

ENERGY PRODUCTION

OBJECTIVES/RATIONALE

Knowledge of metabolism and energy production is important in diagnosing diseases and disorders associated with the digestive system and nutrition. The student will develop an understanding of energy extraction from nutrients and identify metabolic disorders associated with energy metabolism.

TEKS 121.24 1C, 1D

TAKS ELA 1, 3, 4, 5, 6
Science 2, 4

KEY POINTS

I. Metabolism

- A. The sum of all the chemical reactions that take place in living cells.
- B. Energy metabolism includes all the reactions included in extracting energy from food nutrients and providing it to the body's cells.
- C. Energy yielding nutrients are broken down into smaller molecules to yield ATP's in the energy pathways.
 - 1. carbohydrates are broken down to glucose units
 - 2. lipids are broken down to yield glycerol and fatty acids
 - 3. proteins are broken down to amino acids
- D. Although alcohol can be broken down and enter the energy pathways it is not considered a nutrient.
- E. The end product of all energy pathways
 - 1. energy in the form of ATP's
 - 2. H₂O
 - 3. CO₂
- F. Reactions found in the energy pathways
 - 1. Anabolism
 - a. large molecules are made from smaller molecules
 - b. requires energy
 - c. Examples include the making of
 - aa. glycogen from glucose
 - bb. triglycerides from glycerol and fatty acids
 - cc. proteins from amino acids
 - 2. Catabolism
 - a. large molecules are broken down into smaller ones
 - b. usually releases energy
 - c. examples include the breakdown of
 - aa. glycogen into glucose
 - bb. triglycerides into glycerol and fatty acids
 - cc. proteins into amino acids

- G. Catalyst – substances that are needed for a reaction to take place but are not used up or changed in the reaction.
 - 1. enzymes – proteins that act as catalyst
 - 2. coenzymes – organic molecules that help enzymes to do their job (some B vitamins)
 - 3. cofactors – inorganic substances that are needed for a reaction to take place.
- II. Glycolysis (Anaerobic respiration)
 - A. The metabolic breakdown of glucose into pyruvate.
 - B. Anaerobic and takes place in the cytoplasm.
 - C. Yields energy in the form of ATP
- III. TCA Cycle (Aerobic respiration)
 - A. Oxygen must be present for pyruvate to enter the TCA cycle.
 - B. Takes place in the mitochondria.
 - C. Yields more energy (ATP) than glycolysis.
- IV. Electron Transport Chain
 - A. Aerobic
 - B. A series of proteins that serve as electron carriers found in the mitochondria.
 - C. Energy is released each time the electron is passed from one carrier to another.
 - D. The energy is captured by ATP or escapes as heat
 - E. After all the useable energy is captured by ATP's low energy electrons and their H's are joined with O to make H₂O. Energy cannot be extracted from H₂O by cells.

ACTIVITIES

- I. Create a 3-D model depicting energy extraction from one of the nutrients.
- II. Research and report on how advertisements mislead the public in relation to energy production and energy use, such as fat busters, vitamins giving energy, etc.

MATERIALS NEEDED

Assorted materials for model
Newspapers
Magazines
Periodicals
Journals
Public TV

ASSESSMENT

Oral Presentation Rubric
Project Rubric

ACCOMMODATIONS

For reinforcement, the student will create a flow chart representing energy extraction from one of the nutrients.

For enrichment, the student will research metabolic disorders associated with energy production, such as diabetes, lactose intolerance, etc.

REFLECTIONS
