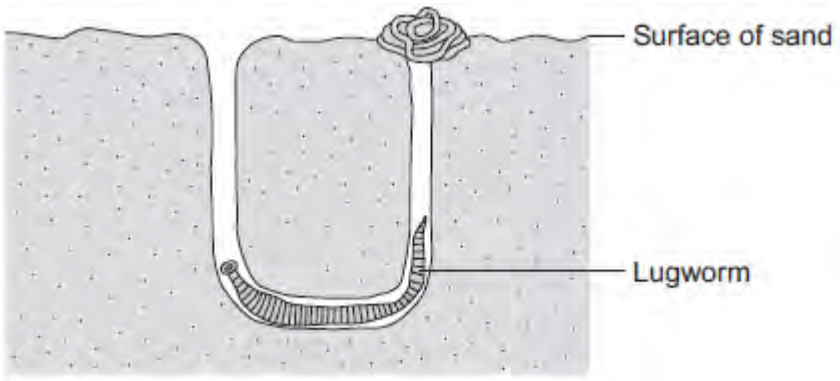
Q1. The lugworm lives in a U-shaped burrow in the sand on the seashore.

The diagram below shows a lugworm in its burrow.



(a) Some scientists investigated the effect of different salt concentrations on lugworms.

The scientists:

- collected 50 lugworms from the seashore
- separated them into five groups of 10 lugworms
- weighed each group of 10 lugworms
- placed each group into a different concentration of salt solution and left them for 8 hours
- took each lugworm out of the solution and placed it on blotting paper for 30 seconds
- re-weighed each group of 10 lugworms.

(i) Why did the scientists use groups of 10 lugworms and not just 1 lugworm at each concentration?

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(1)

(ii) Suggest why the scientists placed each lugworm on blotting paper for 30

seconds before they reweighed the groups of lugworms.

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(1)

(iii) How might the method of blotting have caused errors in the results?

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(1)

(iv) Suggest **one** improvement the scientists could make to their investigation.

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(1)

(b) The table below shows the scientists' results.

Concentration of salt in arbitrary units	**Mass of 10 lugworms at start in grams**	**Mass of 10 lugworms after 8 hours in grams**	**Change in mass in grams**	**Percentage (%) change in mass**
1.0	41.2	61.8	+20.6	+50
2.0	37.5	45.0	+7.5	
3.0	55.0	56.1	+1.1	+2
4.0	46.2	22.2	-24.0	-52
5.0	45.3	22.6	-22.7	-50

(i) The scientists calculated the **percentage** change in mass at each salt concentration.

Why is the **percentage** change in mass more useful than just the change in mass in grams?

Use information from the table in your answer.

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(2)

(ii) Calculate the percentage change in mass for the 10 lugworms in the salt solution with a concentration of 2.0 arbitrary units.

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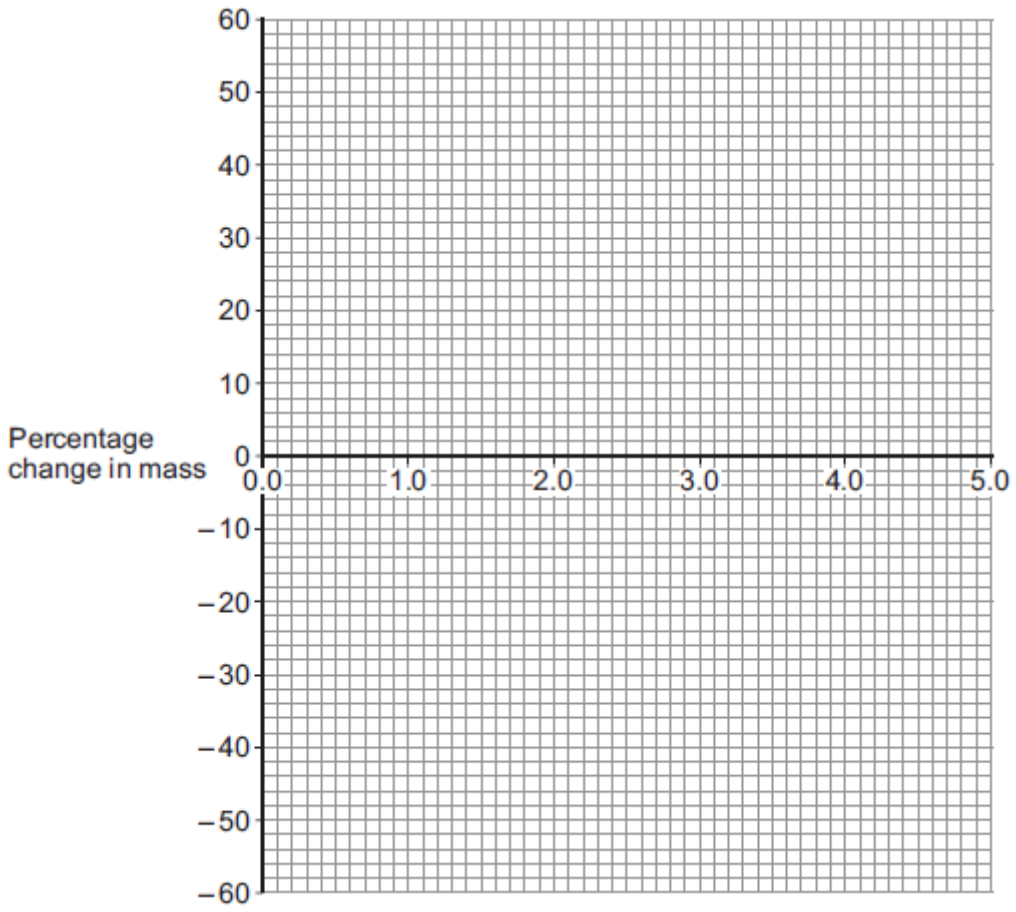
Percentage change in mass = ... %

(2)

(c) (i) On the graph paper below, draw a graph to show the scientists' results:

- plot the **percentage** change in mass
- label the horizontal axis
- draw a line of best fit.



(4)

(ii) The scientists thought one of their results was anomalous.

Draw a ring around the anomalous result on your graph.

(1)

(iii) Suggest what might have happened to cause this anomalous result.

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(1)

(d) (i) What do you think is the concentration of salts in the lugworm's natural environment?

Use information from your graph to give the reason for your answer.

Concentration = ... %

Reason .....

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(2)

(ii) The mass of the lugworms decreased in the salt solution with a concentration of 5.0 arbitrary units.

Explain what caused this.

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(3)
(Total 19 marks)

Q2. Plants transport water and mineral ions from the roots to the leaves.

(a) Plants move mineral ions:

- from a low concentration in the soil
- to a high concentration in the root cells.

What process do plants use to move these minerals ions into root cells?

Tick **one** box.

Active transport ☐

Diffusion ☐

Evaporation ☐

Osmosis ☐

(1)

(b) Describe how water moves from roots to the leaves.

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(2)

(c) Plants lose water through the stomata in the leaves.

The epidermis can be peeled from a leaf.

The stomata can be seen using a light microscope.

The table below shows the data a student collected from five areas on one leaf.

Leaf area	Number of stomata	
	Upper surface	Lower surface

1	3	44
2	0	41
3	1	40
4	5	42
5	1	39
Mean	**2**	**X**

Describe how the student might have collected the data.

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(3)

(d) What is the median number of stomata on the upper surface of the leaf?

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(1)

(e) Calculate the value of **X** in the table.

Give your answer to 2 significant figures.

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Mean number of stomata on lower surface of leaf = ...

(2)

(f) The plant used in this investigation has very few stomata on the upper surface of the leaf.

Explain why this is an **advantage** to the plant.

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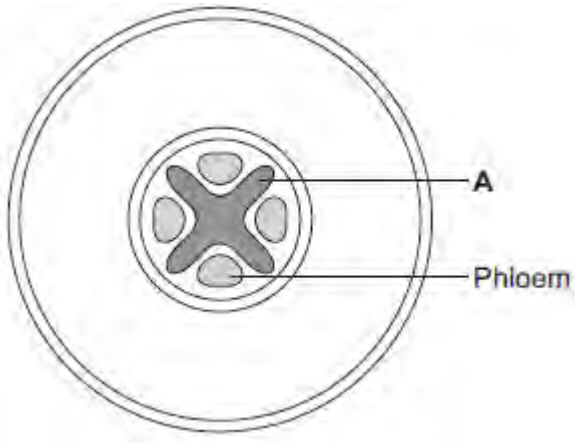
(2)
(Total 11 marks)

Q3. The diagram below shows a cross-section of a plant root. The transport tissues are labelled.



(a) (i) What is tissue **A**?

Draw a ring around the correct answer.

cuticle **epidermis** **xylem**

(1)

(ii) Name **two** substances transported by tissue **A**.

1 .....

2 .....

(2)

(b) Phloem is involved in a process called translocation.

(i) What is translocation?

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(1)

(ii) Explain why translocation is important to plants.

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(2)

(c) Plants must use active transport to move some substances from the soil into root hair cells.

(i) Active transport needs energy.

Which part of the cell releases most of this energy?

Tick (✓) **one** box.

mitochondria ☐

nucleus ☐

ribosome ☐

(1)

(ii) Explain why active transport is necessary in root hair cells.

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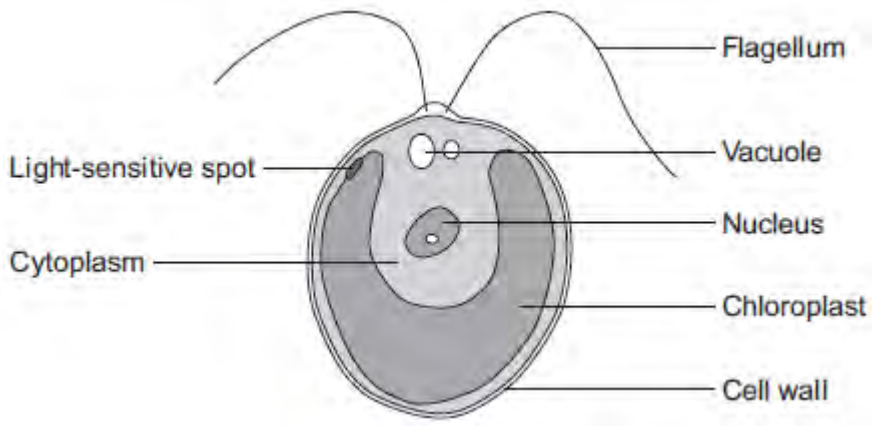
(2)
(Total 9 marks)

Q4. The diagram below shows a single-celled alga which lives in fresh water.



(a) Which part of the cell labelled above:

(i) traps light for photosynthesis

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(1)

(ii) is made of cellulose?

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(1)

(b) In the freshwater environment water enters the algal cell.

(i) What is the name of the process by which water moves into cells?

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(1)

(ii) Give the reason why the algal cell does not burst.

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(1)

(c) (i) The alga can photosynthesise.

Complete the **word** equation for photosynthesis.

water + ... $\xrightarrow{\text{Light energy}}$ ..... + oxygen

(2)

(ii) The flagellum helps the cell to move through water. Scientists think that the flagellum and the light-sensitive spot work together to increase photosynthesis.

Suggest how this might happen.

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(2)

(d) Multicellular organisms often have complex structures, such as lungs, for gas exchange.

Explain why single-celled organisms, like algae, do **not** need complex structures for gas exchange.

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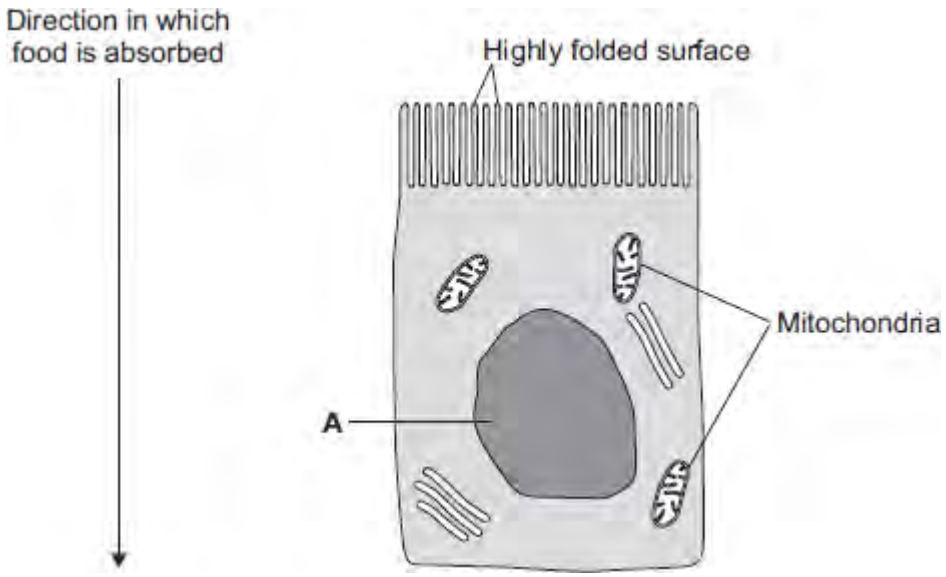
(3)

(Total 11 marks)

Q5. The image below shows an epithelial cell from the lining of the small intestine.



(a) (i) In the image above, the part of the cell labelled **A** contains chromosomes.

What is the name of part **A**?

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(1)

(ii) How are most soluble food molecules absorbed into the epithelial cells of the small intestine?

Draw a ring around the correct answer.

diffusion **osmosis** **respiration**

(1)

(b) Suggest how the highly folded cell surface helps the epithelial cell to absorb soluble food.

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(1)

(c) Epithelial cells also carry out active transport.

(i) Name **one** food molecule absorbed into epithelial cells by active transport.

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(1)

(ii) Why is it necessary to absorb some food molecules by active transport?

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(1)

(ii) Suggest why epithelial cells have many mitochondria.

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(2)

(d) Some plants also carry out active transport.

Give **one** substance that plants absorb by active transport.

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(1)

(Total 8 marks)