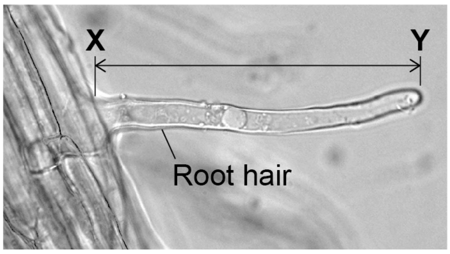
0 5 **Figure 8** shows a root hair viewed using a microscope.

Figure 8



0 5 . 1 The root hair was viewed at a magnification of ×50

The image length of the root hair **X**–**Y** is 43 mm

Calculate the real length of the root hair in micrometres (μm).

[4 marks]

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Real length = ____________________ μm

Do not write outside the box

0 5 . 2 A microscope has a ×5 eyepiece lens.

Describe how to use this microscope to observe a prepared slide of root hair cells at a magnification of ×50

[4 marks]

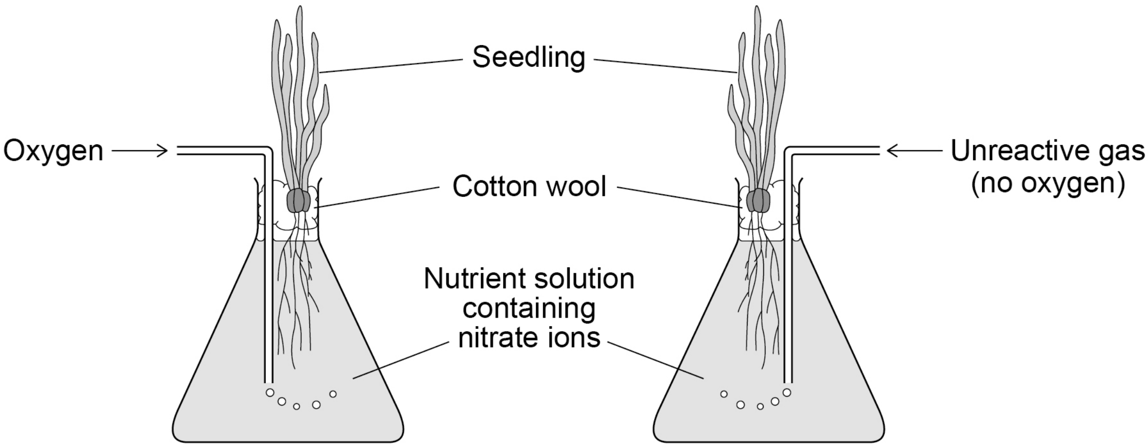
Question 5 continues on the next page

Root hair cells absorb water and mineral ions from the soil.

A scientist investigated the rate of nitrate ion uptake by two seedlings.

Figure 9 shows how the investigation was set up.

Figure 9



The scientist determined the mass of nitrate ions absorbed by each seedling every 30 minutes for 4 hours.

Table 5 shows the results.

Table 5

Time in hours	Total mass of nitrate ions absorbed by seedling in arbitrary units	
	With oxygen added	With no oxygen added
0	0	0
0.5	100	60
1.0	145	95
1.5	170	105
2.0	195	115
2.5	215	120
3.0	235	125
3.5	250	130
4.0	265	130

Do not write outside the box

0 5 . 3 Describe the changes in the rate of absorption of nitrate ions for the seedling with **no** oxygen added.

Use information from **Table 5**.

[3 marks]

0 5 . 4 Explain what the results in **Table 5** show about how nitrate ions are absorbed.

[4 marks]

Question 5 continues on the next page

Do not write outside the box

0 5 . 5 Nitrate ions are essential for plants to grow.

Describe how nitrate ions are used in a plant to help the plant grow.

[3 marks]

18

END OF QUESTIONS

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	$50 = \frac{43}{\text{size of real object}}$	an answer of 860 (µm) scores 4 marks	1	AO1 3×AO2 4.1.1.5
	(size of real object =) $\frac{43}{50}$		1	
	(size of real object =) 0.86 (mm)		1	
	(size of real object =) 860 (µm)	allow correct conversion of their calculated value if no other marks awarded allow 1 mark for $\text{magnification} = \frac{\text{size of image}}{\text{size of real object}}$	1	

Question	Answers	Mark	AO / Spec. Ref.
05.2	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	3–4	AO1 4.1.1.2 AO1
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–2	
	No relevant content	0	
	Indicative content • place slide on stage • use lowest power / ×4 objective lens (initially) • adjust mirror **or** switch light on so light passes through slide • move stage as close to lens as possible • slide must not touch lens • turn focussing knob so slide moves away from lens • turn focussing knob until image comes into focus • use fine focus to get clear image • change objective lens to ×10 • ×5 eyepiece and ×10 objective lenses (gives total magnification of ×50) • refocus slide using focussing knob For Level 2 reference to how to focus the slide / cells **and** achieve magnification of ×50 is required		

05.3	any **three** from: • (rate) fastest in the first 0.5 hours • (rate gradually) decreases after first 0.5 hours **or** (rate gradually) decreases throughout the investigation • rate is constant between 1.0 and 2.0 hours **or** rate is constant between 2.0 and 3.5 hours • (rate) becomes zero between 3.0 and 3.5 hours	allow 'it' for rate allow fastest rate is 120 units per hour (at start) allow mean rate over 3.5 hours is 37.14 units per hour allow (rate) is zero after 3.5 hours	3	AO3 4.1.3.3 4.2.3.2

05.4	more nitrate ions are absorbed in the presence of oxygen	allow nitrate ions absorbed faster in the presence of oxygen	1	AO3
	(which suggests) they are absorbed by active transport / uptake		1	AO2
	which requires energy from respiration	do **not** accept energy produced / created / made	1	AO1
	some nitrate ions absorbed by diffusion **or** some nitrate ions absorbed (by active transport / uptake) requiring energy from anaerobic respiration **or** some nitrate ions absorbed by active transport / uptake using oxygen already dissolved in the solution		1	AO2 4.1.3.3 4.2.3.2

05.5	nitrate ions are used with glucose to form amino acids (which are) used to synthesise proteins (needed for growth)		1 1 1	AO1 4.4.1.3 4.4.2.3
Total			**18**	