Year 13 Science: Homeostasis: how animals keep their internal environment stable

Name: _____ Date: _____

Try these without your notes first, then check the answer key.

Practice

1. Name the control centre for body temperature and for water balance.

2. In the class's data, by how much did the core temperature fall in the 10 minutes after exercise?

3. After a big lunch, which hormone rises and which cells release it?

4. Explain how ADH reduces the volume of urine.

5. Why does a skink bask on a rock in the morning?

6. A runner loses 2 L of sweat in a hot half marathon. Explain how the body reduces further water loss.

7. Why does glucose stay high after meals in type 1 diabetes?

8. Explain why hypothermia gets worse faster once the core falls below about 32 °C.

Fix the mistake

9. Correct this statement: "When you are hot, the blood vessels move closer to the skin."

10. Correct this statement: "Glucagon is stored in the liver and turned into glucose."

11. Correct this statement: "Negative feedback keeps the temperature at exactly 37 °C."

12. Correct this statement: "Ectotherms are cold-blooded, so they cannot control their body temperature."

Answer key (for parents and tutors)

1. Name the control centre for body temperature and for water balance.
   The hypothalamus controls both.
2. In the class's data, by how much did the core temperature fall in the 10 minutes after exercise?
   37.9 − 37.1 = 0.8 °C.
3. After a big lunch, which hormone rises and which cells release it?
   Insulin, released by beta cells in the islets of the pancreas.
4. Explain how ADH reduces the volume of urine.
   ADH makes collecting duct cells insert aquaporins into their membranes, so more water moves back into the blood by osmosis and less leaves as urine.
5. Why does a skink bask on a rock in the morning?
   It is an ectotherm, so it absorbs heat from the sun and the warm rock to raise its body temperature until its enzymes and muscles work well enough to hunt.
6. A runner loses 2 L of sweat in a hot half marathon. Explain how the body reduces further water loss.
   Sweating makes the blood more concentrated; osmoreceptors in the hypothalamus detect this and the posterior pituitary releases more ADH, so the collecting ducts reabsorb more water and less urine is made, and thirst makes the runner drink.
7. Why does glucose stay high after meals in type 1 diabetes?
   The beta cells have been destroyed by the immune system, so no insulin is released; muscle and fat cells do not move GLUT4 into their membranes and the liver does not store glycogen, so glucose stays in the blood.
8. Explain why hypothermia gets worse faster once the core falls below about 32 °C.
   The hypothalamus and muscles are too cold to keep up shivering, and enzymes slow, so less heat is made; as heat production falls the core cools faster, a positive feedback that negative feedback can no longer correct.
9. Correct this statement: "When you are hot, the blood vessels move closer to the skin."
   Blood vessels do not move; the skin arterioles widen, so more blood flows through the surface capillaries.
10. Correct this statement: "Glucagon is stored in the liver and turned into glucose."
    Glycogen is the stored carbohydrate; glucagon is the hormone that tells the liver to break glycogen down.
11. Correct this statement: "Negative feedback keeps the temperature at exactly 37 °C."
    It keeps the temperature within a narrow range, with small swings above and below the set point.
12. Correct this statement: "Ectotherms are cold-blooded, so they cannot control their body temperature."
    Ectotherms regulate mostly by behaviour, such as basking or sheltering, and can hold a fairly steady temperature.