

## **CHAPTER 40**

### **BASIC PRINCIPLES OF ANIMAL FORM AND FUNCTION**

#### **Learning objectives:**

##### **Animal Form and Function**

1. Distinguish between anatomy and physiology.
2. Explain how physical laws constrain animal form.
3. Use examples to illustrate how the size and shape of an animal's body affect its interactions with the environment.
4. Describe the challenges and benefits that come with complex animal form.
5. Define the terms tissue, organ, and organ system. Name the four main categories of tissues.
6. Distinguish among collagenous fibers, elastic fibers, and reticular fibers.
7. Describe the functions of macrophages and fibroblasts within connective tissue.
8. From micrographs or diagrams, correctly identify the following animal tissues, explain how their structure relates to their functions, and note examples of each type.
  - a. Epithelial tissue
  - b. Connective tissue
    - i. Loose connective tissue
    - ii. Cartilage
    - iii. Fibrous connective tissue
    - iv. Adipose tissue
    - v. Blood
    - vi. Bone
  - c. Muscle tissue
    - i. Skeletal muscle
    - ii. Cardiac muscle
    - iii. Smooth muscle
  - d. Nervous tissue
    - i. Neuron
    - ii. Glial cell
9. Compare and contrast the nervous and endocrine systems with respect to specificity of target cells and speed and duration of response.

##### **Regulating the Internal Environment**

10. Distinguish between regulators and conformers for a particular environmental variable. Explain how an animal may be both a regulator and a conformer.
11. Define homeostasis. Describe in general terms how an animal maintains homeostasis.
12. Distinguish between positive and negative feedback mechanisms. Which type of mechanism contributes to homeostasis?
13. Define thermoregulation. Explain in general terms how endotherms and ectotherms manage their heat budgets.
14. Name four physical processes by which animals exchange heat with their environment.

15. Discuss the role of hair, feathers, and adipose tissue in insulation.
16. Explain the role of vasoconstriction and vasodilation in modifying the transfer of body heat with the environment.
17. Describe how a countercurrent heat exchanger may function to retain heat within an animal body.
18. Describe animal adaptations to augment evaporative cooling.
19. Describe thermoregulatory mechanisms utilized by endothermic invertebrates.
20. Explain the mechanisms by which endotherms may increase their metabolic heat production.
21. Explain how ectotherms and endotherms may acclimatize to changing environmental temperatures.

### **The Bioenergetics of Animals**

22. Define bioenergetics.
23. Describe the basic sources of chemical energy and their fate in animal cells.
24. Define biosynthesis.
25. Define metabolic rate and explain how it can be determined for animals.
26. Distinguish between basal metabolic rate (BMR) and standard metabolic rate (SMR). Identify the broad categories of animals to which each term applies.
27. State the equation that describes the relationship between metabolic rate and body size. Describe a hypothesis to explain this relationship.
28. Describe, in broad terms, how the energy budgets of small and large endotherms differ.
29. Describe, in broad terms, how the energy budgets of ectotherms and endotherms of similar size differ.
30. Define torpor, hibernation, estivation, and daily torpor.