1 Pesticides can be used to kill pests, such as insects, that damage plants.

(a) Some pesticides are dissolved in water and can be poured onto soil. They are absorbed by plant roots and transported to the leaves to kill insects feeding there.

These pesticides move through plants more quickly on warm sunny days.

Use this information to suggest what part of the plant transports these pesticides to the leaves, and why this happens more quickly on warm sunny days.



The quality of written communication will be assessed in your answer to this question.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[6]**

(b) Some pesticides are persistent.

(i) What does **persistent** mean?

.....

..... **[1]**

(ii) Describe **one** disadvantage of pesticides being persistent.

.....

..... **[1]**

2 (a) Look at the table about some different animals.

It shows the mean (average) mass, heart rate and life span.

It also shows the mean (average) number of heart beats in a life time, in billions.

(1 billion = 1 thousand million.)

Animal	Mass in g	Heart rate per minute	Life span in years	Life time heart beats in billions
hamster	60	450	3	0.7
chicken	1500	275	15	2.2
cat	2000	150	15	1.2
pig	150000	70	25	0.9
horse	1200000	44	40	0.9
whale	120000000	20	80	0.8

(i) Look at the information in the table.

What patterns can you see between mass, heart rate and life span?

.....

.....

.....

..... **[2]**

(ii) The 'heart beat hypothesis' states that:

'every animal has a similar number of heart beats in its life time'.

Discuss whether or not the information in the table supports the 'heart beat hypothesis'.

.....

.....

.....

..... **[2]**

(iii) This table shows data for humans.

Animals	Mass in g	Heart rate per minute	Life span in years	Life time heart beats in billions
human	90 000	60	70	2.2

Do humans fit the patterns shown by the other animals?

Explain your answer.

.....

.....

.....

..... **[2]**

(b) Scientists have made a four-year study of over 31 000 heart disease patients from around the world.

The scientists compared patients with high rates (greater than 78 beats per minute) with patients with low heart rates (58 or fewer beats per minute).

They found that the patients with high heart rates had:

- a 39% greater chance of having a heart attack
- a 77% greater chance of dying from a heart attack.

(i) This study will be important for doctors.

Explain why.

.....

.....

.....

..... **[2]**

(ii) Describe any limitations in the data.

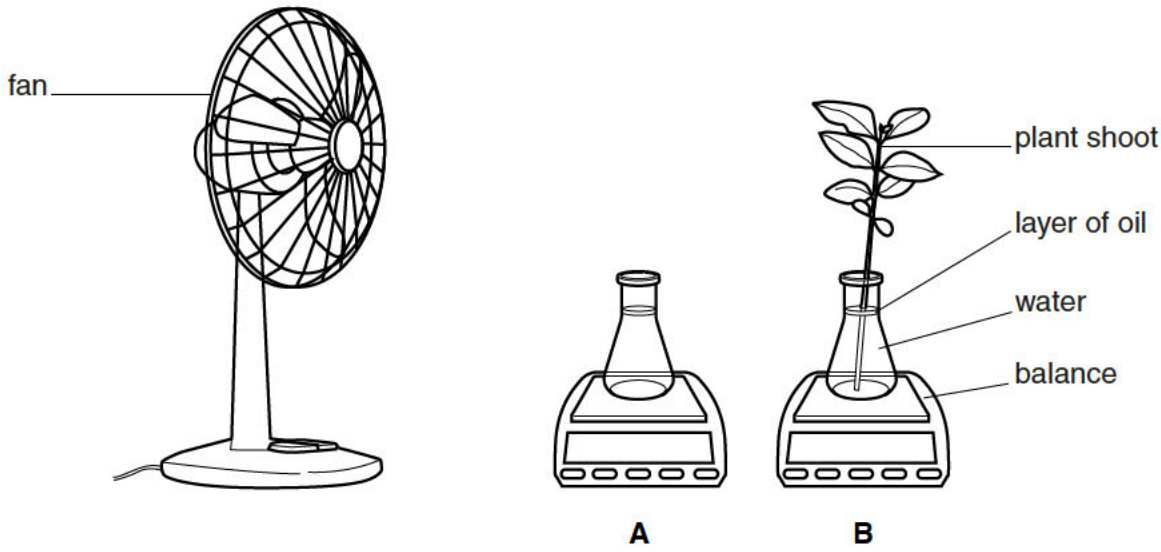
.....

.....

.....

..... **[2]**

3 Liz wants to investigate how air movement affects the rate of transpiration.



She turns the fan on and measures how the readings on the balances change every five minutes.

Describe and explain the overall expected results for **A** and **B**.

The quality of written communication will be assessed in your answer to this question.

.....

.....

.....

.....

.....

.....

.....

.....

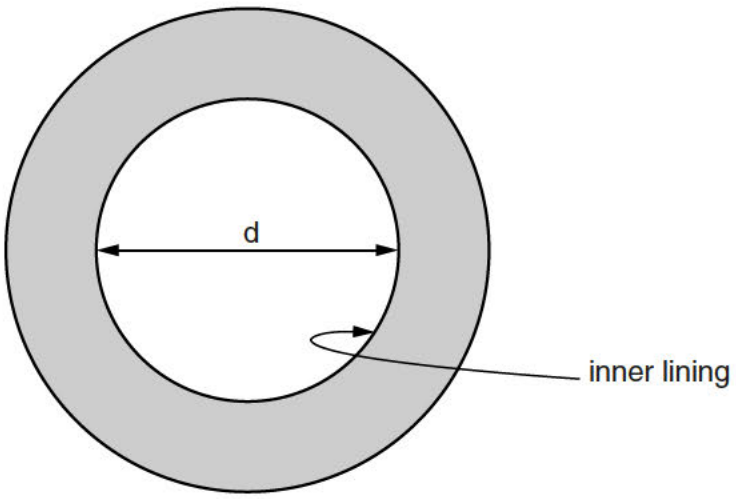
.....

..... **[6]**

[Total: 6]

4 **(a** The diagram represents a section through the human small intestine.

The magnification of the diagram is ×4.



(i) Use the diagram to find out the actual diameter (d) in a real section.

diameter = ... cm **[1]**

(ii) The length (l) of a human's small intestine is 550 cm.

Work out the total surface area of the inner lining.

Assume the lining is a smooth cylinder.

Use the formula: area = $\pi \times d \times l$

($\pi = 3.14$)

surface area = ... cm^2 **[2]**

(iii) The actual surface area of a human's small intestine is always much greater than the answer produced using the formula in **(a)(ii)**.

Explain why.

.....

.....

..... **[2]**

(b) Scientists have measured the actual surface area in the small intestine of rats.

They measured the surface area in non-pregnant female rats.

They also measured the surface area in female rats that were feeding their young on breast milk.

The table shows their results.

	Average length of small intestine in cm	**Average actual surface area of lining in cm^2**
Non-pregnant rats	100	570
Breast-feeding rats	100	970

Suggest an explanation for the scientists' results.

.....

.....

.....

..... **[2]**

[Total: 7]