

Q1.

Homeostasis regulates the internal conditions of the human body.

(a) Which **two** processes are regulated by homeostasis?

Tick (✓) **two** boxes.

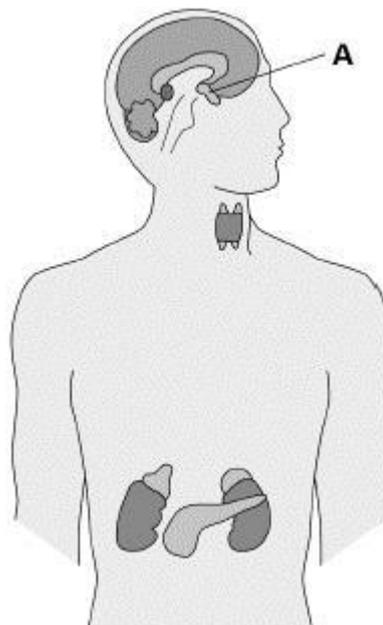
Controlling water output in urine	<input type="checkbox"/>
Defending the body against pathogens	<input type="checkbox"/>
How quickly you walk	<input type="checkbox"/>
Keeping cool on a hot day	<input type="checkbox"/>
Waking up in the morning	<input type="checkbox"/>

(2)

Hormones are produced by glands in the endocrine system.

Each hormone has an effect on a target organ.

The diagram below shows glands of the endocrine system.



(b) What is the name of gland **A**?

Tick (✓) **one** box.

Pancreas	<input type="checkbox"/>
Pituitary	<input type="checkbox"/>
Thyroid	<input type="checkbox"/>

(1)

Before eating a sugar-coated cereal a person had a blood glucose concentration of 5.2 mmol/dm³

Soon after eating the cereal the person had a blood glucose concentration of 8.4 mmol/dm³

(c) Calculate the increase in the blood glucose concentration.

Increase = _____ mmol/dm³

(1)

(d) The person needed medication to decrease their blood glucose concentration.

Suggest what disorder the person has.

(1)

(e) There is a problem with the hormone control of the person.

What is the problem?

Tick (✓) **one** box.

The blood is not taking hormones to target organs.	<input type="checkbox"/>
The pancreas is not releasing insulin.	<input type="checkbox"/>
The pituitary gland is not being stimulated.	<input type="checkbox"/>

(1)

(f) The person:

- works in an office
- drives to work
- is overweight
- watches the television and reads every night
- drinks a hot chocolate every night.

Suggest **two** lifestyle changes the person could make to help treat their disorder.

1. _____

2. _____

(2)

(Total 8 marks)

Q2.

The diagram below shows a food chain.

Algae → Crab → Loggerhead turtle → Shark

(a) Draw **one** line from each description to the organism in the food chain.

Description		Organism in the food chain
		Algae
Primary consumer		
		Crab
Producer		
		Shark
Tertiary consumer		
		Loggerhead turtle

(3)

(b) Which word describes the total number of crabs in this habitat?

Tick (✓) **one** box.

Population	<input type="checkbox"/>
Predator	<input type="checkbox"/>
Species	<input type="checkbox"/>

(1)

(c) Explain what will happen to the number of loggerhead turtles if there are fewer crabs.

Use information from the food chain above.

(2)

(d) What type of factor is a new predator?

Tick (✓) **one** box.

Abiotic	<input type="checkbox"/>
Biotic	<input type="checkbox"/>
Control	<input type="checkbox"/>

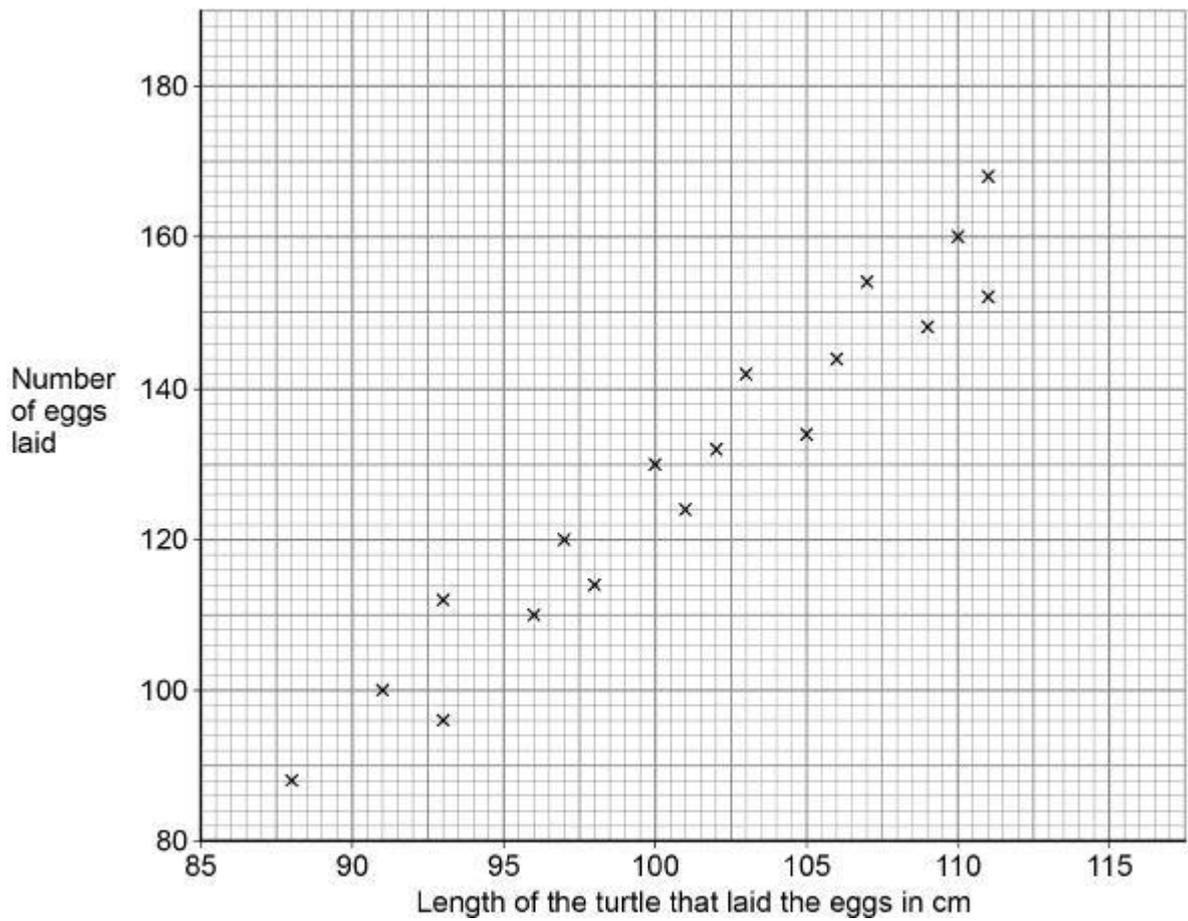
(1)

Female loggerhead turtles lay their eggs on sandy beaches.

(e) Scientists recorded data about turtles on one beach.

The graph below shows:

- the number of eggs each turtle laid
- the length of the turtle that laid the eggs.



Describe the trend in the data on the graph above.

(1)

(f) Female loggerhead turtles return to the same beach each year to lay their eggs.

Global warming is causing the sea level to rise.

Explain the effect that sea levels rising might have on the number of loggerhead turtles.

(2)

Greenhouse gases are one cause of global warming.

(g) Methane is a greenhouse gas.

The concentration of methane in the atmosphere was:

- 720 arbitrary units in 1840
- 1872 arbitrary units in 2018.

How many times greater was the concentration of methane in the atmosphere in 2018 than in 1840?

Number of times greater = _____

(1)

- (h) Which **two** human activities cause an increase in greenhouse gases in the atmosphere?

Tick (✓) **two** boxes.

Burning wood on a fire	<input type="checkbox"/>
Planting trees in new areas	<input type="checkbox"/>
Switching off lights in the home	<input type="checkbox"/>
Travelling by aeroplane	<input type="checkbox"/>
Using wind turbines to generate electricity	<input type="checkbox"/>

(2)

(Total 13 marks)

Q3.

A class of eight students measured the population of water fleas living at the edge of a large pond.

This is the method each student used.

1. Put some pond water in a white tray.
2. Take a pond net and scoop at the edge of the pond a few times.
3. Empty the pond net into the water in the tray.
4. Count the number of water fleas in the tray.

The photograph below shows a student working.



(a) The students did **not** control some variables.

Give **two** variables the students should have controlled to make this a valid method.

1. _____

2. _____

(2)

The eight students then used a different method to obtain valid results.

Table 1 shows their results.

Table 1

Student	Number of water fleas per 1000 cm ³ pond water
A	66
B	37
C	51
D	102
E	40
F	122
G	75
H	19

(b) Calculate the students' mean value for the population of water fleas at the edge of

the pond.

Mean population = _____ water fleas per 1000 cm³ pond water (1)

(c) What was the range of the students' results?

Range = _____ (1)

(d) Suggest **one** reason why such a wide range of results was found.

(1)

(e) The teacher then sampled the centre of the pond eight times.

His mean value was 12 water fleas per 1000 cm³ pond water.

What conclusion can you make about the distribution of water fleas in the pond?

Use the students' mean value from part (b) to compare with the teacher's mean value.

(1)

Scientists counted some different invertebrates living in a pond in 2014 and in 2016

Table 2 shows the results.

Table 2

Invertebrate species	Number of invertebrates	
	2014	2016
Bloodworms	13	48
Freshwater shrimps	24	9
Mayfly nymphs	32	0
Water snails	19	24

(f) Calculate the change in the number of bloodworms between 2014 and 2016

Change = _____ bloodworms

(1)

- (g) Calculate the number of shrimps in the pond in 2016 as a percentage of the number of shrimps in the pond in 2014

Percentage = _____ %

(1)

- (h) Invertebrate species found in a pond can be used as an indicator of the pollution level.

Table 3 shows which species can survive in different levels of pollution.

Table 3

Invertebrate species	Pollution level		
	Low	Medium	High
Bloodworms	✓	✓	✓
Freshwater shrimps	✓	✓	✗
Mayfly nymphs	✓	✗	✗
Water snails	✓	✓	✓

Key

✓ = Can survive

✗ = Cannot survive

What conclusion can you make about the change in the level of pollution in the pond between 2014 and 2016?

Give **one** reason for your conclusion.

Use the data in **Table 2** and **Table 3**

(2)

- (i) Water pollution and global warming are two problems that have been caused by the rapid increase of the human population.

Suggest **two** other problems caused by the rapid increase of the human population.

1. _____

2. _____

(2)
(Total 12 marks)

Q4.

Many biotic and abiotic factors can affect the growth of plants.

- (a) Are the factors in **Table 1** biotic or abiotic?

Tick **one** box for each factor.

Table 1

Factor	Biotic	Abiotic
Diseases		
Herbivores		
Temperature		
Water		

(2)

Two students investigated the effect of light intensity on the distribution of small plants.

The plants are growing under a tree in a park.

The students made the following hypothesis:

‘As you move outwards from a tree there will be more plant growth.’

- (b) Explain why the students thought their hypothesis would be correct.

(3)

(c) The students used two pieces of equipment.

Give the scientific name of each piece of equipment.

A square frame measuring 0.5 m × 0.5 m _____

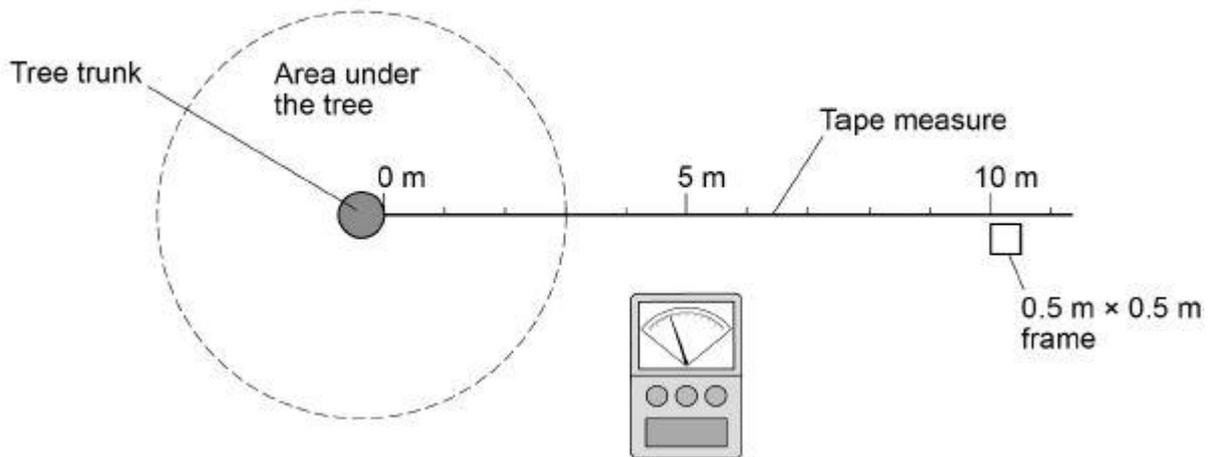
An electronic device to measure light intensity _____

(2)

This is the method used.

1. Fix one end of a tape measure at the base of the tree.
2. Fix the other end of the tape measure 11 metres from the tree.
3. At 0 metres put the square frame on the ground.
4. Identify all the plant species growing inside the frame.
5. Estimate and record the percentage cover of each plant species.
6. Measure the light intensity inside the frame.
7. Put the square frame on the ground every 2 metres along the tape to 10 metres.
8. Repeat steps 4 – 6 in every frame.

The diagram below shows the equipment in this investigation.



(d) Calculate the total area sampled.

Total area sampled = _____ m²

(1)

(e) The whole investigation was done as quickly as possible on the same day.

Suggest **one** reason why.

(1)

(f) Give **one** way the investigation could be improved.

(1)

Table 2 shows the results.

Table 2

	Distance from tree in metres					
	0	2	4	6	8	10
Percentage cover of grass	15	50	35	16	15	15
Percentage cover of plantain	0	5	10	40	25	30
Percentage cover of daisy	0	0	0	4	20	10
Percentage cover of clover	1	10	25	40	40	45
Total percentage cover of plants	16	65	70	100	100	100
Light intensity in arbitrary units	37	59	150	175	>200	>200

(g) Which plant species in **Table 2** will only grow at high light intensity?

(1)

(h) What conclusion can be made about the relationship between light intensity and the total percentage cover of plants?

Use data from **Table 2** in your answer.

(2)

(i) Light intensity might **not** be the cause of this pattern of plant distribution.

Suggest **one** different factor that may cause these results.

Give **one** reason for your answer.

Factor _____

Reason _____

(2)
(Total 15 marks)

Q5.

Conditions inside the human body are controlled.

(a) What is the control of conditions inside the body called?

Tick (✓) **one** box.

Excretion	<input type="checkbox"/>
Fertilisation	<input type="checkbox"/>
Homeostasis	<input type="checkbox"/>
Osmosis	<input type="checkbox"/>

(1)

(b) What are the **two** ways information is sent to control body conditions?

Tick (✓) **two** boxes.

By antigens	<input type="checkbox"/>
By hormones	<input type="checkbox"/>
By muscles	<input type="checkbox"/>
By nerve impulses	<input type="checkbox"/>
By red blood cells	<input type="checkbox"/>

(2)

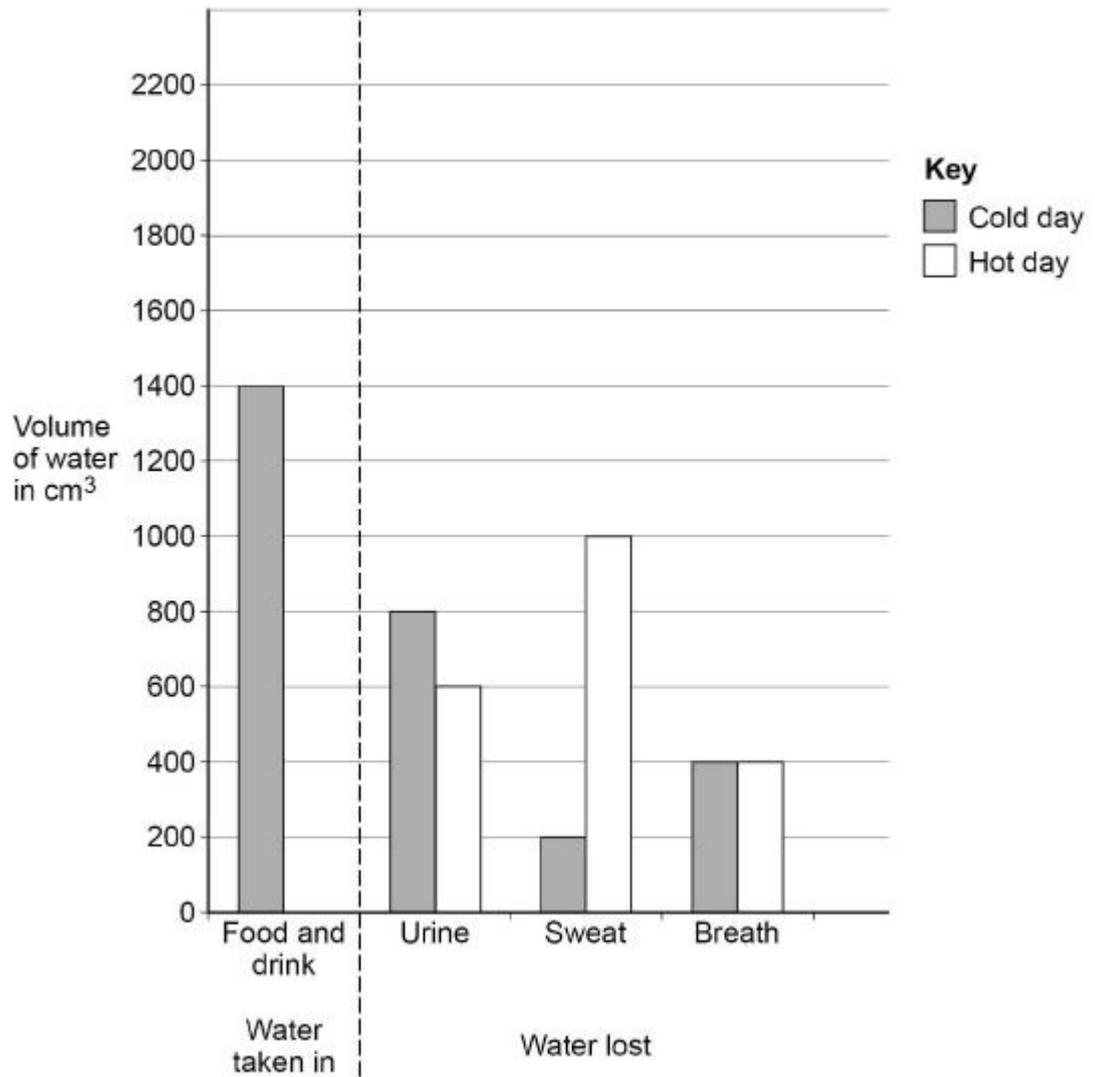
(c) One condition in the body that needs to be controlled is the level of water.

Give **one** other condition in the human body that needs to be controlled.

(1)

The graph shows the volumes of water taken in and lost by one person.

The volume for water taken in on a hot day has **not** been plotted on the bar graph.



(d) The person lost 1400 cm³ of water on the cold day.

How much extra water did they lose on the hot day?

Extra volume of water lost = _____ cm³

(2)

(e) Explain why the volume of water lost on a hot day is higher than on a cold day.

(2)

(f) A boy drank 750 cm³ of water.

His total intake of water for that day was 3000 cm³

Calculate the percentage of the boy's total intake that the 750 cm³ represents.

Percentage = _____ %

(2)

(Total 10 marks)

Q6.

Some animals are adapted to survive in very cold conditions such as the Arctic.

Explain how the adaptations of Arctic animals help them to survive in cold conditions.

(Total 6 marks)

Q7.

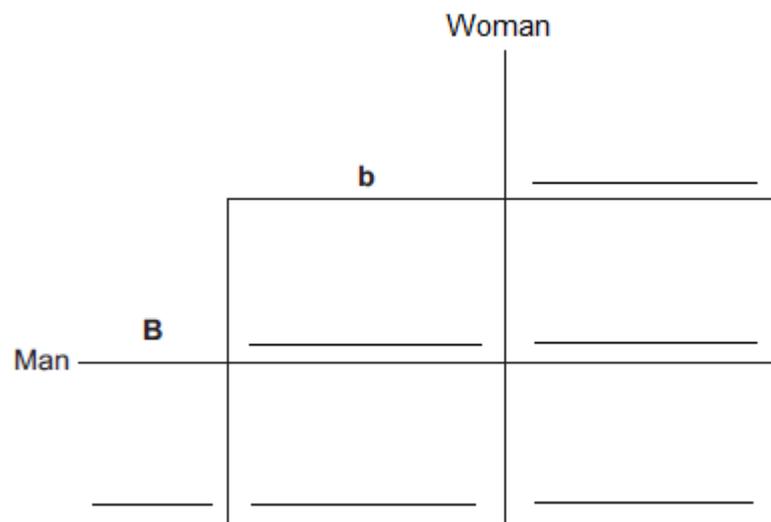
Eye colour is controlled by genes.

The dominant allele of the gene (**b**) produces brown eyes. The recessive allele (**b**) produces blue eyes.

A homozygous blue-eyed woman married a homozygous brown-eyed man.

All of their three children had brown eyes.

(a) (i) Complete the genetic diagram.



(2)

(ii) Give the reason why all of the children had brown eyes.

(1)

(b) The couple's brown-eyed son and his brown-eyed partner had five children. Two of the children had blue eyes and three of the children had brown eyes.

Use a genetic diagram to show how two of their children came to have blue eyes.

(3)
(Total 6 marks)