

# Integration and Exercise

(revised 2011)

## Thermoregulation

INT 1. Diagram the thermal balance for the body, including heat production (metabolism, exercise, shivering) and heat loss (convection, conduction, radiation, and evaporation). Identify those mechanisms that shift from heat production to heat loss when environmental temperature exceeds body core temperature.

INT 2. Define the thermoregulatory set point. Diagram the negative feedback control of body core temperature, including the role of the hypothalamic set point.

INT 3. Contrast the stability of body core with that of skin temperature. Include the control and mechanisms of cutaneous blood flow and sweating on skin temperature.

INT 4. Identify the mechanisms for maintaining thermal balance in the following environments: desert (120°F), snow skiing (10°F), falling through ice into a lake (water temp 37°F), and snorkeling in 80°F water.

INT 5. Explain how the change in core temperature that accompanies exercise differs from the change in core temperature produced by influenza, which alters the thermoregulatory set point.

INT 6. List and describe the physiological changes that occur as a result of acclimatization to heat and cold.

## Exercise

INT 7. Contrast the normal distribution of cardiac output with the distribution of cardiac output during aerobic (sustained) exercise and anaerobic (brief maximal burst) exercise. Include local regulation of blood flow and the role of capillary reserve in altering skeletal muscle blood flow.

INT 8. Define  $VO_{2MAX}$  and identify situations in which it is limited by cardiac output, pulmonary gas exchange, and skeletal muscle blood flow and oxygen uptake.

INT 9. Explain the control mechanisms responsible for the increases in minute ventilation and heart rate that accompany exercise and how they can occur without any measurable change in arterial blood gas values.

INT 10. Define the effects of exercise training on the heart and coronary circulation and how these changes contribute to an increase in  $VO_{2MAX}$ .

**The American Physiological Society  
Medical Curriculum Objectives Project**

Complete curriculum objectives available at:

<http://www.the-aps.org/medphysobj>

INT 11. Explain how each of the following can alter exercise performance: muscle fatigue,  $VO_{2MAX}$ , anaerobic threshold, gender, and age.

INT 12. Describe how exercise training alters insulin action and glucose entry into cells.

INT 13. Describe the health benefits of exercise training on the cardiovascular, musculoskeletal, endocrine, immune and nervous systems.

INT 14. Explain mechanisms of central and peripheral fatigue.

INT 15. Explain metabolic substrate utilization at varying intensities and durations of exercise and the impact on weight control.