A Level Biology B

H422/03 Practical skills in biology

Question Set 7

1. (a) (i) A student investigated the effect of temperature on the rate of diffusion of chloride ions from carrot cells.

This is the student's method for the preliminary experiment.

1. Cut thin sections of carrot.
2. Place the sections of carrot into a boiling tube of distilled water, maintained at a temperature of 100°C.
3. Remove a sample of water from the boiling tube and add silver nitrate solution. The silver nitrate solution reacts with chloride ions to produce a white precipitate.
4. Measure the absorbance of the sample in a colorimeter. Higher chloride ion concentrations will produce more white precipitate which will increase absorbance.

All equipment and sections of carrot were washed with distilled water before use.

Explain why.

[1]

(a) (ii) The absorbance value obtained in step 4 was used as a reference value for further tests. This absorbance value was considered to represent the highest chloride ion concentration that could be measured in the boiling tube solution.

Explain why. **[1]**

(b) Using the sample produced from step 3 in the preliminary experiment, the student carried out a serial dilution that produced the results in Table 2.1.

Concentration of chloride ions (a.u.)	Absorbance
1000.0	0.080
100.0	0.040
10.0	0.020
1.0	0.018
0.1	0.005

Table 2.1

Look at the trend in the results in Table 2.1.

Identify the anomalous result in this trend **and** give its expected absorbance value.

[1]

(c) The student used the method for the preliminary experiment to plan their investigation into the effect of temperature on the rate of chloride ion diffusion.

Describe **three** variables that the student would need to control when planning this investigation. Include reasons why each of your chosen variables must be controlled.

[6]

(d) (i) Fig. 2.1 shows the results of the student's experiment carried out at different temperatures.

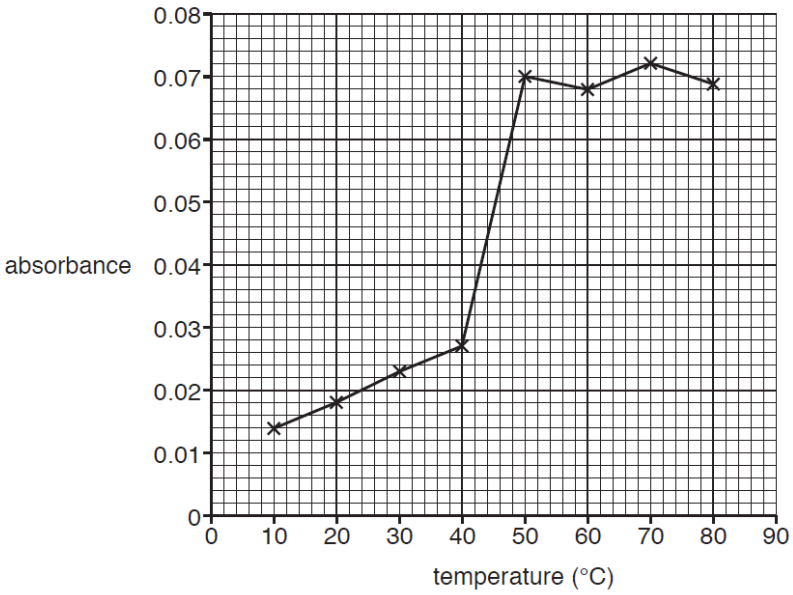

Fig. 2.1

Use Fig. 2.1 to calculate the increase in absorbance between 10 °C and 40 °C.

[1]

(d) (ii) Suggest why the absorbance changed between 10 °C and 40 °C.

[2]

(d) (iii) Fig. 2.2 shows absorbance measured at different concentrations of chloride ions.

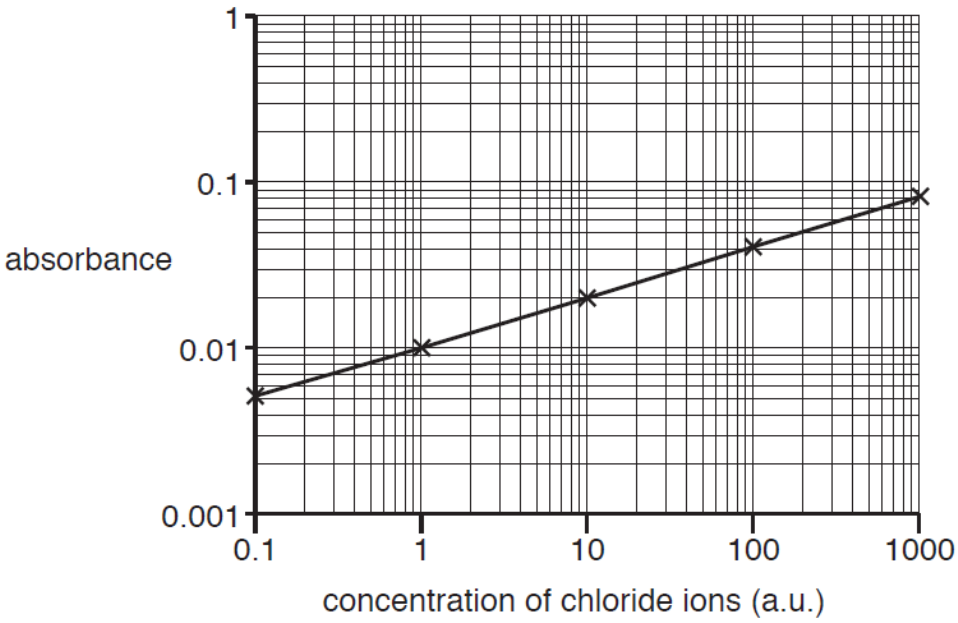

Fig. 2.2

Using the graph in Fig. 2.1 and the graph in Fig. 2.2, estimate the chloride ion concentration at a temperature of 45 °C.

[2]

Total Marks for Question Set 7: 14