

Analysis of a System Maintaining Homeostasis

OBJECTIVE/RATIONALE

Survival is dependent on maintaining homeostasis. The student will investigate the process of how homeostasis maintains a stable internal body temperature when the external temperature changes.

TEKS 121.13 (c) 2C, 2D, 6A, 6B
Physics 7A, 7B

TAKS ELA 1, 5, 6
Mathematics 1, 4, 8, 10
Science 1, 3

National Science Standards A9-12; C9-12; F9-12; G9-12
National Health Care Skills Standards .01, .07
National Math Standards S1; S3

KEY POINTS

****Homeostasis Power Point Presentation**

- I. Homeostasis is the state of body equilibrium, or the maintenance of a stable internal environment.
- II. Homeostatic mechanisms operate at all levels of organization in the body, including the molecular, cellular, tissues, organs, and systems.
- III. There are two basic methods of gaining heat in our body:
 - a. metabolism
 - b. environmental changes
- IV. There are four basic methods of losing heat from our body:
 - a. evaporation- heat loss from converting water from a liquid to a vapor
 - b. conduction- through direct contact between objects (such as water)
 - c. convection- process of conduction where one object is in motion
 - d. radiation- loss of heat to the environment due to the temperature gradient
(This occurs only as long as the ambient temperature is below 98.6 F.)
- V. Mechanisms to cool the body.
 - a. Sweating
 - b. Blood vessel dilation
- VI. Mechanisms to warm the body.
 - a. Shivering – constriction of blood vessels
 - b. Dermal blood vessels – slow passive heat loss

ACTIVITIES

- I. Complete the **Maintaining Homeostasis Laboratory Investigation**.

MATERIALS

Deep enamel, plastic, or aluminum pan

Water

Ice

Ohmmeter

6 V dc source

Milliammeter

Thermistor (Science Kit & Boreal product number: 69601-08)

www.sciencekit.com (800) 828-7777

oral thermometer

Goggles

Biohazard containers

Surface disinfectant

Paper towels

ASSESSMENT

Laboratory Investigation Rubric

ACCOMMODATIONS

For reinforcement, the student will research the effects of hyperthermia resulting from excessive athletic activity.

For enrichment, the student will research and report on the use of hypothermia as an adjunct to treatment.

REFLECTIONS

MAINTAINING HOMEOSTASIS

Purpose:

The purpose of this lab is to illustrate that regardless of changes in the external environment, our body, through homeostatic mechanisms, maintains a constant internal environment. The student will record changes in oral temperature, skin temperature, and skin color to observe how homeostatic mechanisms maintain normal temperature within the body.

Background Information:

Materials:

Deep enamel, plastic, or aluminum pan

Water

Ice

Ohmmeter

6 V dc source

Milliammeter

Thermistor

Oral thermometer

Goggles

Biohazard containers

Surface disinfectant

Paper towels

Procedure:

1. Wash hands and put on goggles.
2. Assemble equipment and materials.
3. Prepare work area.
4. Record oral temperature and dermal temperature (of arm) using a thermistor-thermometer.
5. Submerge one arm in a pan of water containing ice which is maintained 10-15 degrees less than room temperature.
6. Record oral temperature and dermal temperature (of the submerged arm) using a thermistor-thermometer each minute for at least five consecutive readings.
7. Clean work area with surface disinfectant. Remove goggles and wash hands.

Data:

Design a data table and prepare a graph illustrating the simultaneous mouth and skin readings at each one minute interval.

Conclusion:

1. Compare and contrast the oral temperature to the dermal temperature.
2. Describe the process of a fever, including benefits and possible damaging effects.
3. Predict the effect of fever on pulse respiration and blood pressure.