

## Applied Exercise and Sport Physiology, with Labs, 4e

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### Chapter 17 – Study Guide Answers

Name four ways the body loses heat to the environment.

1. Conduction
2. Convection
3. Radiation
4. Evaporation

Explain heat exchange by conduction.

It is accomplished through physical contact between one substance and another (e.g., the body loses heat through conduction when submerged in cold water).

Explain heat exchange by convection.

Heat is transferred by a moving fluid-liquid or gas (e.g., man submerged in cold water)

Explain heat exchange by radiation.

Heat is transferred by means of electromagnetic waves (e.g., sun heating the earth)

Explain heat exchange by evaporation.

When a liquid changes to a gas, it requires large amounts of heat energy (e.g., a refrigerator or a human leaving the swimming pool)

How does the body maintain temperature equilibrium within narrow limits under resting conditions?

The regulatory function is brought about by nervous feedback operating through the temperature regulatory center in the hypothalamus.

In what two ways does the temperature regulatory center of the hypothalamus respond when body temperature is too high?

1. It stimulates the sweat glands to secrete, encouraging evaporative heat loss.
2. It inhibits sympathetic centers in the posterior hypothalamus, reducing the vasoconstrictor tone of the arterioles and microcirculation in the skin.

In what three ways does the hypothalamus respond when body temperature is too low?

1. It stimulates shivering.
2. It stimulates catecholamine release, increasing the rate of cellular oxidation.

3. It stimulates the thyroid gland, which increases metabolic rates.

What is the main problem with exercising in cold weather?

Preventing sudden changes in body temperature (chilling)

For winter sports such as hiking, snowmobiling, and ice fishing, what is the most effective method of conserving heat?

Protecting the torso, for example with a down-filled vest, helps maintain core body temperature.

What is the best clothing to wear for very intense winter sports?

Name three characteristics of that clothing.

1. Should keep athlete warm while waiting to perform and warming up
2. Part of clothing should be able to be removed after warm-up
3. Should be light-weight to allow sweat to evaporate efficiently

Name three effects of cold acclimatization.

1. Increased basal metabolic rate
2. Decreased peripheral circulation
3. Increased body fatness

How does wind chill affect an individual exercising in cold weather?

It requires a dramatic increase over resting metabolism in order for the body to maintain thermal balance.

Why is it more difficult to exercise in a hot environment than in a cold one?

When environmental temperature approaches skin temperature, heat loss through convection and radiation gradually ends, so that the only means for heat loss is evaporation of sweat. Radiation and convection reverse their direction and add heat to the body.

What are the two main problems that could result from exercising in a hot, dry environment?

1. Severe loads on the cardiovascular system due to increases in heart rate to meet the demands of both exercising muscles and skin circulation.
2. Dehydration because voluntary thirst does not ensure adequate water replacement during exercise.

How do the problems of exercising in a hot, humid environment compare to exercising in a hot, dry environment?

The problems of increased cardiovascular loads and dehydration are aggravated in a hot, humid environment because of the body's decreased ability to unload water vapor into an already loaded ambient atmosphere.

List some of the guidelines for maintaining proper hydration in athletes during practice or competition during hot weather.

- Weigh in without clothes before and after exercise
- For each pound of body weight lost during exercise, drink two cups of fluid
- Drink a rehydration beverage containing sodium
- Drink 17 to 20 ounces of fluid two to three hours before practice or competition
- Drink 7 to 10 ounces of fluid 10 to 20 minutes before the event
- Drink at least 7 to 10 ounces of fluid every 10 to 20 minutes during an event
- Do not restrict fluids before or during exercise
- Avoid beverages containing caffeine or alcohol

Name some ways to prevent heat-related illnesses.

- Education
- Clothing
- Hydration
- Fitness

What is exertional hyperthermia?

An elevated core body temperature greater than 104 degrees Fahrenheit that occurs during athletic or recreational activities

What are some effects of acclimatization to a hot climate?

- Cooler skin and core temperatures
- Greater portion of cardiac output available to muscle blood flow
- Reduction of the level of skin blood flow for temperature regulation

What are some of the causes for the decrease in aerobic power when exercising at high altitudes?

- Reduction in oxygen saturation of arterial blood
- Higher cost of increased lung ventilation

Acclimatizing to high altitudes results in an increase of which physiological mechanisms?

- red blood cell count
- hemoglobin content in the blood
- plasma volume
- lung ventilation
- aerobic enzyme activity
- capillary density
- mitochondrial density in skeletal muscle