MAGNIFICATION

1 The pea plant, *Pisum sativum*, is a legume which is grown both as a human food and as livestock feed.

Fig. 6.1 shows some of the root nodules on a pea plant.

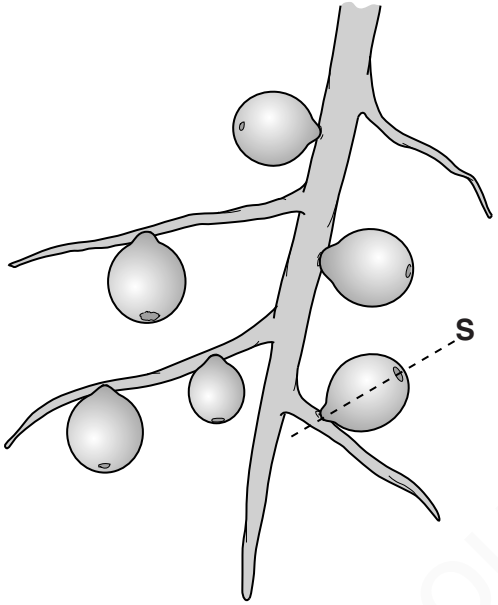


Fig. 6.1

Fig. 6.2 shows a cross-section through the root nodule at **S** on Fig. 6.1.

T indicates the transport tissue in the root.

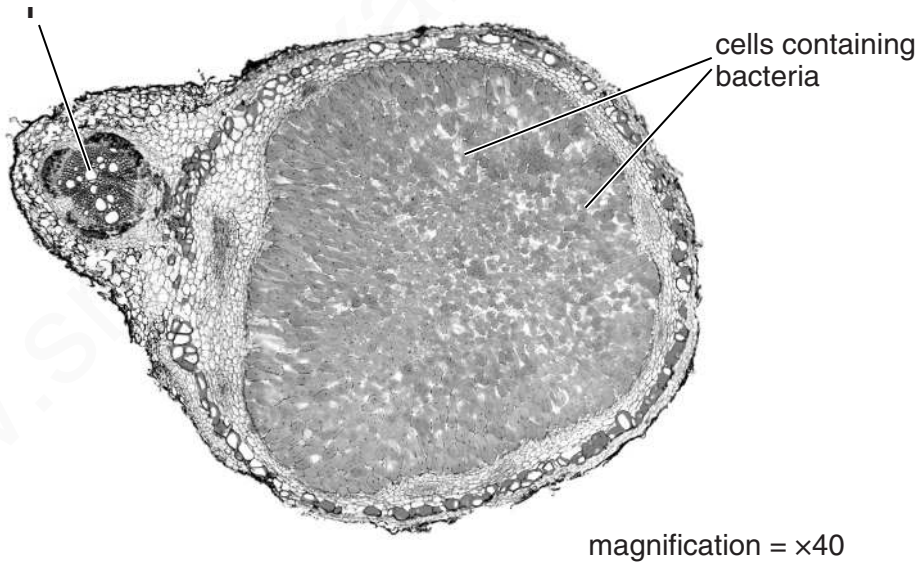


Fig. 6.2

(a) The maximum diameter of the root nodule in Fig. 6.2 is 73 mm.

Calculate the actual diameter of the root nodule.

actual diameter ..... [1]

MARKING SCHEME:

	1.8 / 1.83 / 1.825, mm ;	[1]	

2 **(a)** Fig. 6.2 is a diagram of a human sperm cell.

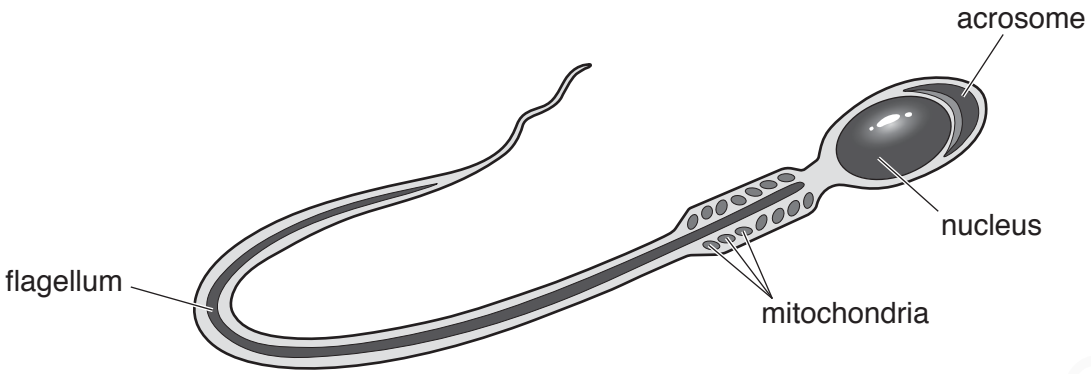


Fig. 6.2

(i) Write the formula that would be used to calculate the magnification of the diagram.

[1]

(ii) The actual length of the sperm cell in Fig. 6.2 is 0.055 mm.

Convert this value to micrometres (μm).

Space for working.

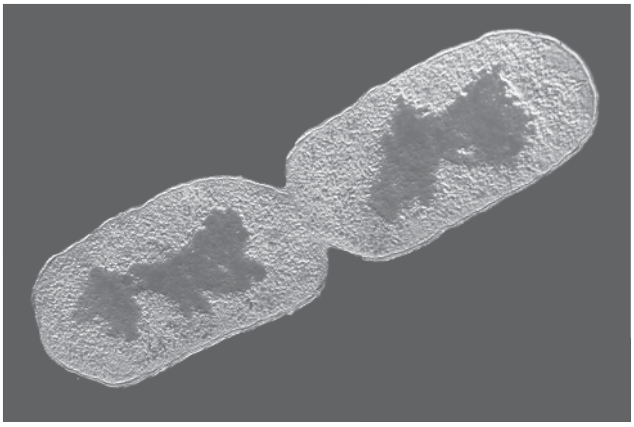
..... μm [1]

MARKING SCHEME:

(i)	image size ÷ actual size ;	**1**	
(ii)	55 (μm) ;	**1**	

3 Bacteria are useful in biotechnology and genetic engineering.

Fig. 6.1 shows a photomicrograph of a bacterium.



magnification ×27 000

Fig. 6.1

(a) State the name of the process that is taking place in Fig. 6.1.

..... [1]

(b) **(i)** Write the formula that would be used to calculate the actual width of the bacterium.

[1]

(ii) The actual width of the bacterium is 0.0008 mm.

Convert this value to micrometres (μm).

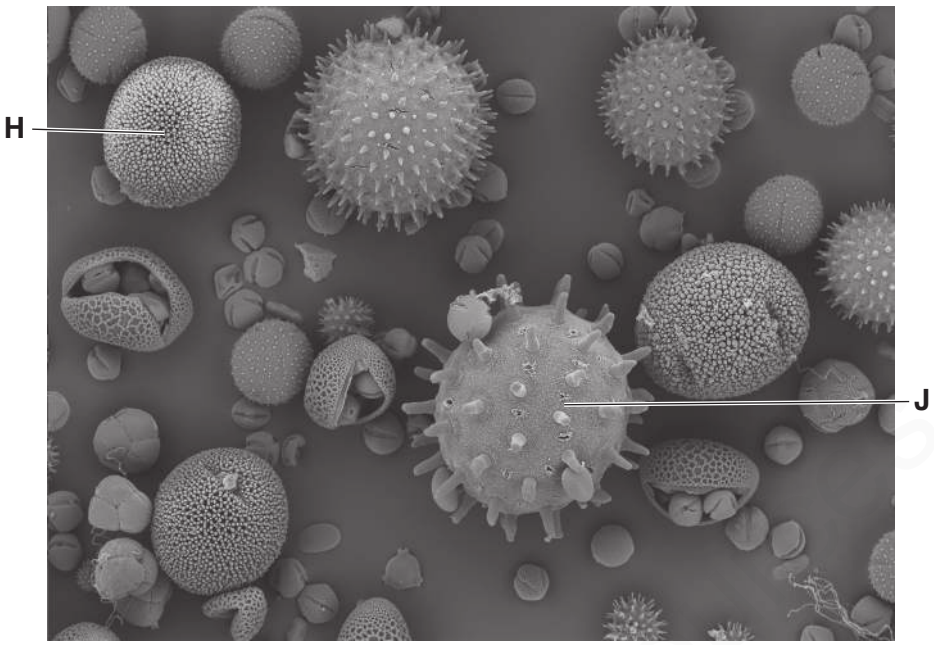
Space for working.

..... μm [1]

MARKING SCHEME:

(a)	(asexual) reproduction ;	**1**	**R** sexual reproduction
(b)(i)	image size ÷ magnification ;	**1**	
(b)(ii)	0.8 (µm) ;	**1**	

4 Fig. 6.2 is a scanning electron micrograph of some pollen grains from wind-pollinated flowers and insect-pollinated flowers.



magnification ×220

Fig. 6.2

(i) Write the formula that would be used to calculate the actual diameter of pollen grain **H**.

[1]

(ii) The actual diameter of pollen grain **H** is 0.082 mm.

Convert this value to micrometres (μm).

Space for working.

..... μm [1]

MARKING SCHEME:

(i)	image size ÷ magnification ;	**1**	
(ii)	82 (μm) ;	**1**	

5 The egg cell is the female gamete. Fig. 5.1 shows an ovum at the time of ovulation. The ovum is surrounded by a 'jelly coat' and many follicle cells.

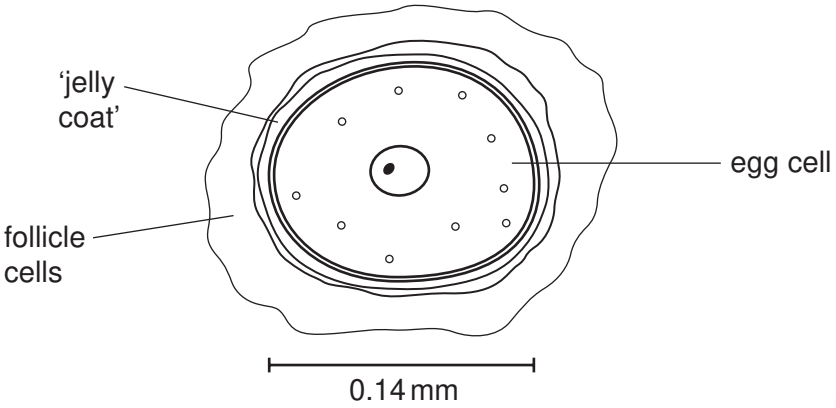


Fig. 5.1

(a) Calculate the magnification of the egg cell as shown in Fig. 5.1.

Show your working and express your answer to the nearest whole number.

..... [2]

MARKING SCHEME:

(a)	$\frac{34/35/36\text{mm}}{0.14}$ answer = (x) 243 to 257 ;;	[2]	