

AS Level Biology B

H022/01 Foundations of biology (Foundation Tier)

Question set 2

1 *Beta vulgaris* (beetroot) is a species of beet plant.

The membrane-bound vacuole of beetroot cells contains the red pigment, betanin.

(a) Name the membrane that surrounds the vacuole in plant cells.

[1]

(b) Beetroot was used by a group of students to investigate the effect of pH on the permeability of cell membranes. When the vacuole membrane is damaged its permeability to betanin increases and betanin leaks out into the surrounding solution.

- The students cut discs of beetroot and placed them in test tubes containing solutions of different pH for ten minutes.
- The students then used a colorimeter with a blue filter to measure the light absorption in the resulting solutions.

(i) During this investigation, the same volume of solution was used in each test tube.

State **two** other variables that must also be controlled in this investigation **and** suggest how they could be controlled.

[2]

(ii) The students used their data to plot an appropriate graph, shown in Fig. 1.

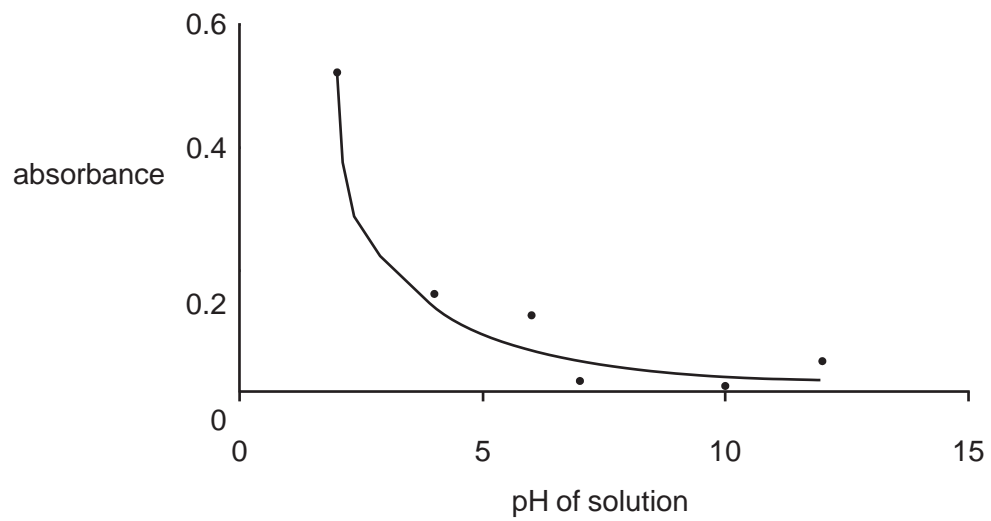


Fig. 1

The students were told that the greater the absorption of light, the greater the concentration of betanin in solution.

Describe **and** explain the results shown in Fig. 1.

[4]

- (c) Betanin is soluble in water.

Explain how the properties of the membrane surrounding the vacuole ensure that betanin does not leak out into the cytoplasm of healthy beetroot cells. [2]

- (d) The passage below describes some of the research into the use of beetroot products for the treatment of obesity.

Chronic inflammation is often associated with obesity.

Beetroot extracts have been investigated as potential anti-inflammatory agents. Some of their effects seem to be in interfering with the cell signalling cascades that initiate, regulate and amplify the inflammatory response.

In particular betalain pigments, such as betanin, in beetroot have been shown to interfere with the action of cytokines.

- (i) Describe the inflammatory response. [3]
- (ii) Using your knowledge, suggest how betalain pigments could interfere with the action of cytokines [1]

Total marks in question set 2: 13



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