Name:	Target Grade:	Actual Grade:

BRIGHT CULTURE

HOMEOSTASIS AND HORMONAL CONTROL
MCQ and STRUCTURED QUESTIONS

READ THESE INSTRUCTIONS FIRST

INSTRUCTIONS TO CANDIDATES

1. Find a quiet, comfortable spot free place from distractions.

2. Spend one minute on each mark.

3. Time yourself for every single question.

4. Every chapter has their own question types. Ensure that you know the different question type for each chapter.

5. Make a conscientious effort to remember your mistakes, especially in terms of answering techniques. E.g Take a picture for the mistakes that you made, keep it in a photo album, and revise it over and over again.

6. Highlight question types that you tend to keep making mistakes and review them nearing exams.

7. Always review the common questions and question type that you tend to make mistakes nearing exams.

8. During exams, classify the question type and recall what you have learnt, how you need to analyse the questions for the different question type, what you need to take note of and answer with the correct answering techniques!

✨ **Wishing you all the best for this test!**

You've got this!

💡 **With lots of love,**
Bright Culture 💛

GOOD LUCK FOR YOUR EXAM!

MARKS

HOMEOSTASIS AND HORMONAL CONTROL MCQ

1 The table below shows events involved in the secretion and action of anti-diuretic hormone (ADH).

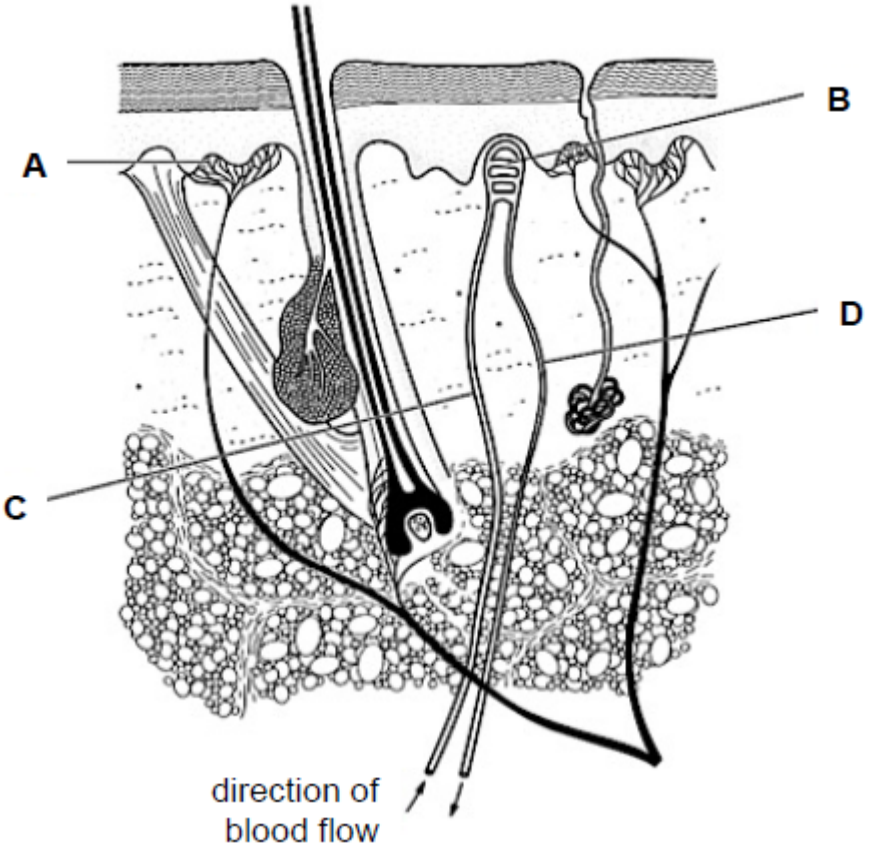
Which row correctly shows the events involved when a person has just finished running 2km?

	blood water potential relative to normal	amount of ADH produced relative to normal	permeability of cells in the walls of the collecting duct relative to normal
A	+	+	-
B	+	-	+
C	-	+	+
D	-	-	-

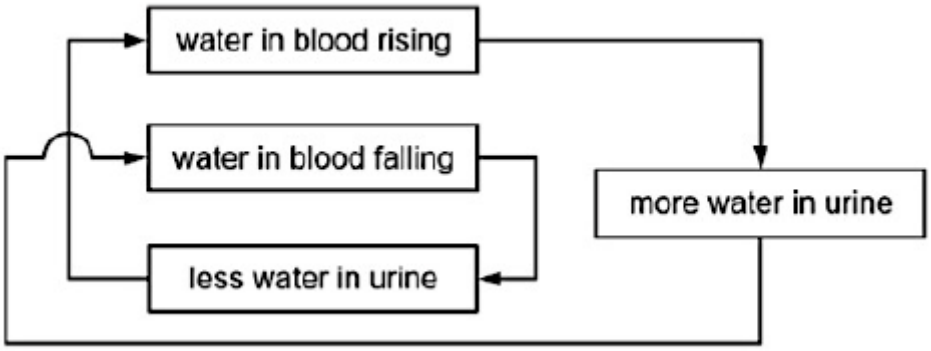
key:
+ : increase
- : decrease

2 The diagram below shows a section of human skin.

Which structure has the highest temperature on a cold day?



3 The diagram below refers to the control of blood water potential.



Why is this considered a negative feedback system?

A It decreases the amount of water in blood.
B It increases the amount of water in blood.
C It does not induce any change in the amount of water in blood.
D It reverses any change in the amount of water in blood.

4 Which of the following is not kept constant by homeostatic control?

A concentration of blood glucose
B concentration of urea excreted
C temperature of the blood
D water potential of the blood

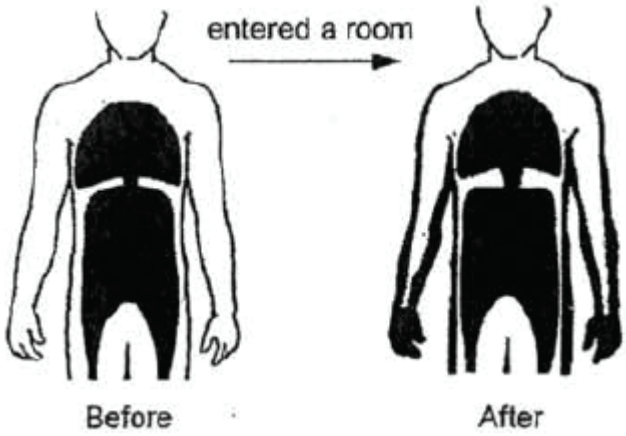
5 Four statements about negative feedback are given below.

1 Effectors bring about corrective responses.
2 A receptor detects a change in the internal environment.
3 Variation from the norm is counteracted.
4 A nerve or hormone message is generated.

The order in which these events occur is

A 2, 1, 4, 3
B 2, 4, 1, 3
C 4, 1, 3, 2
D 4, 2, 1, 3

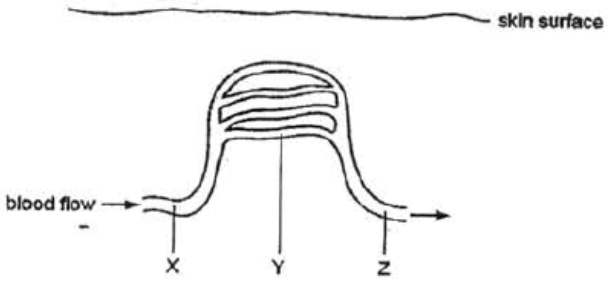
6 The diagram illustrates blood distribution in man before and after he entered a room.



Which of the following is correct?

	Room temperature	Effect
A	Increase	Vasolidation
B	Decrease	Vasolidation
C	Increase	Vasoconstriction
D	Decrease	Vasoconstriction

7 The diagram shows some blood vessels near the surface of the skin.



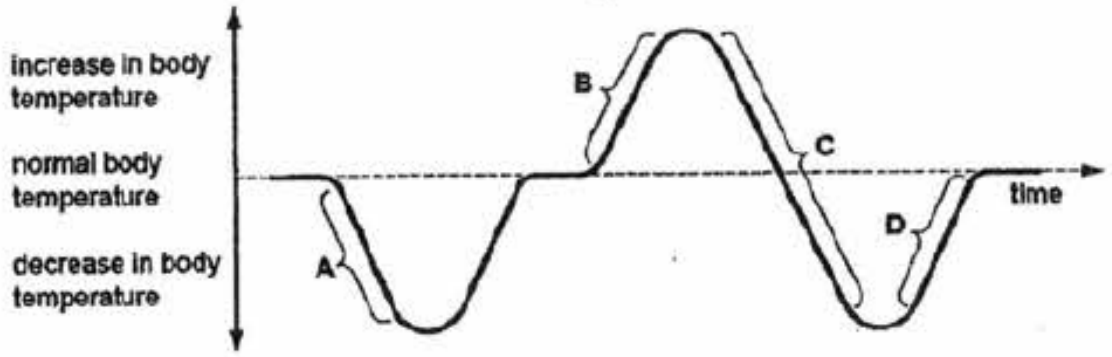
If vasodilation occurs at X, what happens to the blood flow at Y and Z.

	Y	Z
A	Increase	Increase
B	Decrease	Decrease
C	Increase	Stays constant
D	Decrease	Stays constant

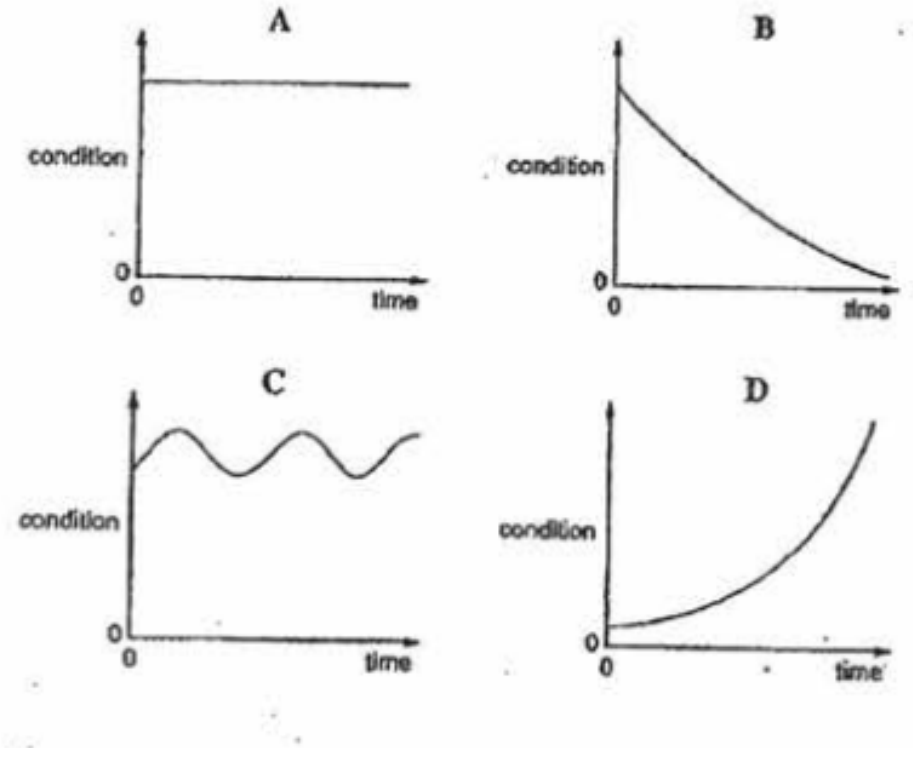
8 During a long-distance run on a hot day, Justin produced a large amount of perspiration. As a result, his kidneys changed the rate of urine production. Why.is this change important?

A Increased urine production allows more water to remain in the bloodstream.
B Increased urine production removes waste products formed as a result of running.
C Decreased urine production increases the amount of salt in blood plasma.
D Decreased urine production allows the body to conserve water.

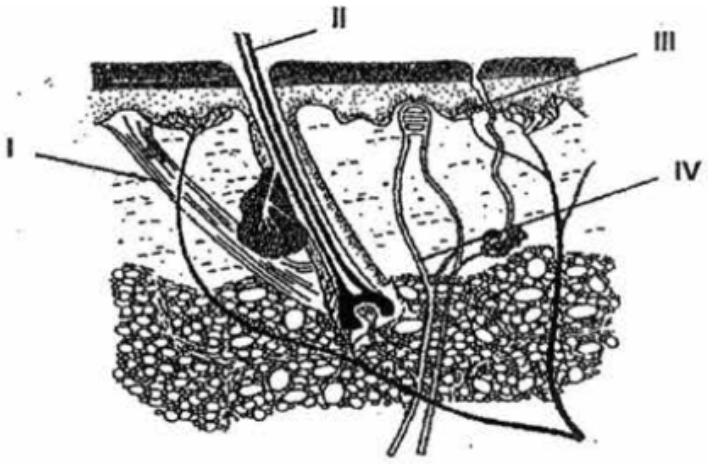
9 The graph shows the variation in a person's body temperature over a period of time. Which temperature change is likely to cause most sweating?



10 The graphs show how four different conditions in the body may change with time. Which of the graphs depicts homeostasis which occurs in our body?



11 The diagram below shows a section through the skin.



A woman went out in the sun for a while and her face became flushed.

Which of the above structure(s) played a role in her face becoming flushed?

A IVonly
B land ll
C ll and I!l
D III and IV

12 Which of the following corrective mechanism would restore the body's original condition?

	stimulus	arterioles	shunt vessels	sweat glands
A	temperature above norm	constricts	constricts	less active
B	temperature above norm	dilate	constricts	more active
C	temperature below norm	constricts	dilate	more active
D	temperature below norm	dilate .	dilate	less active

13 Which of the following processes is not directly controlled by negative feedback?

A absorption of glucose through the villi
B absorption of water through the walls of collecting duct
C maintenance of constant body temperature
D regulation of blood glucose concentration

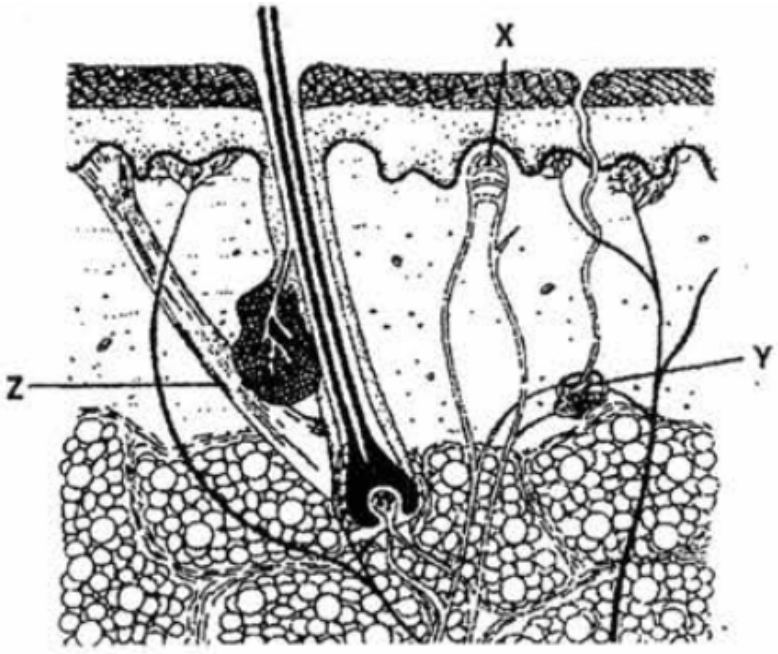
14 Which of these factors are controlled by homeostasis?

	Glucose concentration in blood	**Water content in ileum**	**Temperature in stomach**	**Glucose concentration in duodenum lumen**
A	yes	yes	no	yes
B	yes	no	yes	yes
C	yes	no	yes	no
D	no	yes	yes	no

15 Which homeostatic function of the liver is controlled and monitored by the pancreas?

A Deamination of amino acids
B Release of glucose
C Release of iron
D Removal of toxins

16 The diagram shows the vertical section through human skin.



What happens to parts X, Y, and Z in very hot conditions?

	X	Y	X
A	dilates	inactive	relaxes
B	constricts	active	contracts
C	constricts	inactive	contracts
D	dilates	active	relaxes

17 A woman runs a marathon, sweats profusely and drinks little fluid.
Which line in the table correctly summarises the events that result from this behaviour?

	ADH production	water absorption	urine output
A	**increase**	**increase**	**decrease**
B	**increase**	**decrease**	**decrease**
C	**decrease**	**decrease**	**Increase**
D	**decrease**	**increase**	**increase**

18 About 180 litres of fluid are filtered by the kidney every day. Only 1.5 litres are excreted in urine. A failure of which organ would result in a higher volume of urine being formed?

A gall bladder
B pancreas
C pituitary gland
D spleen

19 When a decrease in the water potential of blood occurs, which of the following events take place?

	ADH production	Permeability of kidney tubules	Volume of urine
A	decreases	increases	decreases
B	increases	decreases	decreases
C	increases	increases	decreases
D	increases	increases	increases

20 A drug has been found to inhibit the effects of antidiuretic hormone. What would the consequence of administering this drug to a healthy person be?

A A smaller volume of urine would be produced.
B More proteins would be present in the urine.
C The urine produced will be more concentated.
D The person will become dehydrated.

HOMEOSTASIS AND HORMONAL CONTROL STRUCTURED QUESTIONS

1 Pancreatitis is an inflammation of the pancreas which affects its function. Individuals with pancreatitis frequently lose weight, even when their appetite and eating habits are normal.

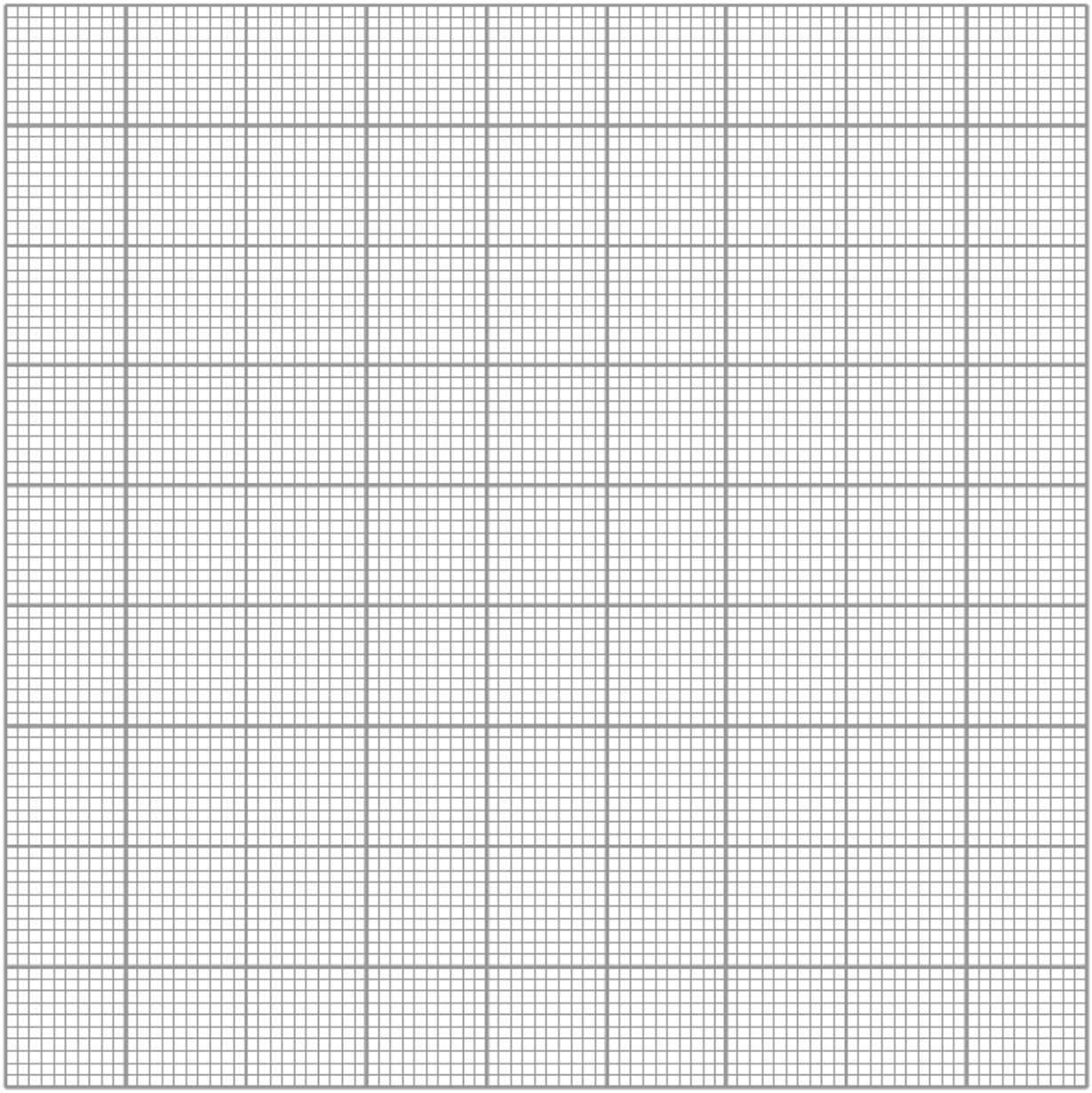
Table 7 shows the weight of an individual with pancreatitis over 8 months, from the time of diagnosis.

time from diagnosis/ month	weight/ kg
1	79.8
2	71.0
4	66.5
6	64.0
7	63.6
8	63.2

(a) Calculate the percentage weight loss of the individual over 8 months.

percentage weight loss: ……[1]

(b) On the grids below, plot a graph to show the weight of the individual against time from the point of diagnosis. [4]



(c) With reference to specific enzymes, substrates and products, suggest how pancreatitis may result in weight loss in an individual.

……...

……...

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……...

……..[4]

(d) Describe one possible effect of pancreatitis on blood sugar regulation.

……...

……..[1]

2 Fig. 5.1 shows a paragraph about the pancreas.

The pancreas is really two glands that are mixed together into one organ. The exocrine pancreas produces enzymes that help with the digestion of food. These cells produce enzymes that are secreted into the pancreatic duct. The endocrine pancreas is composed of the islets of Langerhans. These cells do not release the hormones produced as secretions into the pancreatic duct, but release them into the bloodstream. From: The Sol Goldman Pancreatic Cancer Research Center (*http://pathology.jhu.edu/pancreas/basicoverview3.php?area=ba*)

Fig. 5.1

(a) With reference to Fig. 5.1, state two differences between the exocrine pancreas and the endocrine pancreas.

……..

……..

……..

…… [2]

(b) **(i)** Name the hormone produced by the islets of Langerhans after a person eats a heavy meal.

…… [1]

(ii) Explain how the hormone named in part (b)(i) maintains blood glucose levels.

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…… [3]

(c) Besides blood glucose levels, body temperature is also maintained within a healthy range via homeostasis. Describe how the body effectively maintains a temperature of around 37°C when a person runs a marathon.

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…… [3]

[Total: 9]

3 Fig. 11.1 shows the volume of water gained and lost per day by a person living in a tropical climate.

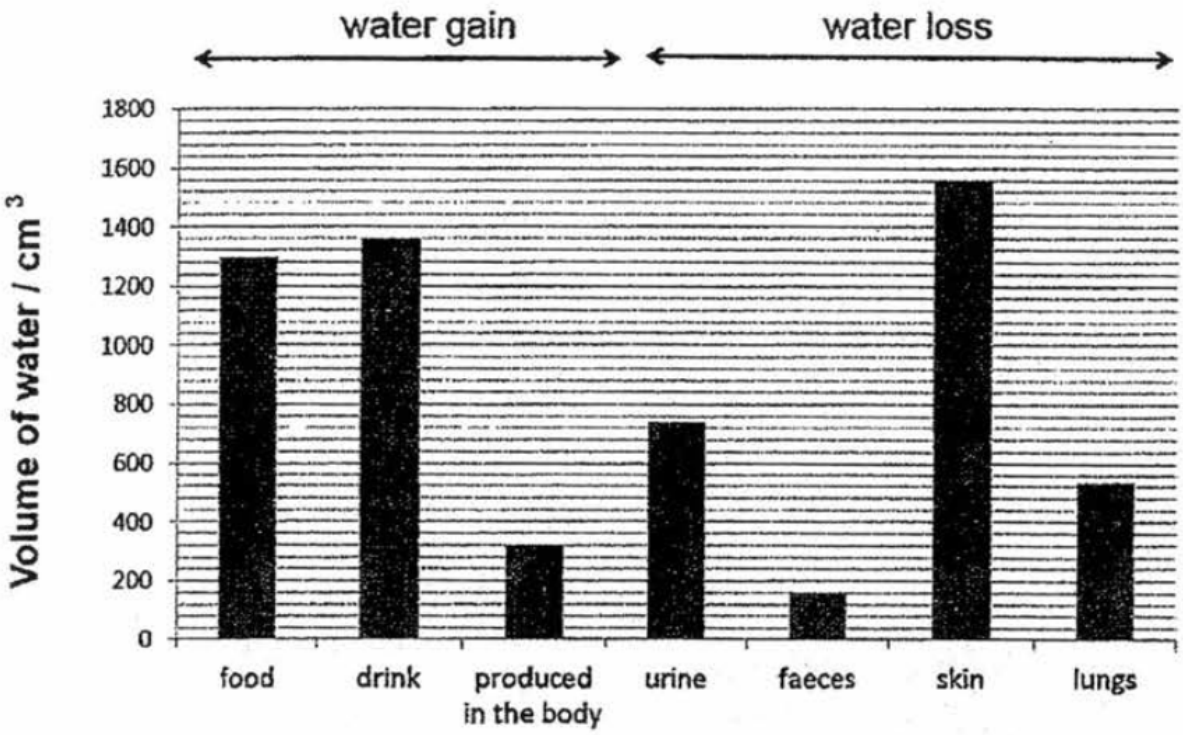


Fig. 11.1

(a) (i) State the form in which water is loss from the lungs.

……..[1]

(ii) Name the process which produces water in the body.

……..[1]

(b) Calculate the net volume of water loss per day.

Volume of water loss = ……..[2]

(c) Predict two ways the volume of water loss would change compared to Fig 11.1 if the weather was much colder.

……..

……..

……..[2]

(d) Describe how the brain is involved in the reabsorption of water.

……..

……..

……..

……..[3]

(e) Other than the kidneys, list another organ that reabsorbs water.

……..[1]

4 Some students carried out an investigation to find the effect of the shape of an animal's body on heat loss from the bod. Heat loss was measured as a decrease in temperature in C.

They used two plastic containers, A and B, to represent two differently shaped bodies of an equal volume. (not drawn to scale)

The containers used are shown in Fig 6.1.

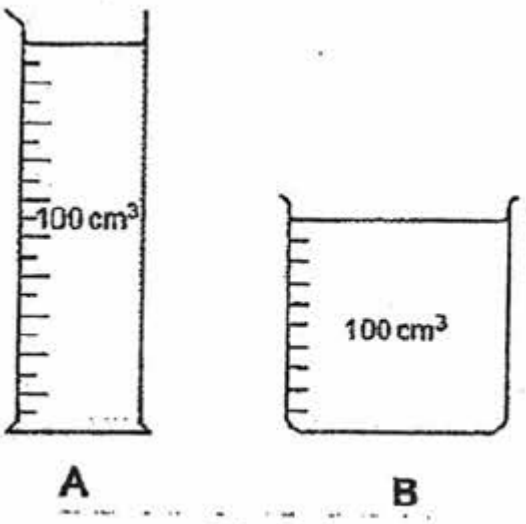


Fig 6.1

The two containers, A and B, were each filled with 100 cm3 of hot water. A thermometer was used to measure the temperature of the hot water in each container immediately. These temperatures were recorded every two minutes, for a total of eight minutes, as shown in Table 6.1.

Time/min	Temperature/ °C	
	A	B
0	65	65
2	55	58
4	50	54
6	46	50
8	40	48

Table 6.1

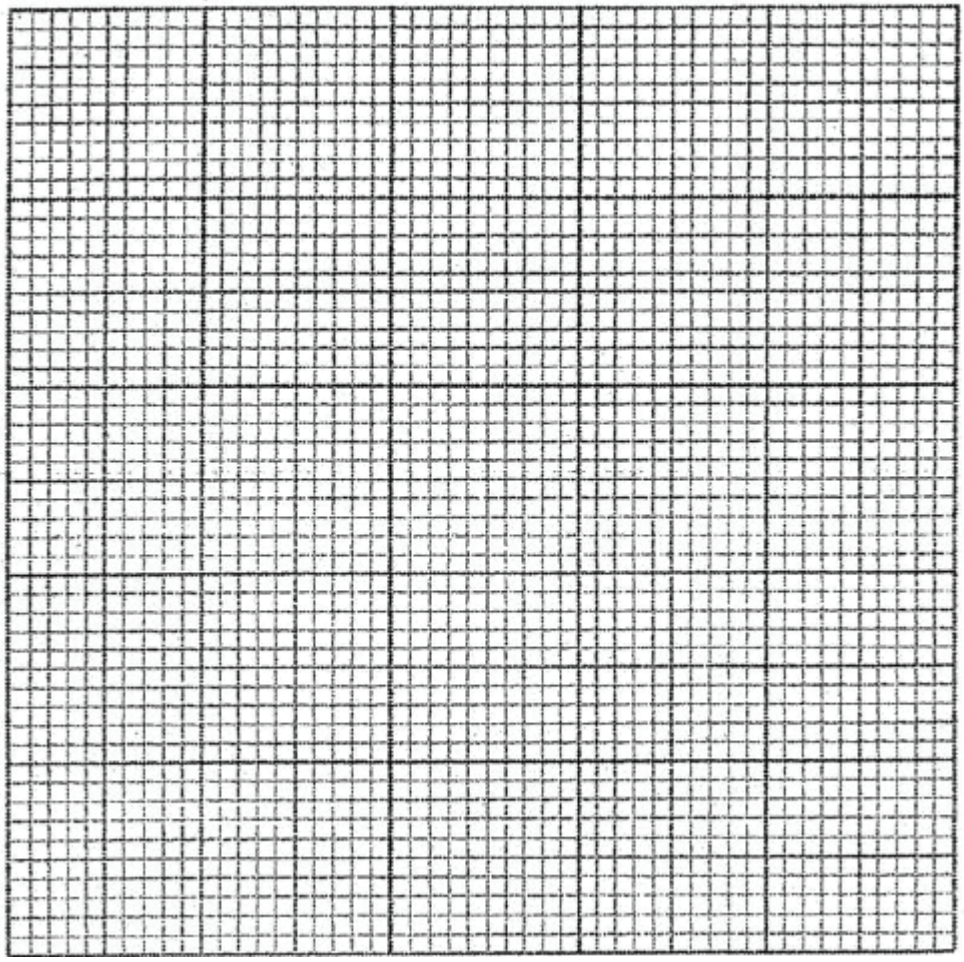
(a) Calculate and record the overall decrease in temperature of the water for each container and record these two values below

Show your working

A……..°C

B ……°C

(b) (i) Construct a graph to show the decrease in temperature of the water with time, in containers A and B, using the results in Table 6.1. Use the same axes for both sets of data.



(ii) Describe these results.

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……..[2]

(iii) The shape of a container does affect heat loss from the container.

Suggest an explanation for this.

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……..[2]

Total: [10]

5 Fig. 6.1 shows the body temperature of a person before, during and after a cold water bath. The temperature of the bath water was 22°C.

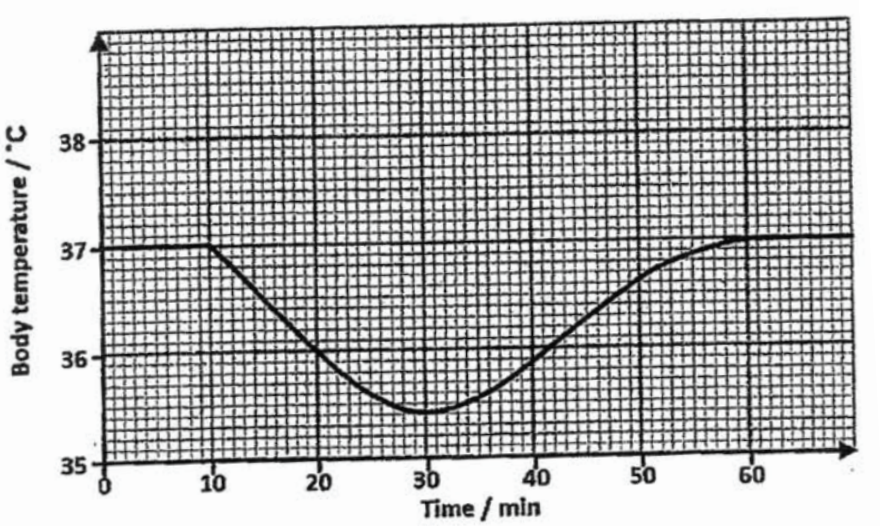

Fig. 6.1

(a) Explain why there was a fall in the person's body temperature. [1]

……..

……..

(b) Estimate the duration that the person was in the bath. [1]

……..

(c) Explain how the corrective mechanism in the person's help to return his body temperature to normal. [4]3

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Total: 6 marks

6 Glucose is absorbed in the small intestine and transported in the blood. The kidneys filter the blood and reabsorb the glucose.

If the blood contains more than 180 mg of glucose per 100 cm3, the kidney cannot reabsorb it all and some is present in the urine. 180 mg of glucose per 100 cm3 is called the renal threshold.

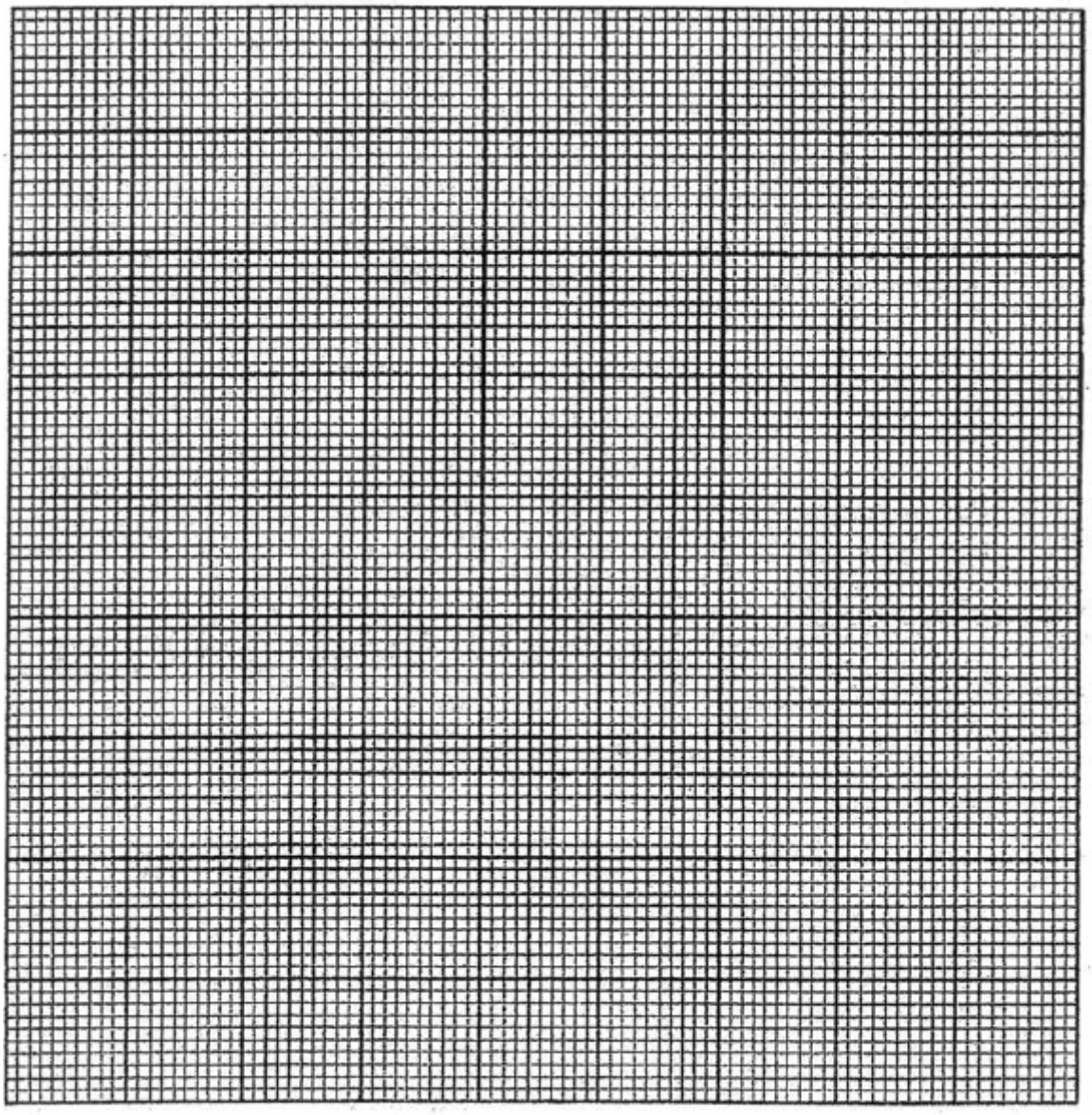
A doctor suspects that a patient has diabetes because a urine test is positive for glucose. The patient takes a glucose tolerance test by drinking a solution of glucose. The doctor records the patient's blood glucose concentration at 30 minute intervals for four hours.

Table 6.1 shows the results.

Table 6.1

Time/min	30	60	90	120	150	180	210	240
Blood glucose concentration / mg per 100 cm^3	120	190	220	230	220	200	170	130

(a) Plot graph of the data in Table 6.1 on the grid in Fig. 6.1



(b) (i) Draw a horizontal line on the grid in Fig. 6.1 to show the renal threshold. [1]

(ii) State the time period when the kidney will produce urine containing glucose.

…….. [1]

(iii) On the grid in Fig. 6.1, sketch the blood glucose concentrations that the doctor might expect if he repeated this test on someone who does not have diabetes. [1]

(c) People who do not have diabetes maintain their blood glucose concentration below 180 mg per 100 cm3. Explain how the body does this.

…….

…….

…….

…….

…….

…….[3]

[Total: 10]

ANSWERS FOR HOMEOSTASIS AND HORMONAL CONTROL MCQ

Q1: C	Q6: A	Q11: D	Q16: D
Q2: C	Q7: A	Q12: B	Q17: A
Q3: D	Q8: D	Q13: A	Q18: C
Q4: B	Q9: B	Q14: C	Q19: C
Q5: B	Q10: C	Q15: B	Q20: D

ANSWERS FOR HOMEOSTASIS AND HORMONAL CONTROL STRUCTURED QUESTIONS

1 Pancreatitis is an inflammation of the pancreas which affects its function. Individuals with pancreatitis frequently lose weight, even when their appetite and eating habits are normal.

Table 7 shows the weight of an individual with pancreatitis over 8 months, from the time of diagnosis.

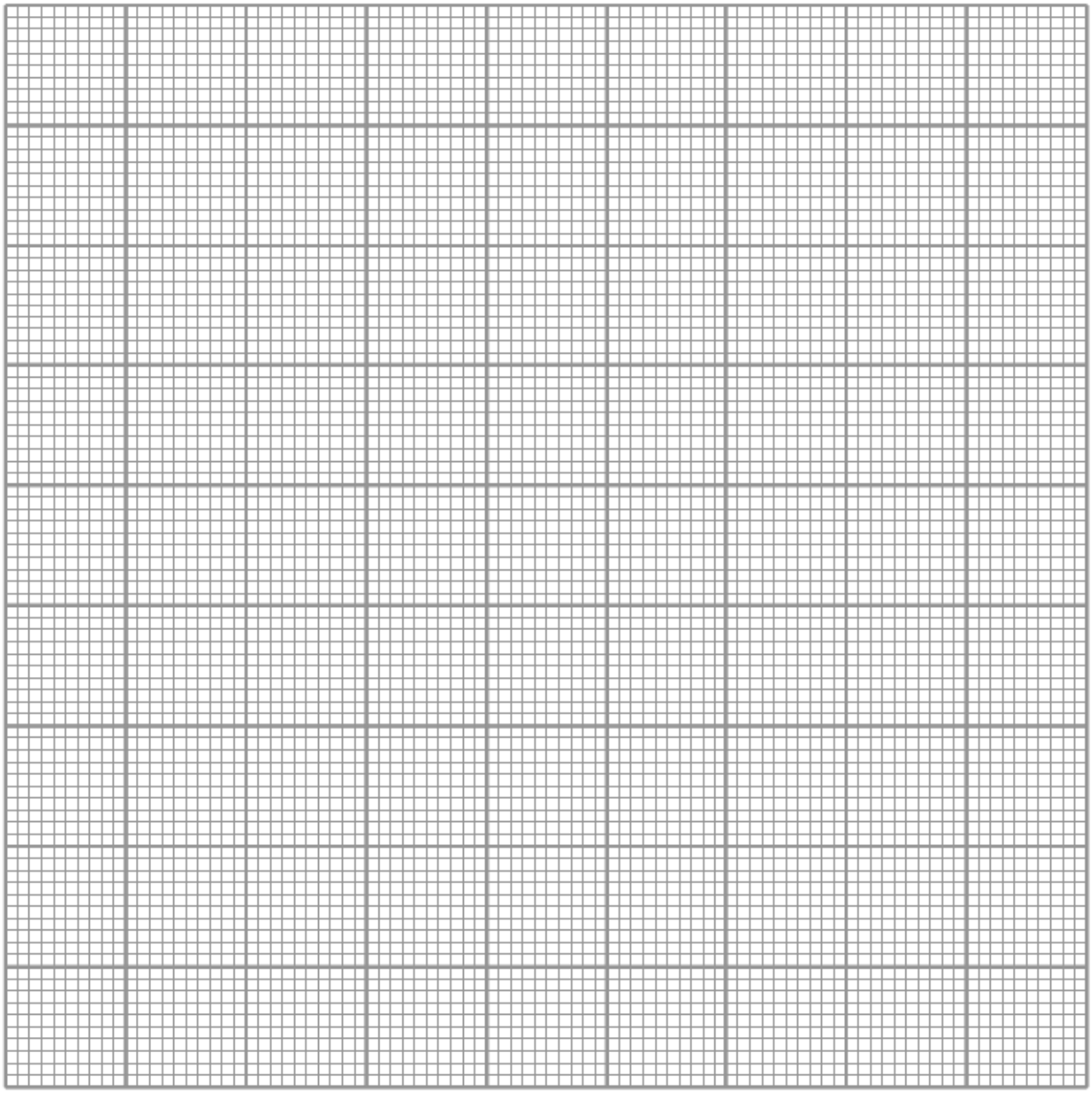
time from diagnosis/ month	weight/ kg
1	79.8
2	71.0
4	66.5
6	64.0
7	63.6
8	63.2

(a) Calculate the percentage weight loss of the individual over 8 months.

(79.8 - 63.2/ 79.8) x 100%

percentage weight loss: = 20.8 % [1]

(b) On the grids below, plot a graph to show the weight of the individual against time from the point of diagnosis. [4]



LU

A

S – avoid inappropriate scale, eg. 10 squares to 3 units

BF

(c) With reference to specific enzymes, substrates and products, suggest how pancreatitis may result in weight loss in an individual.

A patient with pancreatitis will produce lesser trypsin, pancreatic amylase and pancreatic lipase.
To produce maltose, polypeptide and and fatty acids and glycerol
Rate of digestion of starch/ protein/ fats in the small intestine will decrease/ Lesser digestion
Lesser end-products of digestion/ small digested nutrients will be absorbed/ lesser respiration releasing energy/ large complex molecules cannot be absorbed, resulting in malnutrition.

Note:

- Trypsin digests protein to polypeptide [1]/ Pancreatic amylase digests starch to maltose [1]/ Pancreatic lipase digests fats to fatty acids and glycerol [1] BUT cap at 2 marks [4]

(d) Describe one possible effect of pancreatitis on blood sugar regulation.

Blood glucose concentration remains high/ no change in blood glucose concentration/

production of insulin and glucagon is affected. [1]

2 Fig. 5.1 shows a paragraph about the pancreas.

The pancreas is really two glands that are mixed together into one organ. The exocrine pancreas produces enzymes that help with the digestion of food. These cells produce enzymes that are secreted into the pancreatic duct. The endocrine pancreas is composed of the islets of Langerhans. These cells do not release the hormones produced as secretions into the pancreatic duct, but release them into the bloodstream. From: The Sol Goldman Pancreatic Cancer Research Center (*http://pathology.jhu.edu/pancreas/basicoverview3.php?area=ba*)

Fig. 5.1

(a) With reference to Fig. 5.1, state two differences between the exocrine pancreas and the endocrine pancreas.

1. The exocrine pancreas produces enzymes while the endocrine pancreas produces hormones

2. The exocrine pancreas releases its secretions into the pancreatic duct, while the endocrine pancreas releases its secretions directly into the bloodstream

R: secretes enzymes/hormones as a function of the [2]

Marker's report:

Students who combined the differences into one sentence will only be awarded with one mark. As there was a write-up already given in the question, students are expected to use it to phrase their answers more coherently (e.g., "releasing its contents into a duct" and not just stating that "there is a duct").

(b) **(i)** Name the hormone produced by the islets of Langerhans after a person eats a heavy meal.

Insulin [1]

Marker's report:

Well done.

(ii) Explain how the hormone named in part (b)(i) maintains blood glucose levels.

1. Insulin stimulates the liver cells to convert excess glucose into glycogen, to be stored in the liver
2. It also stimulates liver and muscles cells to become more permeable to glucose, increasing glucose uptake
3. It also stimulates cells to increase the oxidation of glucose / increase rate of respiration, thus decreasing blood glucose levels back to normal

R: use for cellular activities without mention of respiration. [3]

Marker's report:

Most students lost marks due to the missing "excess" word. Students need to be very clear that the body does not convert all glucose into glycogen. Very few students were able to come up with point 3.

(c) Besides blood glucose levels, body temperature is also maintained within a healthy range via homeostasis. Describe how the body effectively maintains a temperature of around 37°C when a person runs a marathon.

1. As the person exercises, the body temperature increases above normal
2. Sweat glands become more active, increasing sweat production. As sweat evaporates, it removes the latent heat of vaporisation
3. Shunt vessels constrict and arterioles vasodilate, increasing bloodflow to the blood capillaries near the skin surface to remove heat via conduction, convection and radiation
4. Metabolism rate is reduced to generate less heat energy from respiration, thus maintaining a stable body temperature

Any 3 points [3]

[Total: 9]

3 Fig. 11.1 shows the volume of water gained and lost per day by a person living in a tropical climate.

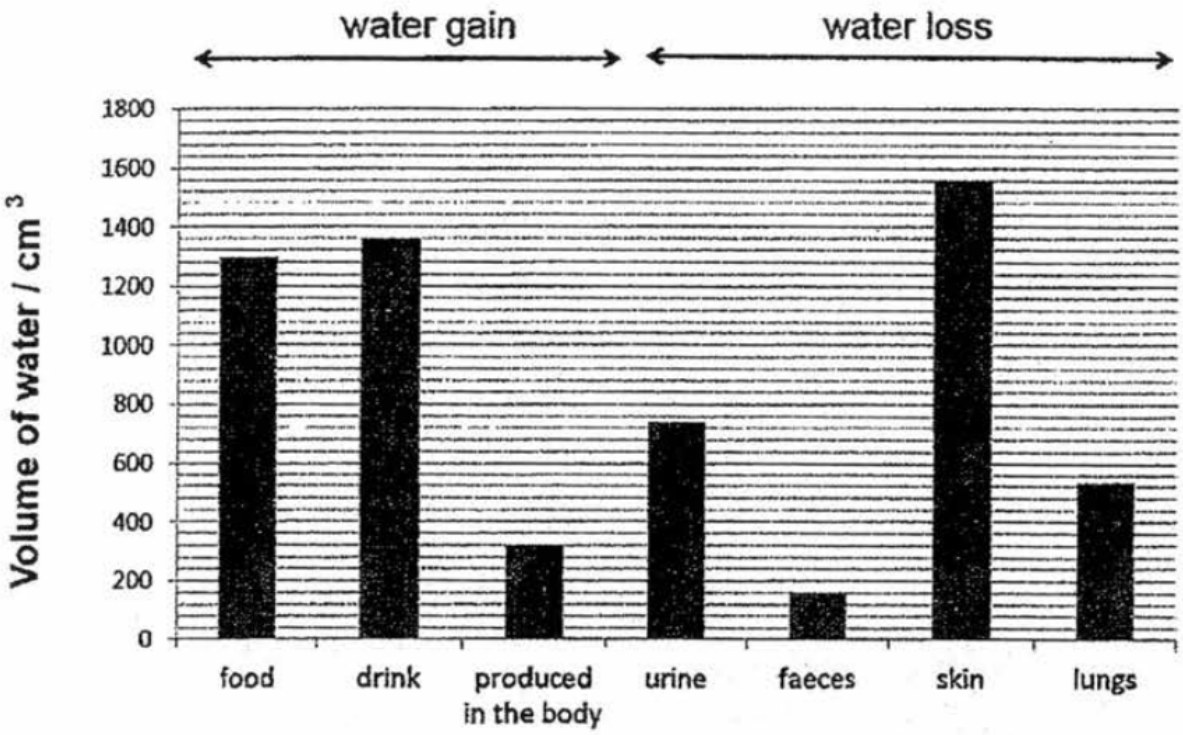


Fig. 11.1

(a) (i) State the form in which water is loss from the lungs.

Water vapour [1]

(ii) Name the process which produces water in the body.

Condensation [1]

(b) Calculate the net volume of water loss per day.

Water gained = 1300+'1360 + 320 = 2980 cm^3

Water loss = 740+160 + 1560 + 540 = 3000 cm^3

Net water loss = 3000 - 2980 = 20 cm^3

Volume of water loss = 20 cm^3 [2]

(c) Predict two ways the volume of water loss would change compared to Fig 11.1 if the weather was much colder.

Water loss via **skin will decrease** [1]

Water loss via **urine will increase** [1] [2]

(d) Describe how the brain is involved in the reabsorption of water.

The changes in osmostic pressure is detected by the hypothalamus [1]

The pituitary gland then releases anti-diuretic hormone [1] which controls the permeability of nephron to water

If more ADH is released, more water is reabsorbed. [1]

[3]

(e) Other than the kidneys, list another organ that reabsorbs water.

Large intestine/small intestine [1]

4 Some students carried out an investigation to find the effect of the shape of an animal's body on heat loss from the bod. Heat loss was measured as a decrease in temperature in C.

They used two plastic containers, A and B, to represent two differently shaped bodies of an equal volume. (not drawn to scale)

The containers used are shown in Fig 6.1.

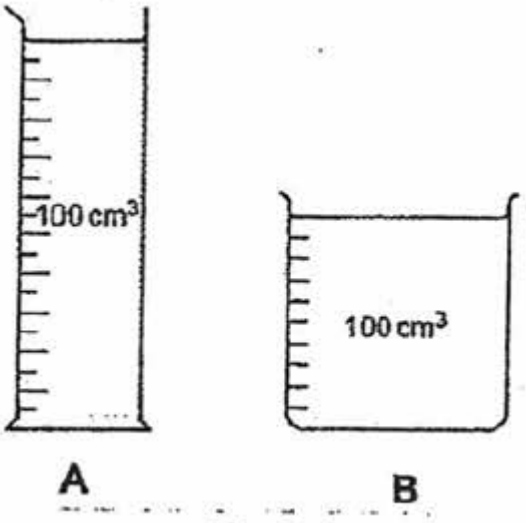


Fig 6.1

The two containers, A and B, were each filled with 100 cm3 of hot water. A thermometer was used to measure the temperature of the hot water in each container immediately. These temperatures were recorded every two minutes, for a total of eight minutes, as shown in Table 6.1.

Time/min	Temperature/ °C	
	A	B
0	65	65
2	55	58
4	50	54
6	46	50
8	40	48

Table 6.1

(a) Calculate and record the overall decrease in temperature of the water for each container and record these two values below

Show your working

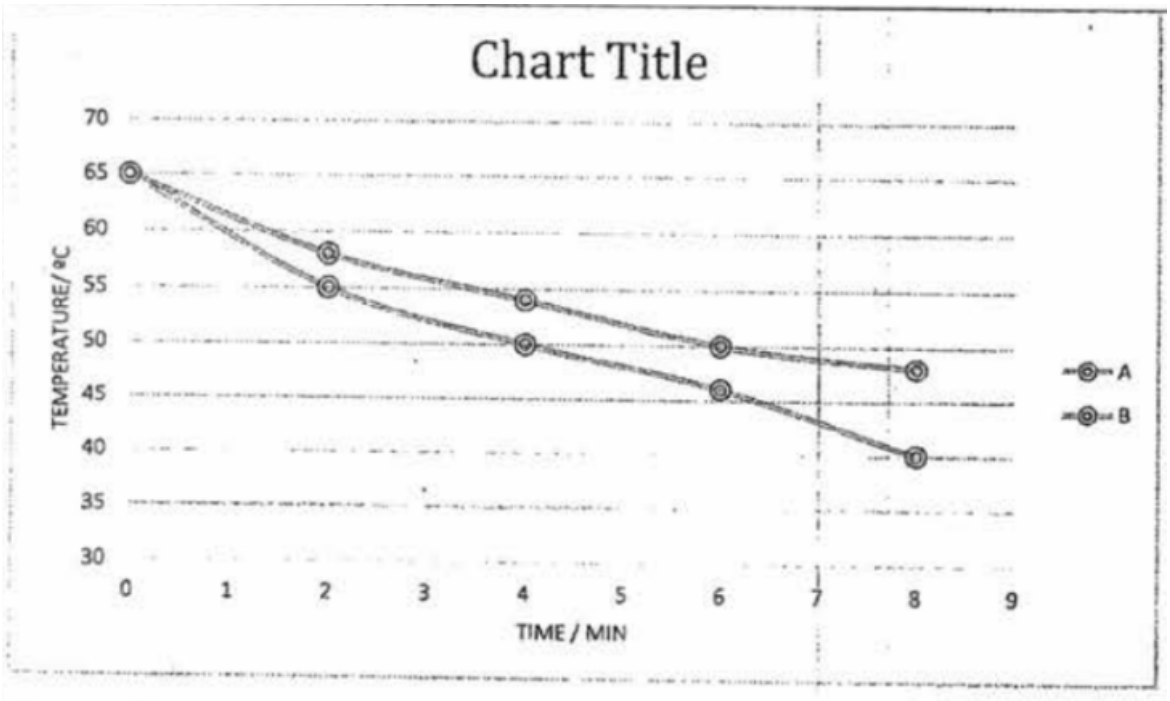
A: 65- 40 =25

B: 65- 48 = 17

A : 25°C

B: 17°C

(b) (i) Construct a graph to show the decrease in temperature of the water with time, in containers A and B, using the results in Table 6.1. Use the same axes for both sets of data.



(ii) Describe these results.

time on x axis, temperature on y axis + full labels ;

reactions take place to convert substrates to product/ product molecule

products leave + active site / enzyme re-useable / unchanged; [2]

(iii) The shape of a container does affect heat loss from the container.
Suggest an explanation for this.

respiration can occur (presence of oxygen)

provides energy for root (cells / hairs) to increased uptake of ions; by active transport; ref. energy

requirements of active transport;

- Result in (any two of the following that leads to better plant growth)

(increased) chlorophyll production + magnesium;

(increased) photosynthesis (since more chlorophyll);

(increased) amino acid / protein production + nitrates. [2]

Total: [10]

5 Fig. 6.1 shows the body temperature of a person before, during and after a cold water bath. The temperature of the bath water was 22°C.

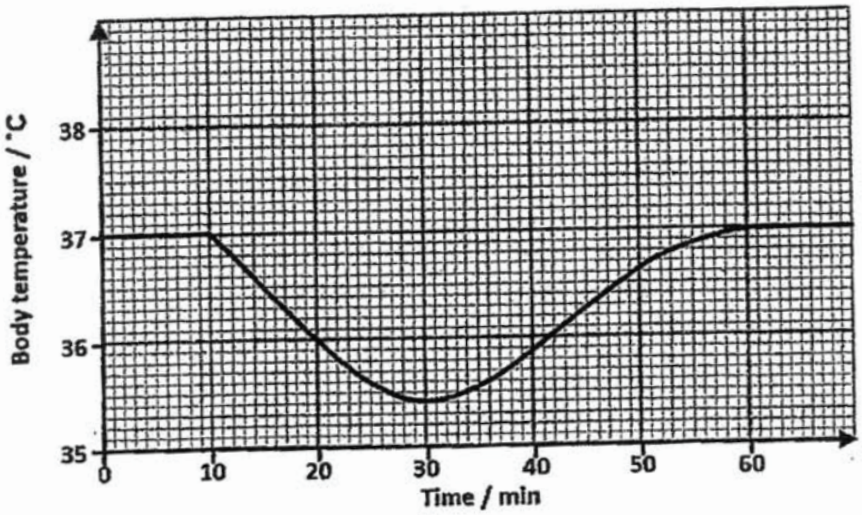


Fig. 6.1

(a) Explain why there was a fall in the person's body temperature. [1]

External temperature is lower than body temperature, so body loses heat to environment.

(b) Estimate the duration that the person was in the bath. [1]

20 minutes

(d) Explain how the corrective mechanism in the person's help to return his body temperature to normal. [4]

Liver increased metabolic rate increases heat production. [1]

- Muscles of the body shiver to produce heat. [1]
- Arterioles in skin constrict and shunt vessels dilate, [1)
  to reduce blood fiow to skin surface and decrease heat loss. [1]

Rejected:

1) Sweat glands not active, to reduce heat loss from sweating (as person is wet)

2) Hair erector muscles contract and hair stands on end (Not effective in humans)

Total: 6 marks

6 Glucose is absorbed in the small intestine and transported in the blood. The kidneys filter the blood and reabsorb the glucose.

If the blood contains more than 180 mg of glucose per 100 cm3, the kidney cannot reabsorb it all and some is present in the urine. 180 mg of glucose per 100 cm3 is called the renal threshold.

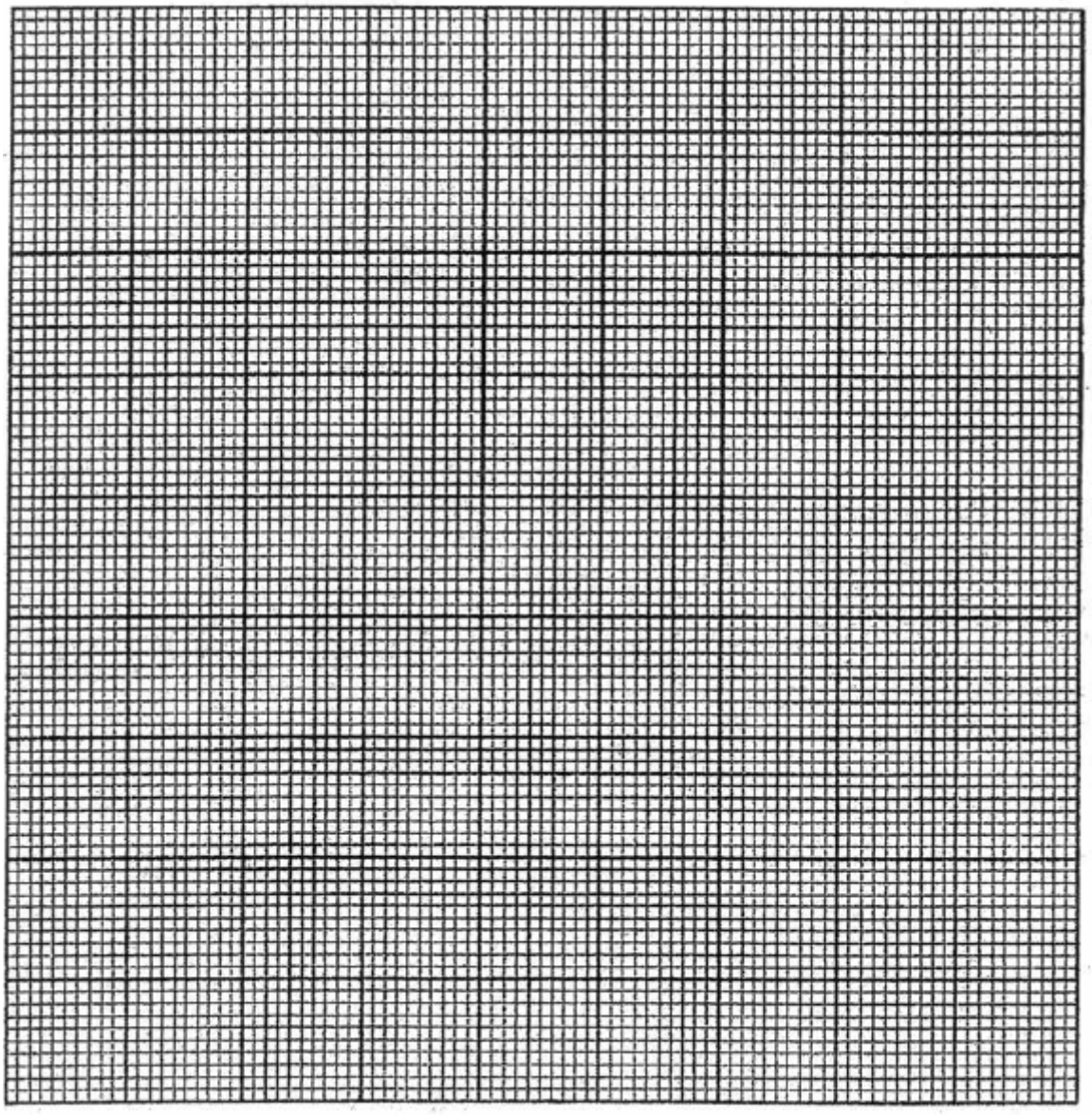
A doctor suspects that a patient has diabetes because a urine test is positive for glucose. The patient takes a glucose tolerance test by drinking a solution of glucose. The doctor records the patient's blood glucose concentration at 30 minute intervals for four hours.

Table 6.1 shows the results.

Table 6.1

Time/min	30	60	90	120	150	180	210	240
Blood glucose concentration / mg per 100 cm^3	120	190	220	230	220	200	170	130

(a) Plot graph of the data in Table 6.1 on the grid in Fig. 6.1



Axis labelled correctly with units
Scale appropriate / graph size more than 1/2 of grid
Points correctly plotted
Best fit

(b) (i) Draw a horizontal line on the grid in Fig. 6.1 to show the renal threshold. [1]

horizontal line at 180 mg per 100 cm3

(ii) State the time period when the kidney will produce urine containing glucose.

60 to 210 minutes [1]

(iii) On the grid in Fig. 6.1, sketch the blood glucose concentrations that the doctor might expect if he repeated this test on someone who does not have diabetes. [1]

increases after time when glucose is ingested, decreases, but stays below. or touches 180 mg per 100 cm^3

(c) People who do not have diabetes maintain their blood glucose concentration below 180 mg per 100 cm3. Explain how the body does this.

insulin secreted / produced / released by pancreas glucose absorbed by liver / permeability of liver cell membranes increases, increasing rate of glucose uptake insulin causes / stimulates liver to convert excess glucose into glycogen for storage [3]

[Total: 10]