

Biological Molecules

Question Paper 3

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Biological Molecules
Sub-Topic	
Paper Type	Alternative to Practical
Booklet	Question Paper 3

Time Allowed: 52 minutes

Score: /43

Percentage: /100

- 2 A protein is used to hold other chemicals onto the clear plastic backing of photographic film, as shown in Fig. 1.1.

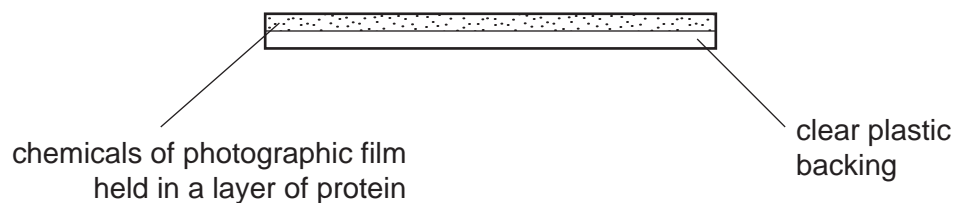


Fig.1.1

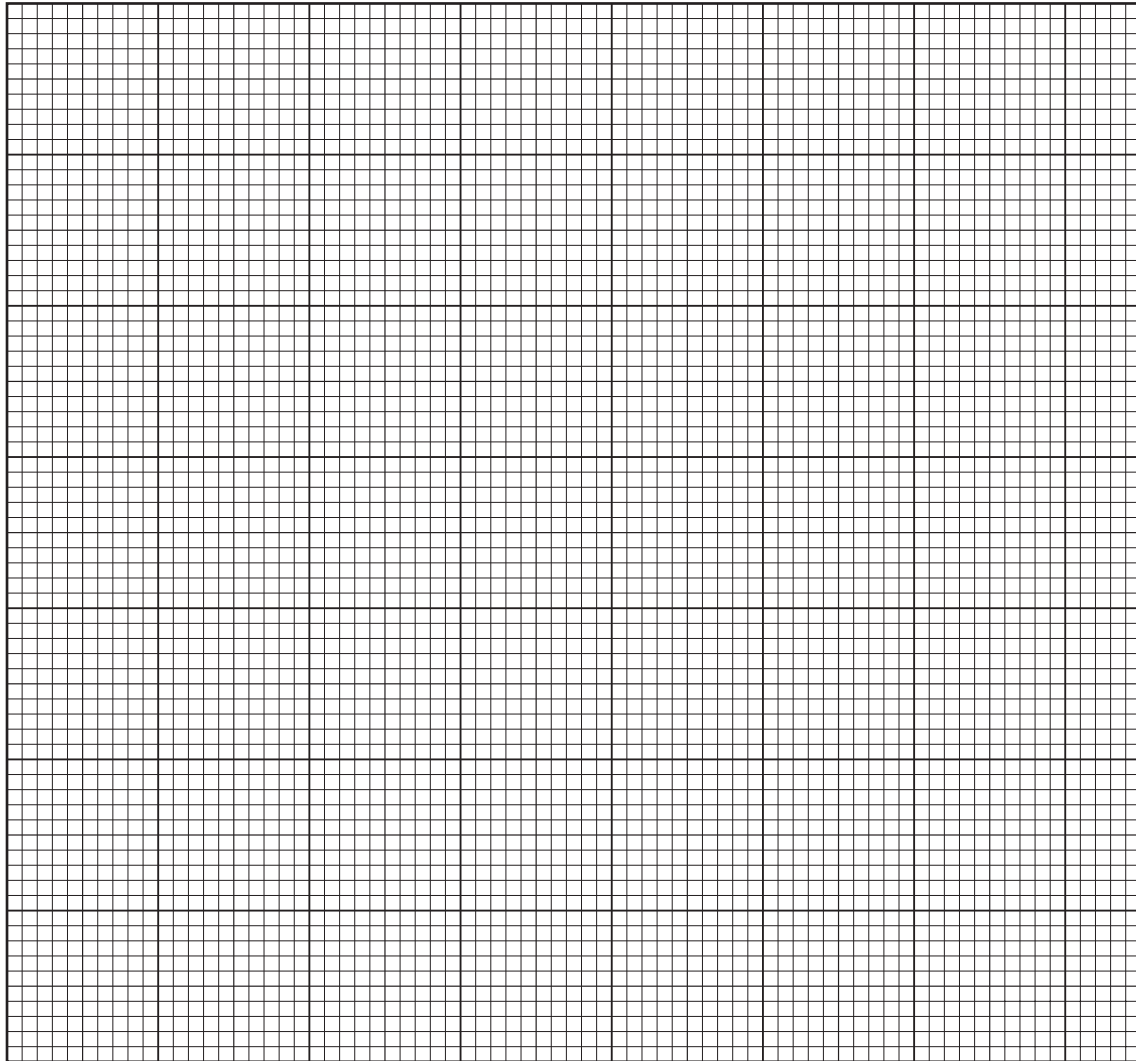
Trypsin is an enzyme which will digest the protein so that the coating on the photographic film is removed and the film becomes clear.

Table 1.1 shows the results obtained by two students who investigated the effect of pH on the activity of this enzyme. They made up the solutions, set up the experiment and timed how long the enzyme took to digest the protein and clear the film.

Table 1.1

pH	time for the protein to be digested / mins	
	student 1	student 2
2	12.0	14.0
4	8.0	9.0
6	2.0	3.0
8	0.5	1.0
10	8.0	9.0

(a) (i) Plot the results obtained by **student 2** in the form of a suitable graph.



[5]

(ii) Describe and explain the effect of pH on the activity of the enzyme.

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[5]

(b) (i) Suggest reasons for the difference in the results for the two students.

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..... [3]

(ii) If you were to carry out this investigation, describe what steps you would take to ensure that your results were as reliable and valid as possible.

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..... [5]

[Total: 18]

3 Fig.1.1 shows a diagram of a groundnut plant, *Arachis hypogaea*.

The flower stalks grow downwards so that the fruits develop below the soil surface.

Fig. 1.2 shows the mature fruits, one of which has been cut open.

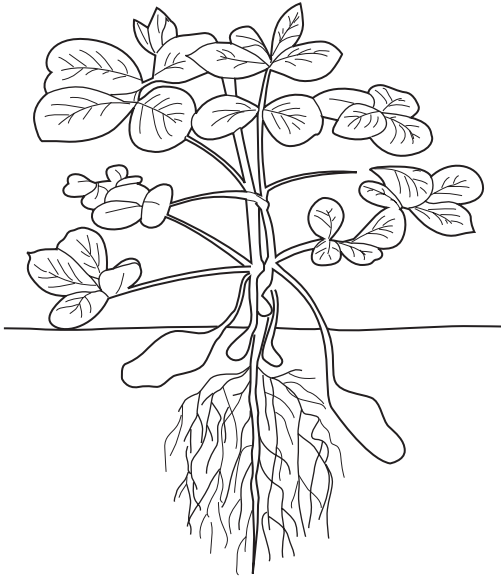


Fig. 1.1

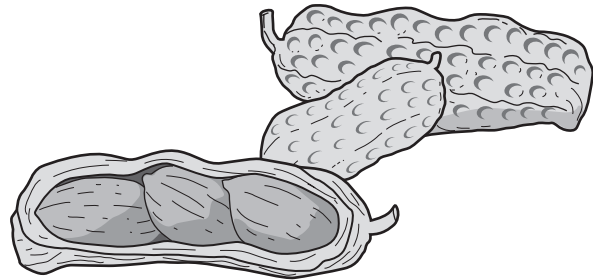


Fig. 1.2

(a) (i) Make a large, labelled drawing of the open fruit and its contents.

[5]

(ii) Measure the length of your drawing.

Measure the length of the same structure in Fig. 1.2.

Calculate the magnification of your drawing.

Show your working.

Magnification

[3]

(b) A student investigated the energy content of a seed.

A seed was weighed and its mass recorded in Table 1.1. The seed was firmly attached to the end of a mounted needle. A large test tube containing 20 cm³ of water was held in a clamp stand, with a thermometer and a stirrer. The apparatus is shown in Fig. 1.3.

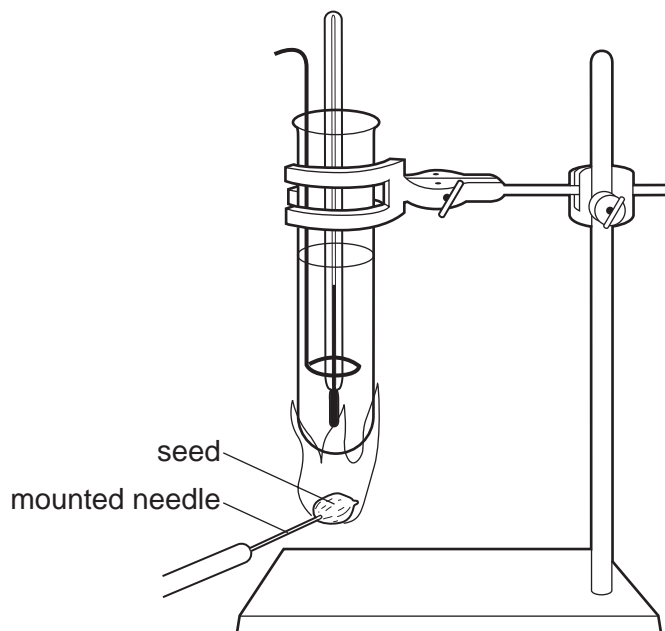


Fig. 1.3

- The temperature of the water at the start was recorded in Table 1.1.
- The seed was set alight by placing it in a flame for a few seconds.
- The burning seed was held under the test tube until the seed was completely burnt.
- The water was stirred immediately. The highest temperature of the water was recorded in Table 1.1.

(i) Complete Table 1.1 by calculating the rise in temperature. [1]

Table 1.1

mass of seed / g	volume of water / cm ³	temperature at the start / °C	highest temperature / °C	rise in temperature / °C
0.5	20	29	79

The energy contained in the seed can be calculated using the formula below.

$$\text{energy} = \frac{\text{volume of water} \times \text{rise in temperature} \times 4.2}{\text{mass of seed} \times 1000}$$

(ii) Using the formula calculate the energy content of the seed.

Show your working.

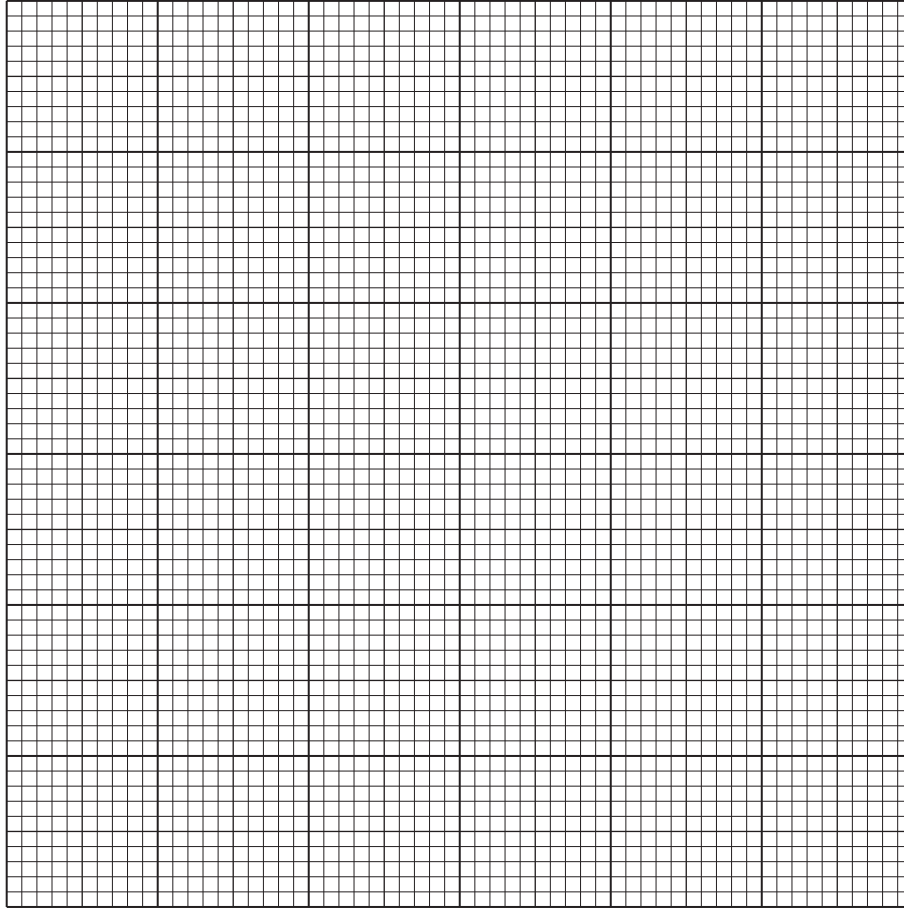
Energy content kJg⁻¹ [2]

The same method was used to find the energy content of some food substances. The results are shown in Table 1.2.

Table 1.2

food substance	mass of food burnt /g	starting temperature / °C	final temperature / °C	rise in temperature / °C	energy content /kJg ⁻¹
starch	0.62	31	65	34	4.61
sugar	0.54	30	59	29	4.51
fat	0.56	30	90	60	9.00
protein	0.40	31	52	21	4.41

(iii) On the grid below, plot a suitable graph to compare the energy content per gram of the four different food substances **and** the seed from (b)(ii).



(vi) Use this information to suggest the main food substance present in the seed. [4]

..... [1]

(c) Describe how you would test for the presence of reducing sugars in a seed.

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..... [3]

[Total : 19 marks]