Types of Energy

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Objectives

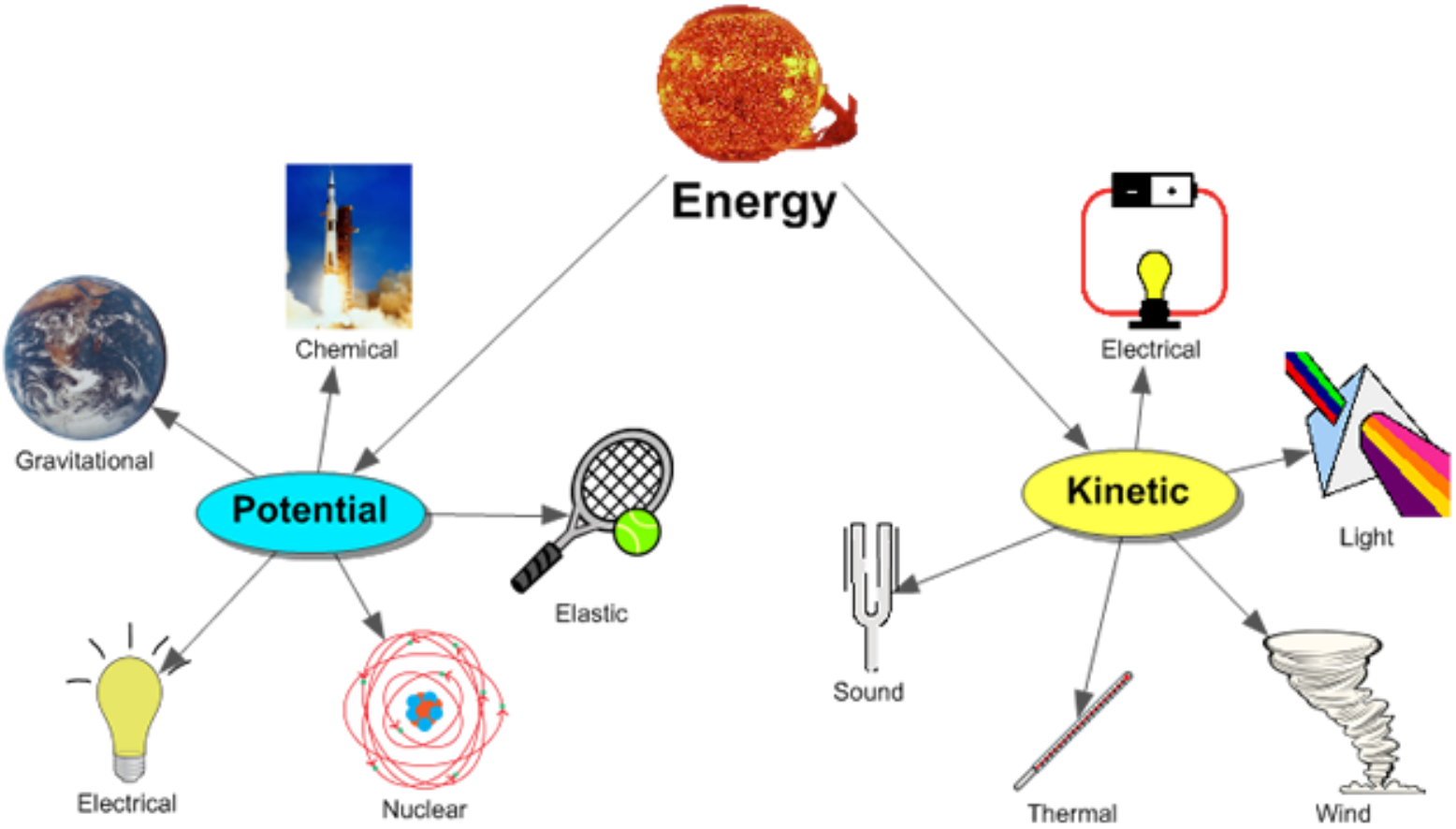
- Calculate the kinetic energy of a moving object.
- Calculate the gravitational potential energy of a system
- Analyze the relationship between work done on or by a system, and the energy gained or lost by that system.

What is energy?

- Energy is the ability or capacity to do work.
  - Work is the process of moving an object.

- Energy is the ability or capacity to move an object!

Energy is all around us!



Energy Transformations

- Energy can be transformed from one type to another.
- You can transfer energy from on object to another by doing work.

- Work-Energy Theorem
  - Work done on a system by an external force changes the energy of the system.
  - $W = Fd\ Cos\theta = \Delta E_T$

Units of energy

- Units of energy are the same as the units of work, joules (J).

- $1\ J = 1\ N \times m = \frac{1\ kg \times m^2}{s^2}$

Kinetic Energy

- Kinetic Energy is energy of motion
  - The ability or capacity of a moving object to move another object

$$KE = \frac{1}{2}mv^2$$

Kinetic Energy Sample

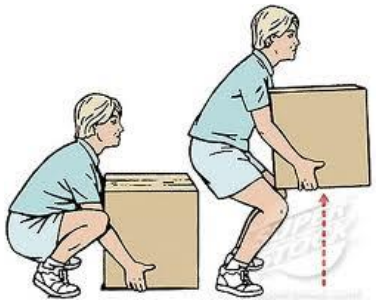
- A toad speeds along on his toad-o-cycle at a constant 30 m/s. If the mass of the toad and motorcycle is 5kg, find the kinetic energy of the toad/cycle system.

Potential Energy

- Potential Energy (PE) is energy an object possesses due to its position or condition.

- Gravitational Potential Energy (PEg) is the energy an object possesses because of its position in a gravitational field (height).

Calculating PEg

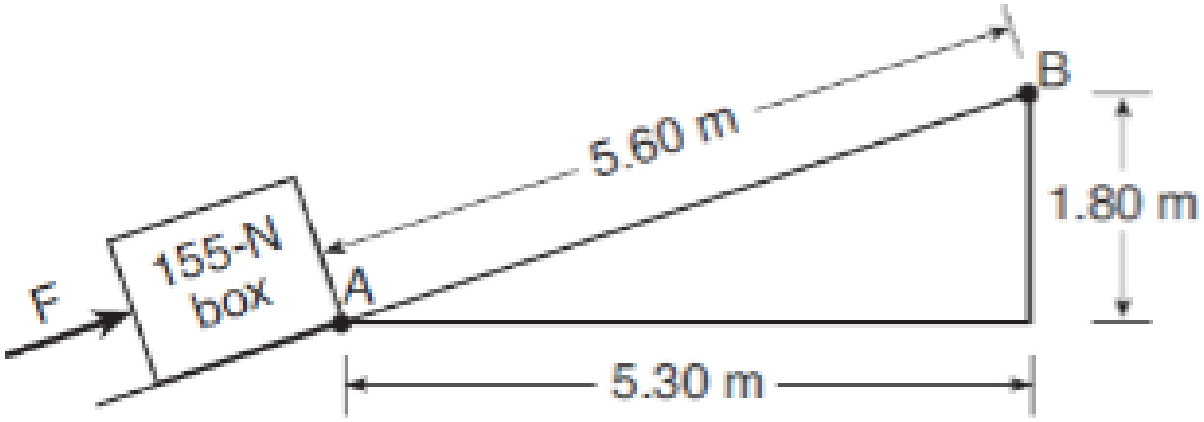


- 10 kg box on the floor
- Set current PEg to 0 as a reference point

$$W = FD =$$

PE_G Sample Problem

- The diagram represents a 155 – newton box on a ramp. Applied force F causes the box to slide from point A to point B. What is the total amount of gravitational potential energy gained by the box?

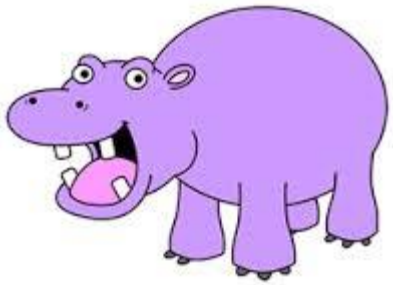


PEG SAMPLE PROBLEM 2

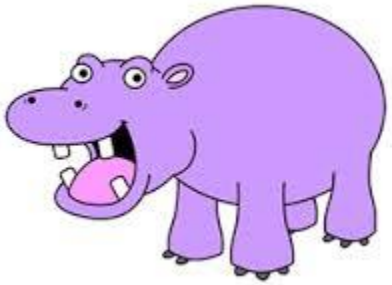
- Which situation describes a system with decreasing gravitational potential energy?

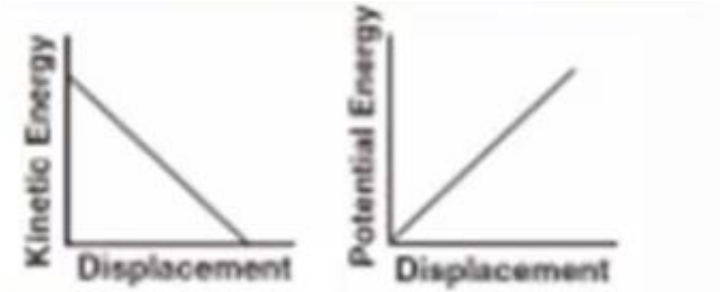
1. A girl stretching a horizontal spring
2. A bicyclist riding up a steep hill
3. A rocket rising vertically from Earth
4. A boy jumping down from a tree limb

PE and KE Sample problem

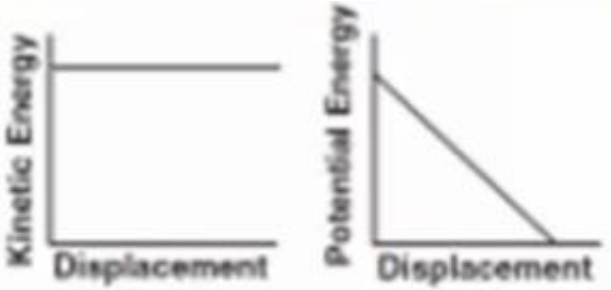


- A hippopotamus is thrown vertically upward. Which pair of graphs best represents the hippo's kinetic energy and gravitational potential energy as functions of its displacement while it rises?

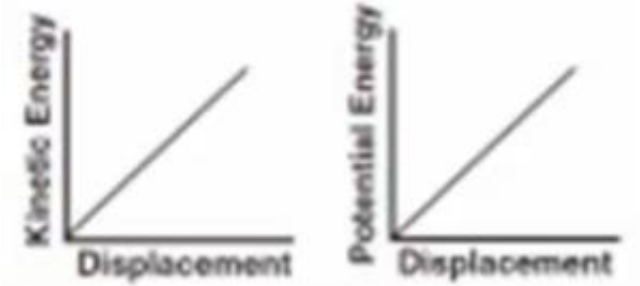



Kinetic Energy
Displacement
Potential Energy
Displacement

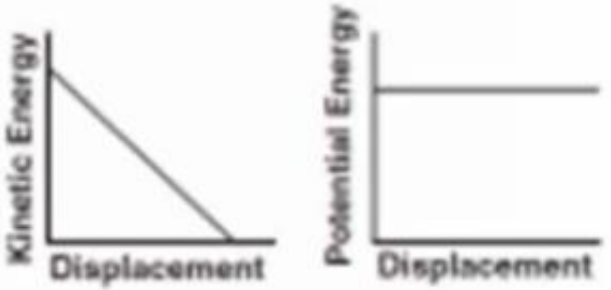
(1)


Kinetic Energy
Displacement
Potential Energy
Displacement

(3)


Kinetic Energy
Displacement
Potential Energy
Displacement

(2)


Kinetic Energy
Displacement
Potential Energy
Displacement

(4)

Sources of energy on Earth

- Source of all energy on Earth is the conversion of mass into ENERGY.

Assignment

- Work KE Problems and PE problems # 1-3