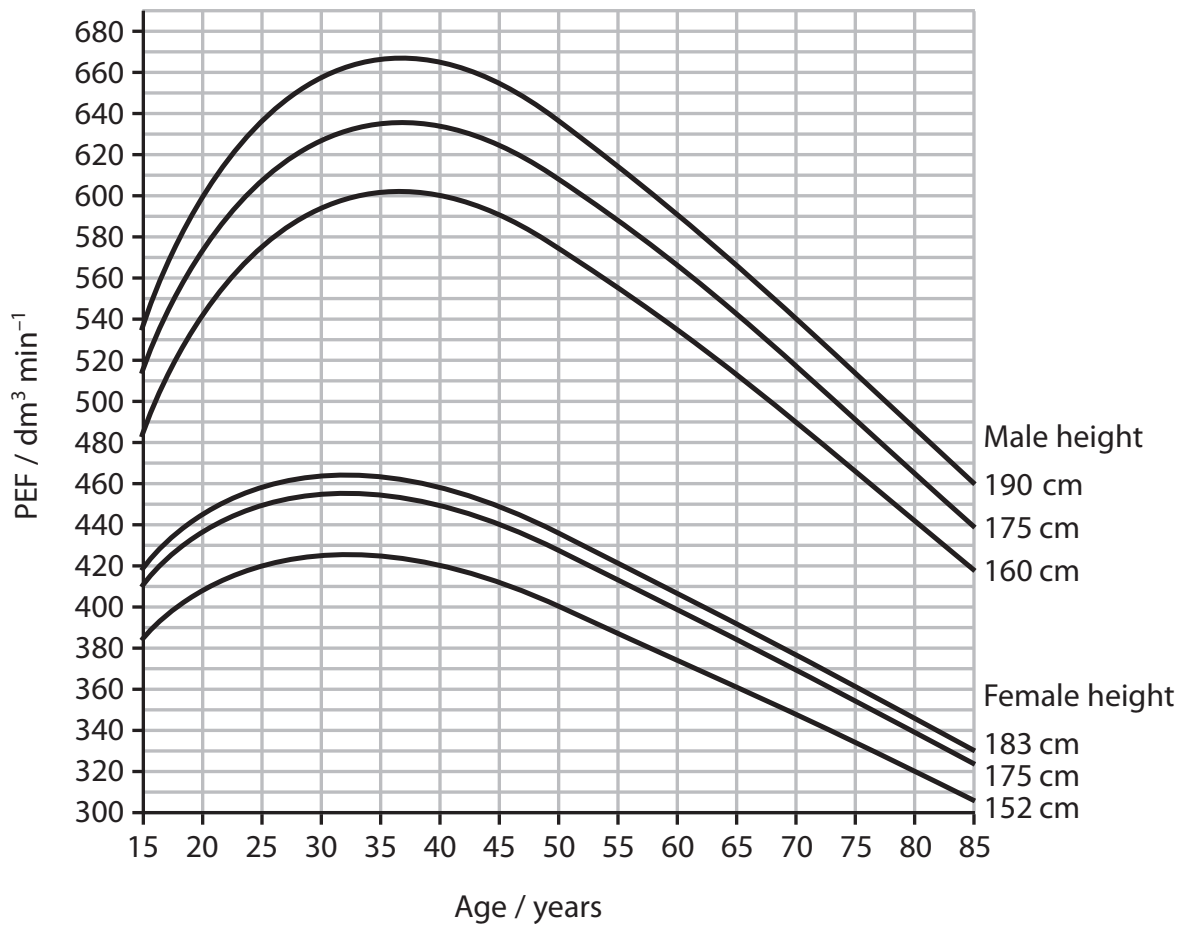




- (b) The peak expiratory flow (PEF) is a measure of how fast a person can breathe out. This can indicate any obstruction in the airways of the lungs. It is measured using a peak flow meter.

The graph below shows the expected PEF values for people aged 15 to 85 years of various heights.



- (i) Using the information in the graph, describe the effect of age on PEF.

(4)

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- (ii) Using the information in the graph, give one reason for the difference in PEF values between ages 35 years and 85 years.

(1)

- (iii) If a person with asthma has a PEF 30% below the expected value, it may indicate that their asthma is not under control.

A 52-year old man with asthma has a PEF reading of  $350 \text{ dm}^3 \text{ min}^{-1}$ .

Using the information in the graph, state whether or not his asthma is being kept under control. Give a reason for your answer.

(2)

- (iv) Give one other piece of information that is needed before an accurate diagnosis of his asthma can be made.

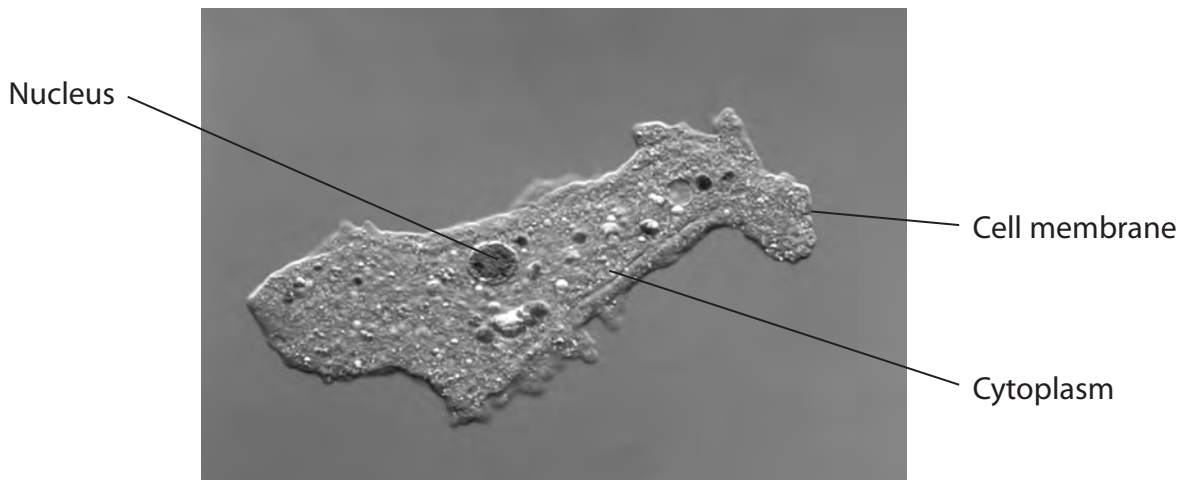
(1)

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**(Total for Question 1 = 14 marks)**

- 2 An amoeba is a single-celled organism that lives in water. Gas exchange in an amoeba occurs between the water and the cytoplasm.

The photograph below shows an amoeba, as seen using a microscope.



Magnification x800

Dr Jeremy Burgess / Science Photo Library

- \*(a) Using the information shown in the photograph and your own knowledge, suggest how gas exchange occurs in an amoeba.

(4)

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(b) Suggest how oxygen passes from the cell membrane into the centre of an amoeba.

(2)

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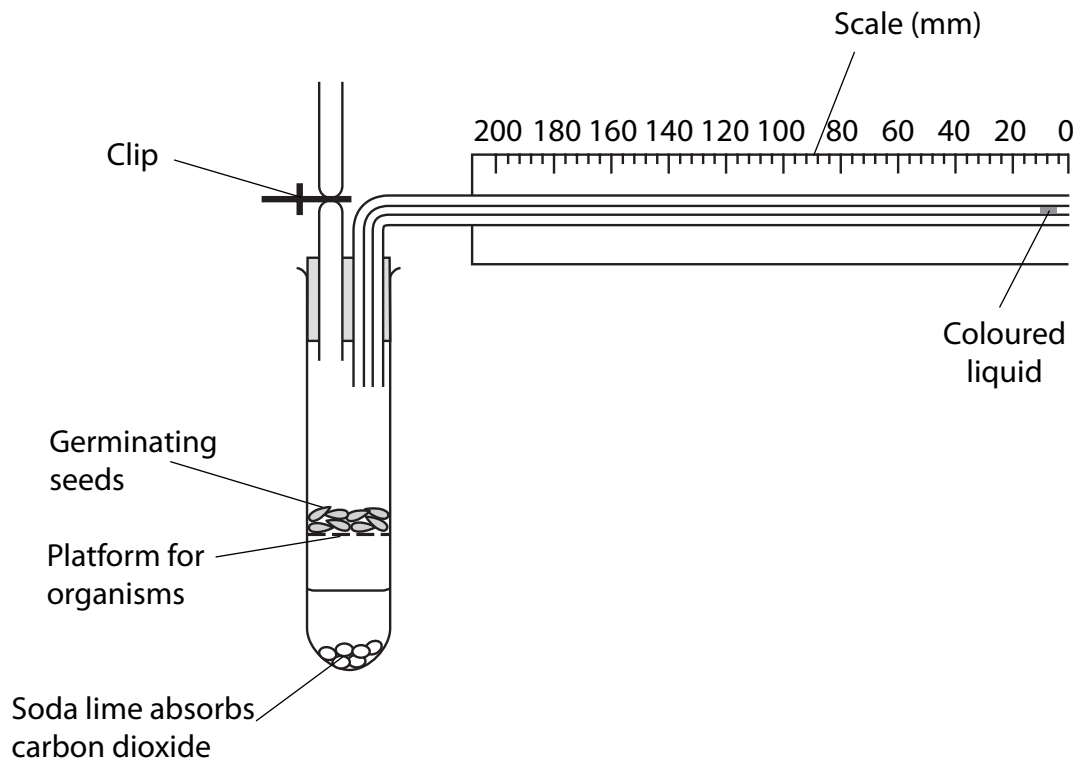
**(Total for Question 2 = 6 marks)**

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3 The apparatus shown in the diagram below was used to measure the rate of respiration of germinating seeds in air. The distance moved by the coloured liquid was measured at 15-minute intervals for one hour.

This was repeated with the air replaced by nitrogen gas.

The rate of respiration of small insects in air was measured using the same apparatus.



(a) Suggest reasons for absorbing carbon dioxide in this apparatus.

(2)

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(b) The table below shows results recorded by a student using this apparatus.

Organism	Distance moved by liquid in 15-minute intervals / mm				Mean rate of respiration / mm min <sup>-1</sup>
Germinating seeds	7	6	5	6	0.4
Germinating seeds in nitrogen gas	0	0	0	0	0
Insects	12	11	13	12	

- (i) In the space below, calculate the mean rate of respiration for the insects, expressed as movement of liquid in millimetres per minute. Show your working.

(2)

Answer ..... mm min<sup>-1</sup>

- (ii) The seeds in the experiment with nitrogen gas continued to germinate. Suggest an explanation for the lack of movement of the liquid.

(2)

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- (iii) Suggest **two** reasons why a valid comparison cannot be made between the mean rates of respiration of the germinating seeds in air and the insects. For each reason, suggest a modification that would allow a valid comparison.

(4)

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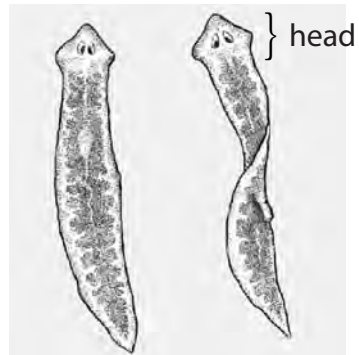
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**(Total for Question 3 = 10 marks)**



- 4 Some species of flatworm are found in freshwater streams. Flatworms obtain oxygen from the water through the surface of their bodies. The diagram below shows the structure of flatworms.



Flatworms

Magnification  $\times 10$

- (a) Using the diagram and your knowledge of gas exchange surfaces, explain how the structure of a flatworm is adapted to obtain oxygen from the water.

(2)

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(b) The table below shows the relationship between the temperature of water and the solubility of oxygen in water.

<b>Temperature of water / °C</b>	<b>Solubility of oxygen in water / mg dm<sup>-3</sup></b>
0	14.6
5	12.8
10	11.3
15	10.2
20	9.2
25	8.6
30	7.5
35	6.9
40	6.4

(i) Describe the relationship between the temperature of the water and the solubility of oxygen in water.

(2)

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