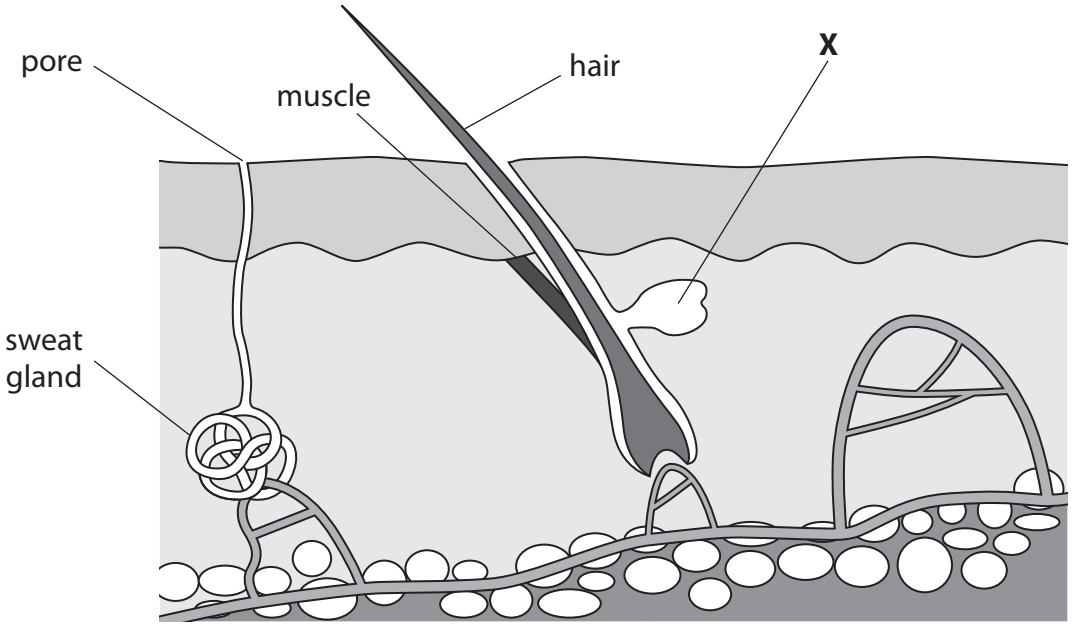
1 (a) The diagram shows a cross section through human skin.



(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

Structure **X** is the

(1)

☒ **A** blood capillary

☒ **B** dermis

☒ **C** nerve ending

☒ **D** sebaceous gland

(ii) Describe the role of the sweat gland in thermoregulation.

(2)

(iii) Explain why the muscle attached to the hair follicle is important when a person starts to feel cold.

(2)

(b) Thermoregulation is one way in which a constant internal environment is maintained.

What is the name given to the maintenance of a constant internal environment?

Place a cross (☒) in the box next to your answer.

(1)

☒ **A** homeostasis

☒ **B** hypothalamus

☒ **C** vasoconstriction

☒ **D** vasodilation

(c) Explain why the temperature of the human body needs to be maintained at 37 °C.

(2)

(d) The photograph shows a reptile lying in sunlight.

Explain why reptiles lie in sunlight for long periods of time.

(2)

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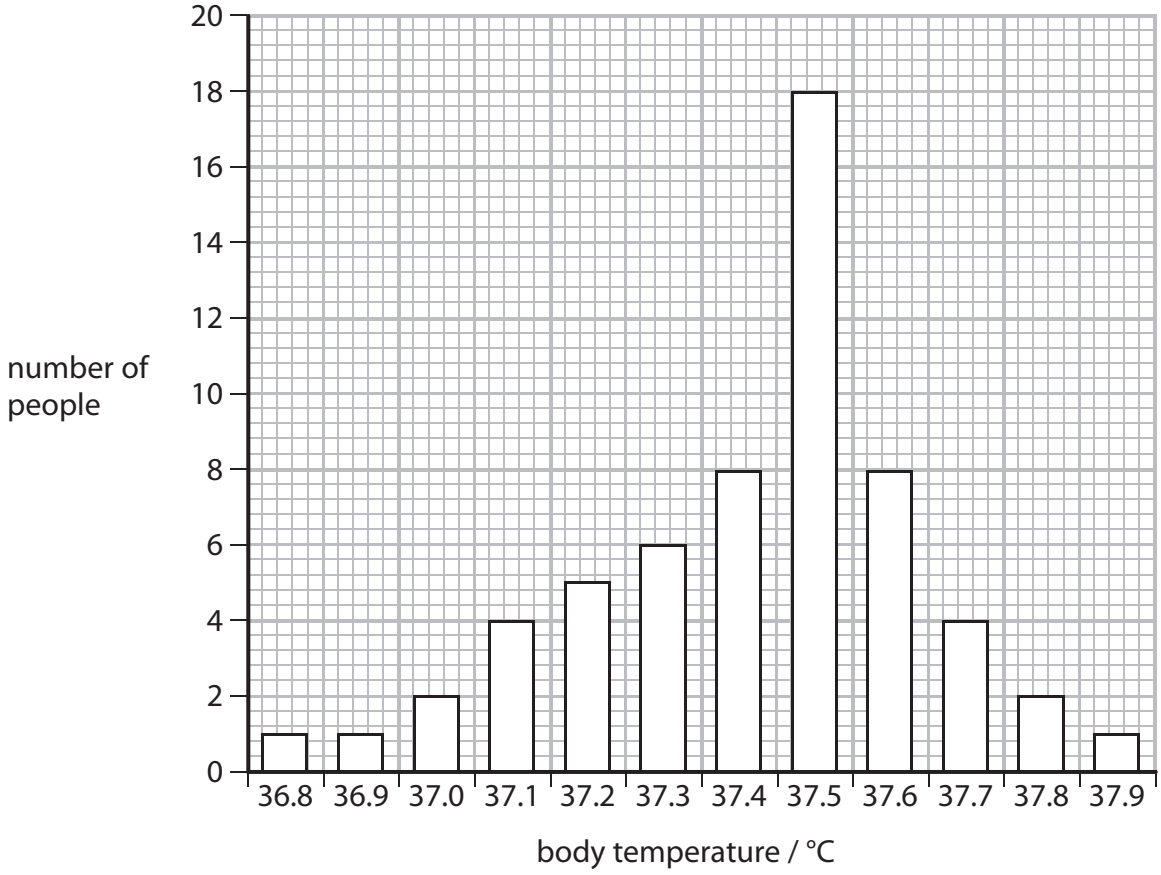
(Total for Question 1 = 10 marks)

2 (a) The graph shows the body temperature of 60 people.



(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The range in body temperature is

(1)

☒ **A** 0.1

☒ **B** 1.1

☒ **C** 11.0

☒ **D** 11.1

(ii) State the type of variation, shown in the graph, that results in a normal distribution curve.

(1)

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(iii) Calculate the percentage of people with a body temperature of 37.5 °C.

(2)

answer = ... %

(b) A person with a body temperature of 37.9 °C had a body temperature of 37.5 °C one hour later.

(i) Explain how thermoregulation causes this reduction in body temperature.

(4)

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(ii) Explain how exercise can cause body temperature to increase.

(2)

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(Total for Question 2 = 10 marks)

3 Humans regulate the glucose concentration of their blood.

A scientist recorded the blood glucose concentration of an individual over a seven-hour period.

The results are shown in the table.

time of day	blood glucose concentration / mg per 100 cm^3
06.00	76
07.00	77
08.00	124
09.00	91
10.00	83
11.00	81
12.00	79
13.00	130

(a) (i) Describe the trend in blood glucose concentration for this seven-hour period.

(2)

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(ii) Suggest reasons for the changes in blood glucose concentration.

(2)

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(iii) Complete the sentence by putting a cross (☒) in the box next to your answer.

Excess blood glucose is converted into

(1)

☒ **A** glucagon in the liver

☒ **B** glucagon in the pancreas

☒ **C** glycogen in the liver

☒ **D** glycogen in the pancreas

(b) (i) Scientists have discovered that a high body mass index (BMI) is a risk factor that may cause Type 2 diabetes.

Calculate the BMI for a female who has a mass of 67.5 kg and a height of 1.50 m.

$$\text{BMI} = \frac{\text{mass in kg}}{(\text{height in metres})^2}$$

(2)

answer = ...

(ii) Explain how a Type 2 diabetic can regulate their blood glucose concentration.

(3)

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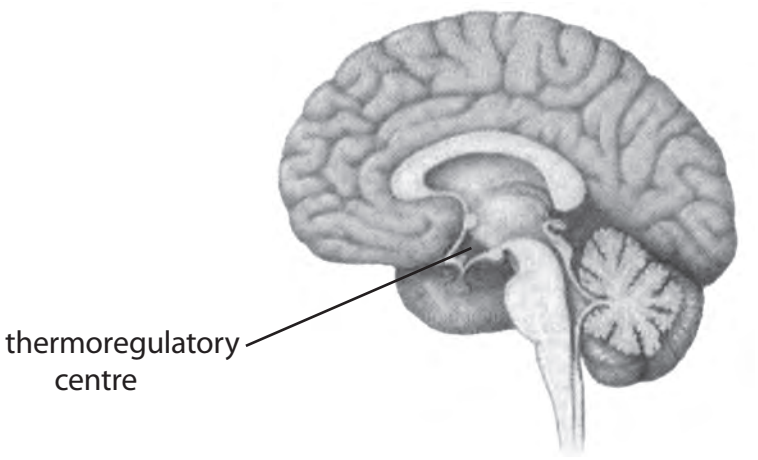
(Total for Question 3 = 10 marks)

4 The diagram shows a brain with the thermoregulatory centre labelled.



(a) (i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The part of the brain that contains the thermoregulatory centre is the

(1)

- ☒ **A** cerebrum
- ☒ **B** cerebellum
- ☒ **C** hypothalamus
- ☒ **D** medulla

(ii) The thermoregulatory centre controls internal body temperature.

Explain how the blood vessels in the skin help to control internal body temperature.

(4)

(b) Water content is also controlled within the human body.

State the name given to the control of water content in the body.

(1)

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*(c) The human body prevents blood glucose levels from becoming too high or too low.

Explain how the human body maintains blood glucose levels within a narrow range.

(6)

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(Total for Question 4 = 12 marks)