1. The cells in beetroot contain a red pigment called betalain. The plasma membrane of the beetroot cell is impermeable to betalain.

A group of students set out to investigate how temperature affects the structure and permeability of the plasma membrane of beetroot cells. The method they used is shown below.

- Cut some pieces of beetroot.
- Place them in a flask containing 100 cm^3 of distilled water.
- Stand this flask in a water bath and increase the temperature at 10 °C intervals.
- Take a sample of water from the flask 5 minutes after each new temperature is reached.
- Measure the absorbance of the water samples taken using a blue filter in the colorimeter.

In a second experiment, students followed the same method but used pieces of beetroot that had been frozen for several days and then defrosted. They were surprised when their results differed from the students that had been given fresh beetroot.

Suggest how their results would **differ** from those given in the table **and** provide an explanation.

[2]

2. *The thermal properties of water allow organisms to live in an environment with relatively small changes in temperature. These properties also make water efficient as a coolant, e.g. in sweating or by absorbing large amounts of heat.

Outline how **other** properties of water are essential for sustaining life on Earth.

[6]

3. Water molecules are transported in the stem of a sunflower. Water molecules are polar and are therefore attracted to each other.

i. Draw **two** water molecules **and** label the bond between the two molecules.

[3]

ii. Explain how the properties of water are related to the transport role of water in a stem.

[3]

END OF QUESTION PAPER