

Answers to end-of-chapter questions

Chapter 14: Homeostasis

- 1 a An endothermic animal is able to regulate its body temperature, maintaining a fairly constant temperature even when the environmental temperature changes. An ectothermic animal's body temperature varies with the temperature of its environment.
- b The dermis is the lower layer of the skin, containing nerve endings and blood vessels. The epidermis is the surface layer of the skin.
- c Vasoconstriction is the narrowing of the arterioles that transport blood to the surface capillaries in the skin. Vasodilation is the widening of these arterioles.
- d Glycogen is a polysaccharide that is the way in which carbohydrate is stored in animal cells, especially in the liver. Glucagon is a protein hormone made by the pancreas, which acts on the liver to cause the breakdown of glycogen to glucose, causing blood glucose concentration to rise.
- 2 a Keeping the body temperature constant is just one part of homeostasis, which is the maintenance of a constant internal environment. Homeostasis also involves the regulation of blood glucose concentration, as well as the water content of the body.
- b The hairs do stand on end when the body is too cold, but in humans we do not have enough hair for this to help to keep us warm. In other mammals, the raised hairs trap a layer of insulating air next to the skin.
- c Air of any kind cannot get into the body through the skin. The fat layer prevents heat leaving the body by conduction, as it is an insulator.
- d The sweat glands do secrete sweat onto the surface of the skin when we are too hot, but this liquid is not cold. It cools the body because the water in the sweat evaporates, and this process takes heat energy from the skin.
- e The blood capillaries do not move at all. The arterioles that supply the blood capillaries near the surface of the skin get wider (dilate) when you are too hot. This allows more blood to flow through these capillaries, allowing heat to radiate from the blood into the air.
- f Insulin is a hormone, not an enzyme. Enzymes catalyse reactions, but insulin is not a catalyst. Insulin causes enzymes in liver cells to convert glucose to glycogen.
- 3 a A 37.4 °C;
B 37.5 °C; [2]
- b homeostasis;
humans are endothermic;
body produces more heat to maintain body temperature;
shivering;
vasoconstriction; [max 4]
- c air is more insulating than water;
heat lost more easily from the body in water than in air;
by conduction; [max 2]
- d person A was moving but person B remained still; idea that 'new' cold water was constantly coming into contact with A's skin;
water around B's body warms up (as heat is lost from his body to the water);
heat transfers from hot object to cold object;
so more heat lost from A's body than B's body; [max 3]
- 4 a for respiration;
by combining it with oxygen
to provide energy; (*not* 'produce' energy)
for named function (e.g. movement, active transport); [max 3]

b pancreas; [1]

c i starch digested to glucose;
by enzymes / amylase and maltase;
absorbed into the blood from, the small
intestine / ileum; [3]

ii insulin secreted;
causes liver to take up glucose from the blood;
liver converts glucose to glycogen;
(also) glucose used by body cells in
respiration; [max 3]

d negative feedback is a process that brings
concentration back to normal when it rises too
high or too low;
when blood glucose concentration rises too high,
insulin is secreted and reduces it to normal;
when blood glucose concentration drops
too low, glucagon is secreted and raises it to
normal; [3]

e i line rises in similar way from A to B (or
goes higher);
line from B to C and C to D higher than the
original line; [2]

ii no insulin secreted;
when blood glucose rises;
so blood glucose not brought back to
normal; [3]