

## Section 9.1: Maintaining an Internal Balance

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1. Homeostasis is the process by which the body maintains an internal environment that is adequate for proper function. Examples may include: sweating when hot; shivering when cold
2. The body is continuously responding to changing external conditions, which are rarely held constant. Therefore, the body must always be adjusting its internal conditions to maintain homeostasis.
3. When the body is too hot, it sweats; this would involve the nervous system and the integumentary system. When the body is cold, it shivers; this would involve the nervous system and the muscular system. Note: Other systems may be included with explanations.
4. Answers may vary. Sample answer: When an animal is under attack, the body purposefully increases blood flow and adrenaline levels to increase the chances of survival. It would not be advantageous to maintain a balance of these variables during an attack.
5. Answers may vary. Sample answer: Humans monitor and control the sugar and starches that they eat to control blood glucose levels. They also take insulin and other medications to artificially maintain their blood glucose levels.
6. Answers may vary. Sample answer: Some examples of diagnostic tools in the body include: the brain, pain receptors, hunger pangs, thirst, etc.
7. When a car is put on cruise control it has a set speed limit that it will travel. At times this speed may vary by a few kilometres per hour, but in general the system will maintain the set speed. If the car starts to go up a hill, the systems will automatically increase the amount of fuel given to maintain the set speed. If the car starts to come down a hill, the car will automatically decrease the amount of fuel given in order to maintain the set speed. It is the same with homeostasis—the body has a set limit for many variables. If one of these limits increases or decreases, the body will sense this change and automatically try to fix the problem to maintain the pre-set limits. Cruise control is a good metaphor for homeostasis—both involve constant monitoring of levels, and automatic small adjustments when those levels fall below (or rise above) a set point.
8. (a) Other members of the dog family maintain temperature homeostasis by panting, seeking shade and swimming to keep cool.  
(b) Elephants also probably maintain temperature homeostasis (i.e., keep cool) by dissipating heat from the large surface area of their ears.
9. Often the body will go outside the bounds of normal homeostasis to fight off diseases, e.g., a fever.
10. Indications that levels of certain molecules in the muscles are outside of a normal homeostatic range are the muscles get sore, cramp and/or reach exhaustion.
11. Homeostasis requires that certain internal parameters are constantly monitored and adjusted to maintain a balanced environment. These parameters (e.g., body temperature) must be “regulated,” or maintained within a very tight range. To accomplish this regulation, “feedback” loops sense changes in the environment and adjust the environment to achieve homeostasis. In this context, feedback is a type of regulation that results in homeostasis.

**12.** Temperature receptors in the skin detect external temperature. Temperature receptors in the hypothalamus detect the temperature of the blood. The hypothalamus acts as a processing centre, receiving information from the temperature receptors, and triggering the sweat glands and muscles. At high body temperatures, more sweat is produced by sweat glands, which cools the body when it evaporates. Also, blood vessels supplying the capillaries of the skin dilate allowing more blood to flow through skin capillaries, thereby increasing energy loss. Exposure to very hot temperatures produces increased sweating. This can cause dehydration. A dehydrated person may not be able to produce enough sweat to regulate temperature and core body temperature may increase without control. When core body temperature becomes too high the normal mechanisms for controlling body temperature break down.