CHAPTER 1 READING QUESTIONS

These reading questions are designed to help you focus your reading on the most important points in the chapter. They are arranged using chapter section headers so that the file can be easily edited to reflect the material covered in class.

1.1 PHYSIOLOGY IS AN INTEGRATIVE SCIENCE

1. List the 10 levels of organization, starting with atoms and ending with the biosphere. (Fig. 1.1)
2. List the 10 human organ systems. (Fig. 1.2)
3. Practice mapping in Figure 1.3, *Focus on … Mapping*. (Use a separate sheet of paper.)

1.2 FUNCTION AND MECHANISM

4. Use possible answers to the question "Why do we breathe?" to explain the difference between a teleological approach and a mechanistic approach.

1.3 THEMES IN PHYSIOLOGY

5. List and briefly describe the four major physiological themes (and any sub-themes) discussed in this book. (Tbl. 1.1)

1.4 HOMEOSTASIS

6. Define homeostasis. (Fig. 1.4)
7. Explain what happens when homeostasis cannot be maintained.

What Is the Body's Internal Environment?

8. Explain the difference between extracellular fluid and intracellular fluid. How do they relate to compartmentation? (Fig. 1.5)

Homeostasis Depends on Mass Balance

9. Define the law of mass balance. Express as an equation. (Fig. 1.6)

10. How is mass balance maintained?

11. Express *mass flow* as an equation. What are scientists measuring when they calculate mass flow of a substance?

Excretion Clears Substances from the Body

12. Define clearance. What organs are primarily responsible for clearance in the body?

Homeostasis Does Not Mean Equilibrium

13. Explain the difference between equilibrium and steady state.

14. If homeostasis does not mean equilibrium, then what does it mean? (Fig. 1.7)

15. What is the goal of homeostasis?

1.5 Control Systems and Homeostasis

16. Diagram the four components of a simple control system. (Fig. 1.8)

Local Control Is Restricted to a Tissue

17. Define local control and give an example. (Fig. 1.9)

Reflex Control Uses Long-Distance Signaling

18. Define reflex control.

19. Distinguish between a response loop and a feedback loop.

20. Diagram the seven steps of a reflex response loop. (Fig. 1.10)

Response Loops Begin with a Stimulus

21. Use the example of a house with both air conditioning and heating to explain how the two climate-control systems exert antagonistic control over the temperature in the house.

Feedback Loops Modulate the Response Loop

22. What is the purpose of a feedback loop?

Negative Feedback Loops Are Homeostatic

23. Sketch a diagram of a negative feedback loop. (Fig. 1.12a)

24. Explain how the setpoint and sensitivity of a system play a role in maintaining homeostasis. (Fig. 1.11)

Positive Feedback Loops Are Not Homeostatic

25. Sketch a diagram of a positive feedback loop. (Figs. 1.12b, 1.13)

26. Explain how a positive feedback loop moves a system away from homeostasis. How is a positive feedback loop shut off?

Feedforward Control Allows the Body to Anticipate Change

27. Define feedforward control and give an example.

Biological Rhythms Result from Changes in a Setpoint

28. Define and describe biological rhythms (or biorhythms). Give some examples. (Fig. 1.14)

29. Distinguish between acclimation and acclimatization.

1.6 The Science of Physiology

Good Scientific Experiments Must Be Carefully Designed

30. In an experiment, what is an independent variable? What is a dependent variable?

31. Why should every experiment have an experimental control?

32. How does a scientific theory differ from a hypothesis? How does a scientific theory differ from a model?

The Results of Human Experiments Can Be Difficult to Interpret

33. Why is a crossover study better than a study in which the experimental and control groups are composed of different organisms from a population?

34. Define and contrast placebo and nocebo effects.

35. Briefly define and contrast the following types of studies: blind study, double-blind study, and double-blind crossover study. What advantage is gained by using a blind or double-blind study or a crossover design?

Human Studies Can Take Many Forms

36. Briefly define and contrast the following types of studies: longitudinal study, prospective study, cross-sectional study, and retrospective study.

37. What is a meta-analysis and how are they useful?

Running Problem: What to Believe?

38. What is a peer-reviewed article? Why do we have journals with a peer-review system?

39. What is a review article?

Focus on … Graphs

40. Identify situations in which it is most appropriate to use a bar graph, a histogram, a line graph, or a scatter plot (Fig 1.15).