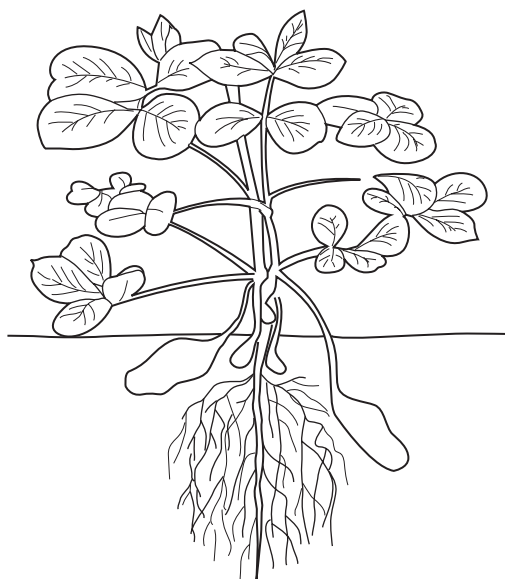




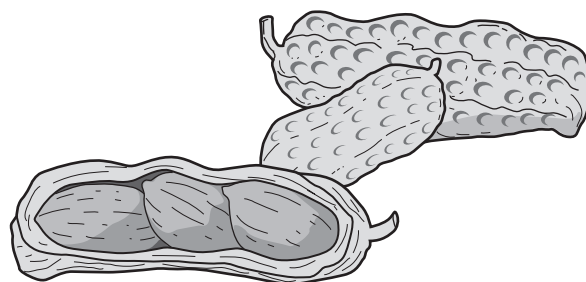
- 1 Fig.1.1 shows a diagram of a groundnut plant, *Arachis hypogaea*.

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**

For  
Examiner's  
Use

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

*For  
Examiner's  
Use*

[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 cm<sup>3</sup> of water was held in a clamp stand, with a thermometer and a stirrer. The apparatus is shown in Fig. 1.3.

For  
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Use

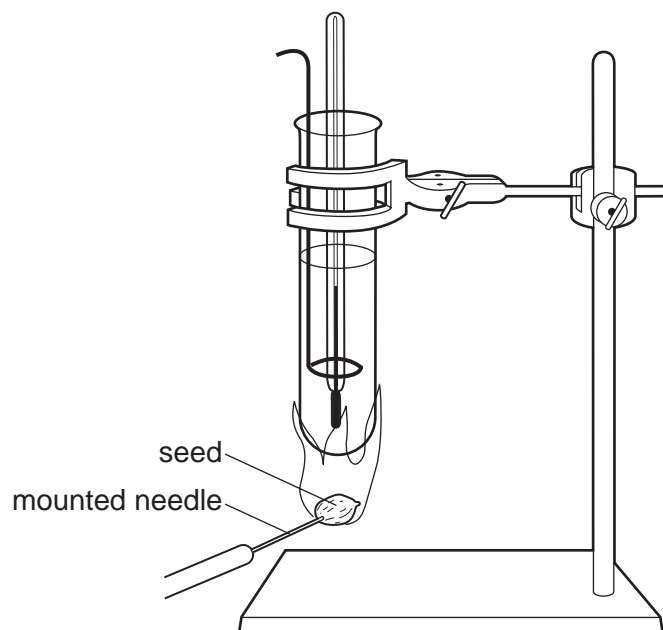


Fig. 1.3

- 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]

For  
Examiner's  
Use

**Table 1.1**

mass of seed / g	volume of water / cm <sup>3</sup>	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 ..... kJ g<sup>-1</sup>

[2]

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

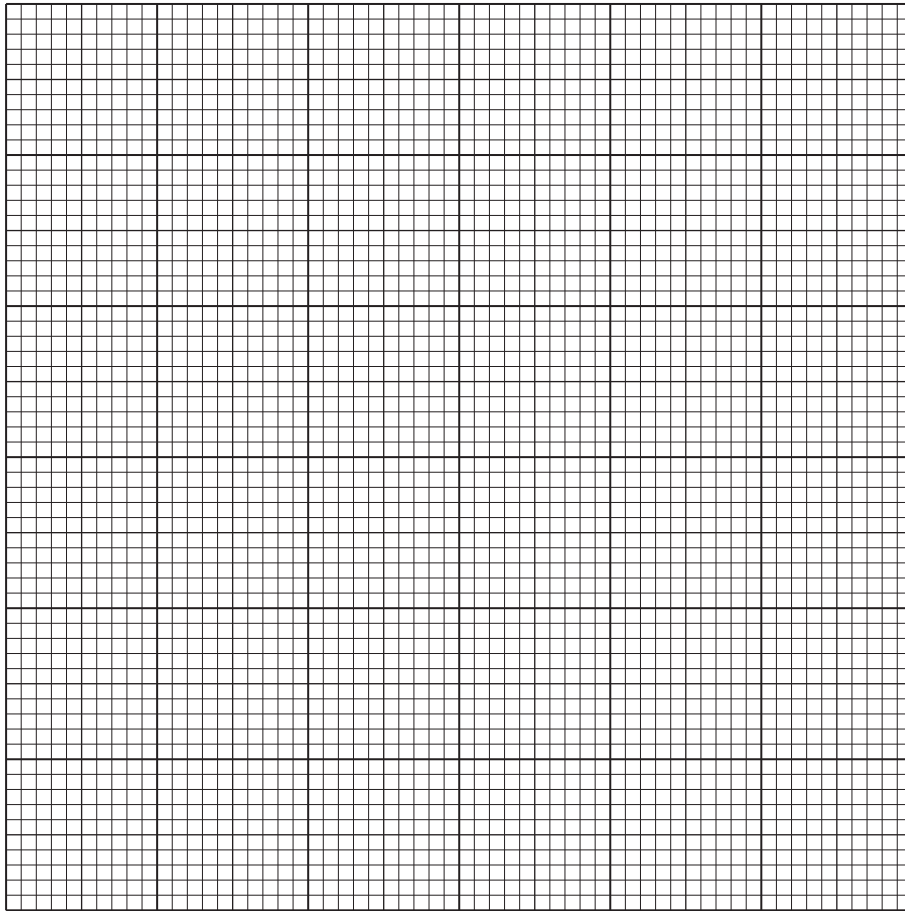
*For  
Examiner's  
Use*

**Table 1.2**

food substance	mass of food burnt /g	starting temperature / °C	final temperature / °C	rise in temperature / °C	energy content / kJ g <sup>-1</sup>
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).

For  
Examiner's  
Use



- (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.

.....  
 .....  
 ..... [3]

[Total : 19 marks]

- 2 Fig. 2.1 shows a young bean seedling which had been grown in the dark and then placed horizontally on the surface of some damp soil.

For  
Examiner's  
Use

The seedling was kept well watered and exposed to the light for 2 days.  
Fig. 2.2 shows the seedling after 2 days.

Fig. 2.1

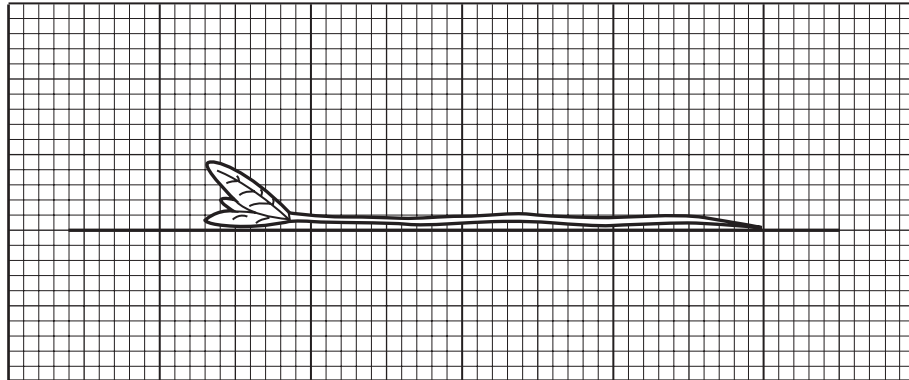
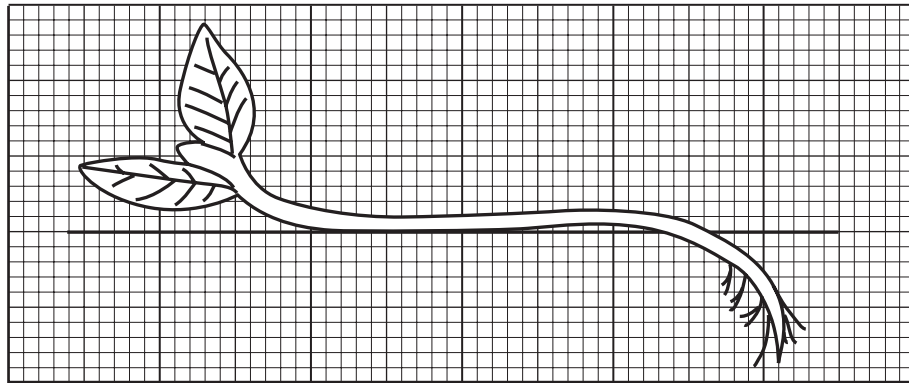


Fig. 2.2



- (a) Describe the changes in appearance of the shoot and the root of the seedling after 2 days.

(i) shoot .....  
 .....  
 ..... [2]

(ii) root .....  
 .....  
 ..... [2]



- (b) Describe the processes involved in the changes of directional growth of the shoot of the seedling.

*For  
Examiner's  
Use*

.....

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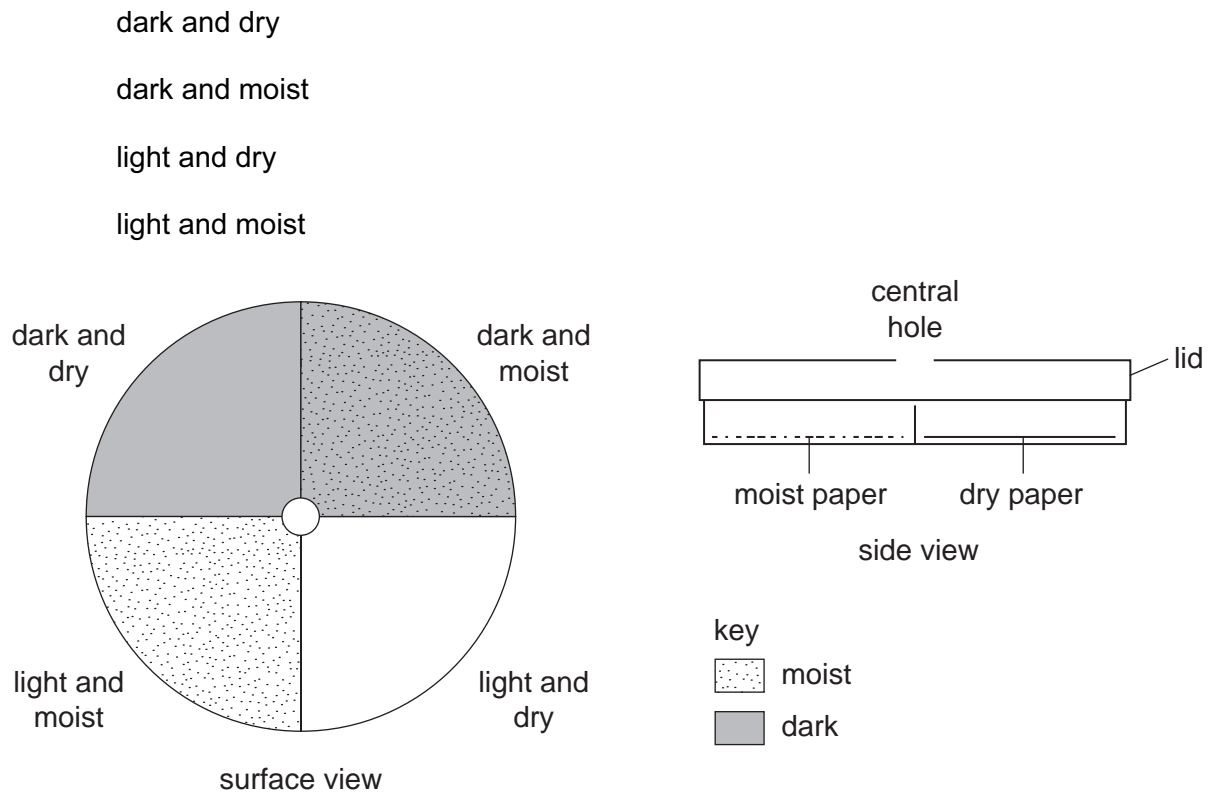
.....

..... [6]

[Total : 10]

3 Fig 3.1 shows a choice chamber.

- This apparatus can be used to study the behaviour of small invertebrates, such as woodlice, in different conditions.
- 60 woodlice were introduced through the central hole.
- The four sections of the choice chamber had different conditions as shown in Fig. 3.1.



**Fig. 3.1**

- The choice chamber was left undisturbed for 10 minutes.
- The numbers of woodlice in each section were counted.
- The numbers were recorded in Table 3.1.
- These woodlice were released into their natural environment.
- The investigation was repeated with three more samples of woodlice.

(a) (i)

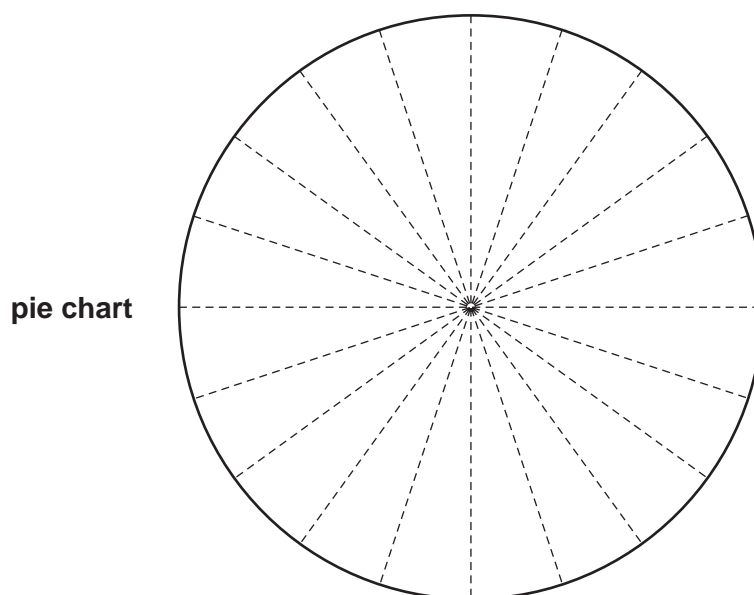
Table 3.1

sample of woodlice	dark and dry	dark and moist	light and dry	light and moist
1st	8	47	1	4
2nd	4	56	0	0
3rd	5	52	1	2
4th	7	49	2	2
total	.....	204	.....	8
average	.....	51	.....	2

Complete Table 3.1. The calculations for the moist sections have been completed for you.

[2]

(ii) Plot the average number of woodlice in each condition on the **pie chart** below.



[3]

(b) (i) State which conditions the woodlice prefer.

..... [1]

(ii) Suggest how this behaviour might help the woodlice to survive in their natural habitat.

.....

.....

..... [2]

(c) Suggest how you could improve this investigation to make the results more reliable.

.....

.....

.....

.....

.....

..... [3]

[Total 11]

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*Copyright Acknowledgements:*

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Question 1      Fig. 1.2 © A. King; *Agriculture: An Introduction for Southern Africa*; Cambridge University Press; 1985.

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