# The challenges of size

## **Question Paper**

Level	GCSE
Subject	Biology (Gateway Science)
Exam Board	OCR
Topic	Scalling Up
Sub-Topic	The challenges of size
Booklet	Question Paper

Time Allowed: 38 minutes

Score: /31

Percentage: /100

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- 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.

	Ø	The quality of written communication will be assessed in your answer to this question
		[6
(b)	Son	ne pesticides are persistent.
	(i)	What does persistent mean?
		[1
	(ii)	Describe <b>one</b> disadvantage of pesticides being persistent.
		[1

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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.)

(i) Look at the information in the table.

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	1 500	275	15	2.2
cat	2000	150	15	1.2
pig	150 000	70	25	0.9
horse	1200000	44	40	0.9
whale	120 000 000	20	80	0.8

.....[2]

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Do humans fit the patterns shown by the other animals?

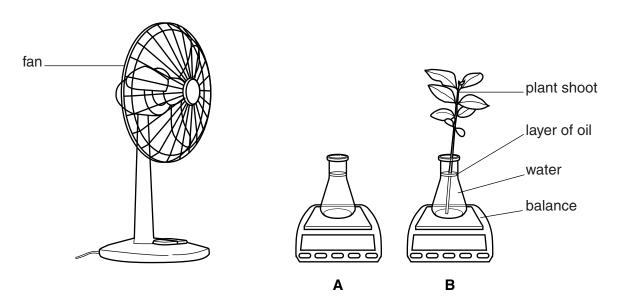
(iii) This table shows data for humans.

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

		Explain your answer.
(b)	Scie worl	entists have made a four-year study of over 31 000 heart disease patients from around the d.
		scientists compared patients with high rates (greater than 78 beats per minute) with ents with low heart rates (58 or fewer beats per minute).
	The	y 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]

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



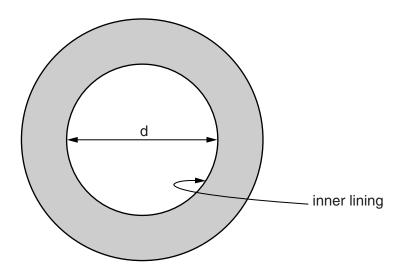
She turns the fan on and measures how the readings on the balances change every five minutes. Describe and explain the overall expected results for **A** and **B**.

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  $\times 4$ .



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

(ii) The length (I) 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 =  $\pi \times d \times I$ 

$$(\pi = 3.14)$$

Explain why.

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).

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(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 <sup>2</sup>
Non-pregnant rats	100	570
Breast-feeding rats	100	970

ggest an explanation for the scientists' results.
[2

[Total: 7]