Physical Science
Study Guide
Unit 4 Test – Friday, March 18

Key Terms:

- Energy
- Chemical Energy
- Energy Conversion
- Fossil Fuels
- Elastic Potential Energy
- Kinetic Energy
- Electrical Energy
- Nuclear Energy
- Power
- Gravitational Potential Energy
- Potential Energy
- Mechanical Energy
- Photosynthesis
- Watt
- Law of Conservation of Energy
- Joule
- Thermal Energy
- Turbine
- Horsepower
- Electromagnetic Energy

Test Material by Subject:

The Nature of Energy

- Understand what energy is
- 2 Kinds:
  - Kinetic
    - Understand that kinetic energy is dependent on mass and velocity (more on velocity than mass)
    - Given a mass and a velocity, be able to calculate the kinetic energy.

Example: A ball has a mass of 5kg and is moving at 15m/s. What is the ball's kinetic energy?	
m = 5kg v = 15m/s $E_K = \frac{1}{2}mv^2$	$E_K = \frac{1}{2}(5kg)\left(\frac{15m}{s}\right)^2$ $E_K = \frac{1}{2}(5kg)\ 225\frac{m^2}{s^2}$ $E_K = 562.5\ J$

  - Potential
    - Elastic potential energy
      - Be able to give examples of objects with elastic potential energy
      - Understand the difference between elastic potential energy and kinetic energy
    - Gravitational potential energy
      - Understand that gravitational potential energy is dependent on mass (or weight) and height.
      - Be able to calculate the gravitational potential energy given an object's weight or mass and its height.

Example: Batman is standing on the edge of a building that is 250m tall. If he has a mass of 65kg, what is his gravitational potential energy?	
m = 65kg a = 9.8m/s^2 $E_P = mgh$	$E_P = (65kg)\left(\frac{9.8m}{s^2}\right)(250m)$ $E_P = 159250\ J$

- There are 6 types of energy; be able to recognize examples of each.
  - Mechanical
  - Chemical
  - Thermal
  - Nuclear
  - Electric
  - Electromagnetic

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Energy Conversion and Conservation

- Be able to discuss how running water can be used to convert energy
- Understand that one type of energy can be converted into most other forms of energy
- Know why input work is less than output work for any machine (why it is not 100% efficient)
- Be able to discuss the energy conversions in a pole vaulting, a pendulum, juggling, and/or a waterfall.
- Understand the law of conservation of energy. Be able to discuss it and Einstein's revision of the law.
- Understand that kinetic energy is converted into potential energy and vice versa. Be able to use this fact to calculate the amount of one kind of energy from the other.

Example: A skydiver has a mass of 50kg and jumps from a plane at 3810m. What is his kinetic energy at 2000m?	
m = 50kg a = 9.8m/s^2 h_1= 3810m h_2 = 2000m $E_P = mgh$	$E_P = (50kg)\left(\frac{9.8m}{s^2}\right)(3810m)$ $E_P = 1866900\,J$ $E_P = (50kg)\left(\frac{9.8m}{s^2}\right)(2000m)$ $E_P = 980000J$ $E_K = 1866900J - 980000$ $E_K = 886900J$

- Understand the difference between conserving energy and the law of conservation of energy.

Energy Conversions and Fossil Fuels

- Know where fossil fuels come from.
- Be able to describe the process of photosynthesis.
- Be able to describe the energy conversions and conditions required for creating coal (starting with the energy conversions in the sun).
- Understand what we use fossil fuels for and how their energy is converted. Be able to describe this process.
- Understand what a turbine is and how it is used.

Power

- Understand the difference between energy and power.
- Given time and work or force and distance, be able to calculate power.

Example: If 150J of work are done on an object in 10 seconds, what is the power used to do the work?	
W = 150J t = 10s $P = \frac{W}{t}$	$P = \frac{150J}{10s}$ $P = 15watts$

- Understand what horsepower is.
- Know how many watts are in 1 horsepower. Be able to convert between these units.

Example: How many watts are in 350hp?	
hp = 360hp 1hp = 746w	$360hp * \frac{746watts}{hp} = 268560watts$