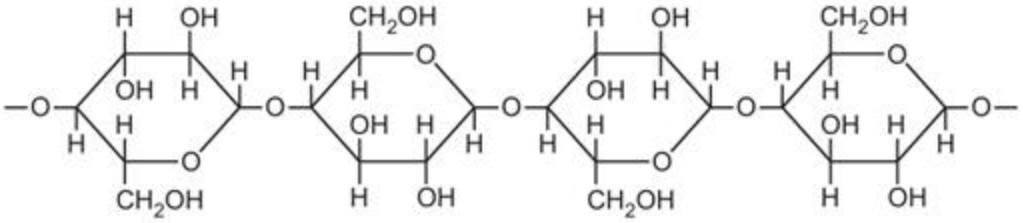
B



C



D



E

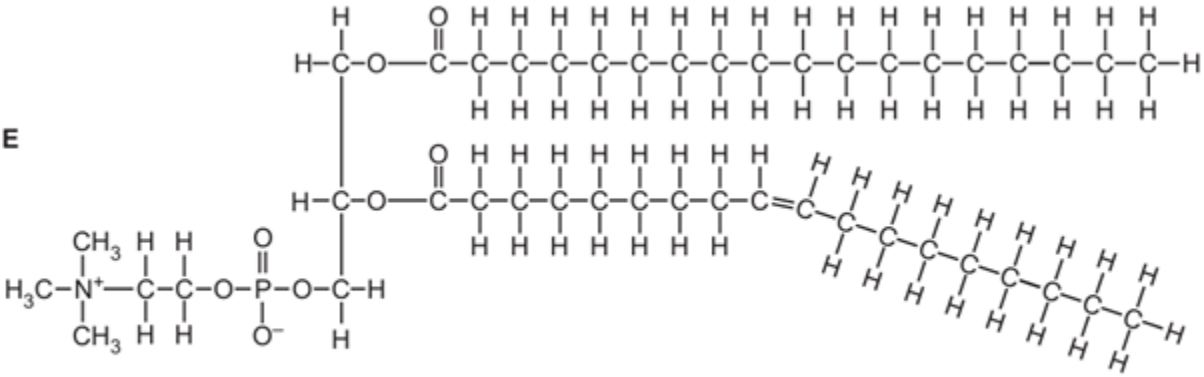


Fig. 1.1

(f) Molecule **A** and molecule **C** dissolve in water. Molecule **B** does **not** dissolve in water.

Explain why molecule **A** and molecule **C** dissolve in water, but molecule **B** does **not** dissolve in water.

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8 Water is a main component of plant cells.

(b) Fig. 3.2 shows two water molecules linked by a hydrogen bond.

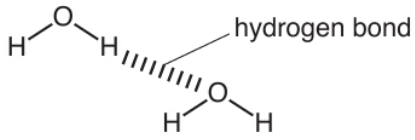


Fig. 3.2

Explain how hydrogen bonding occurs between water molecules.

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(c) Suggest why water is an excellent solvent for ions.

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