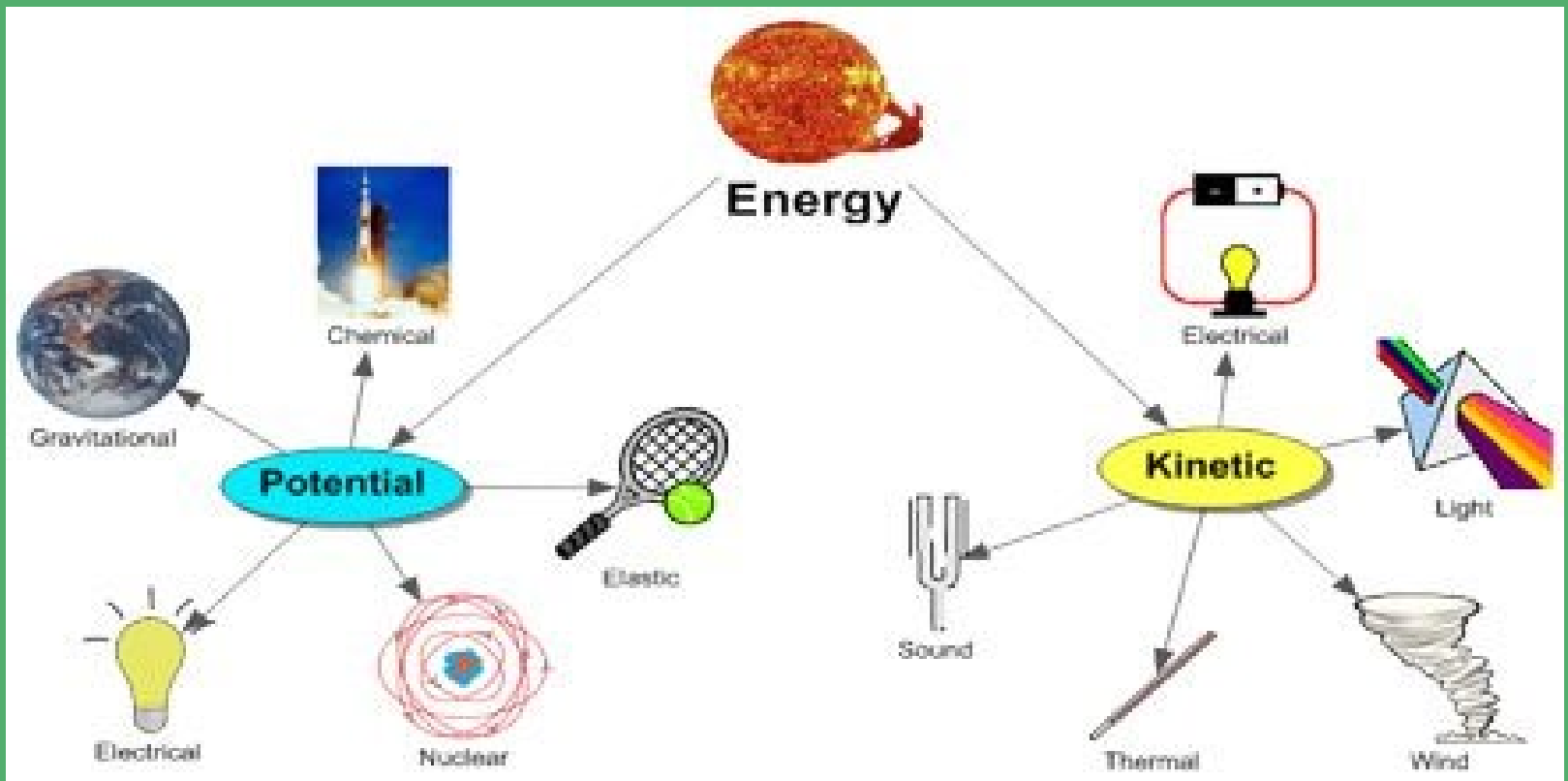
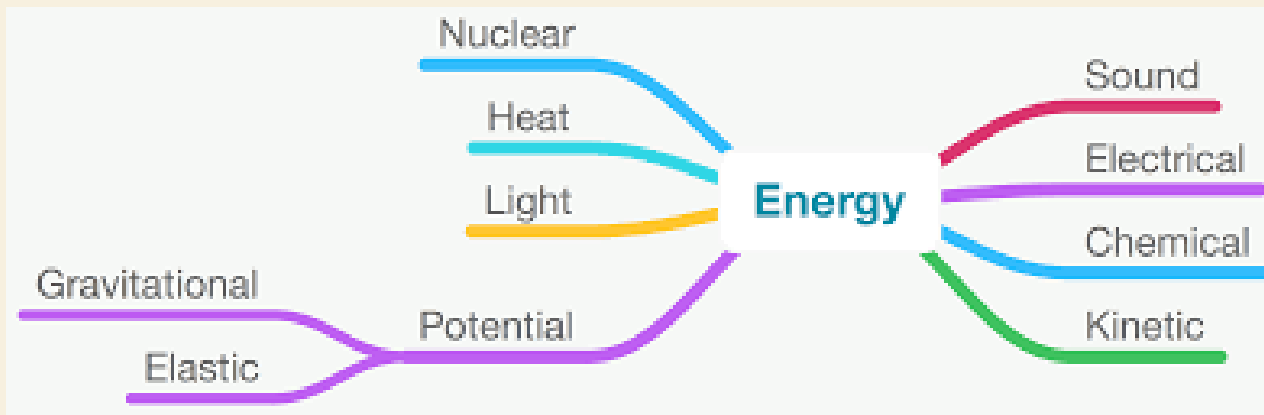


# ENERGY



# ENERGY CAN PRODUCE CHANGE IN A SYSTEM

- There are different forms of energy that exist.
- These forms of energy can be transferred to an object or transformed into another form of energy.



# ENERGY AND SYSTEMS

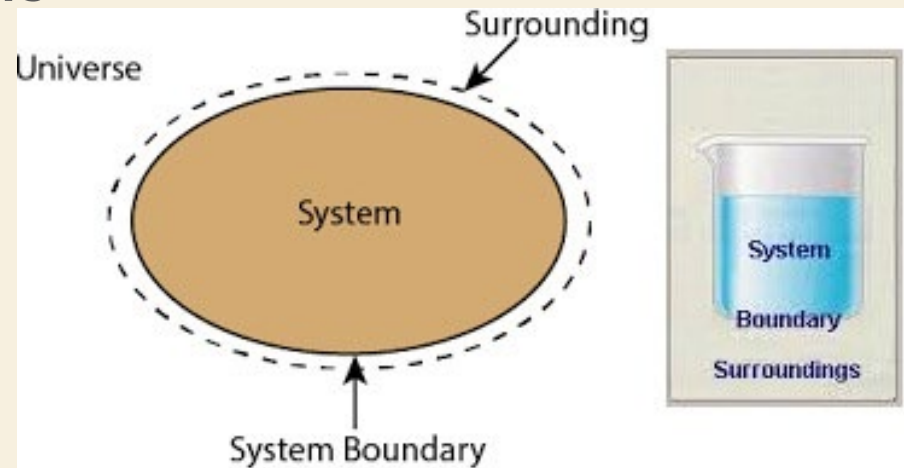
- **Recall:**

- **System:** anything that is under observation

- Defined by the observer

- **Surroundings:** anything that is not part of a system

- Universe = system + surroundings



# DEFINING ENERGY AND SYSTEMS

- A system is something we define
  - May be defined differently depending on the scientist
  - We define the system so that we can study it or the way it interacts with the surroundings.
- Energy produces a change in the system.
- Energy may be added to the system from its surroundings or released from the system to the surroundings



# DISCUSSION QUESTIONS

- I. a) Why can it be a challenge to observe energy directly?
- b) How can this challenge be overcome?

# DISCUSSION QUESTIONS

I. a) Why can it be a challenge to observe energy directly?

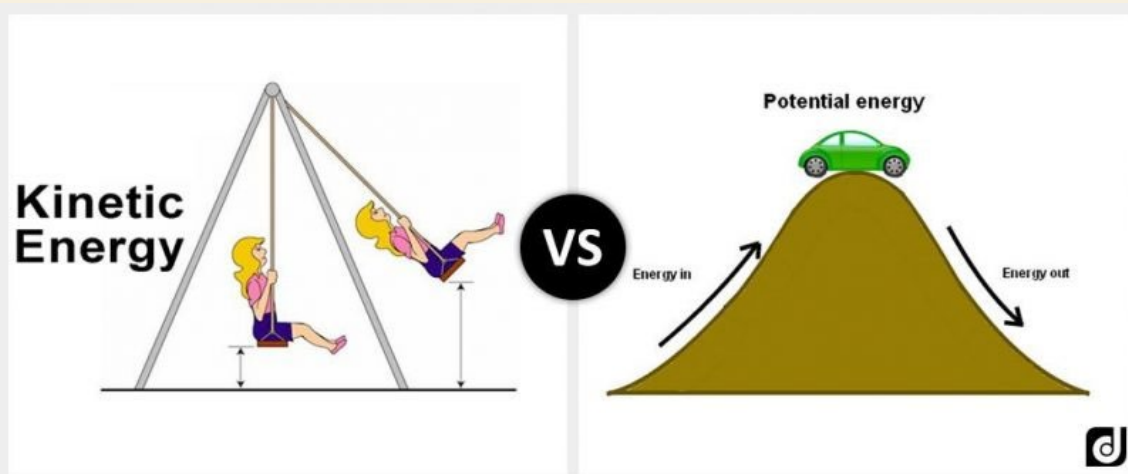
a) Energy cannot be seen

b) How can this challenge be overcome?

b) Observe energy by the effect it has on other things.

# THERE ARE DIFFERENT FORMS OF ENERGY

- There are two main types of energy:
  - 1) **Kinetic energy:** the energy of motion
  - 2) **Potential energy:** the stored energy of an object as a result of its condition or its position

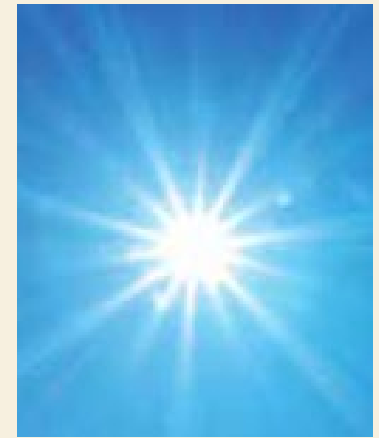


***Kinetic Energy vs. Potential Energy***

# KINETIC ENERGY

- Types of kinetic energy:

- 1) **Mechanical kinetic energy:** energy of an object that is in motion
- 2) **Radiant energy:** energy of electromagnetic waves from an energy source
- 3) **Thermal energy:** energy of random motion of particles in a substance



p. 203 Kinetic energy



# KINETIC ENERGY (CONT'D)

**4) Sound energy:**  
energy of vibrations  
of particles

**5) Electrical kinetic  
energy:** energy of  
electrons moving  
along a wire



p. 203 Kinetic  
energy

# POTENTIAL ENERGY

- Types of potential energy:

## 1) Elastic potential

**energy:** energy stored in a stretched or compressed object



## 2) Chemical potential

**energy:** energy stored in chemical bonds



# POTENTIAL ENERGY (CONT'D)

**3) Gravitational potential energy:** energy due to the position of an object

**4) Nuclear energy:** energy stored in the nucleus of an atom



pp. 204 and 205  
Potential energy

# POTENTIAL ENERGY (CONT'D)

**5) Electrical potential energy:** energy is stored by a separation of positive and negative charges



**6) Magnetic potential energy:** energy stored in a magnetic field



# TIME OUT

- Describing Forms of Energy worksheet
- Pg 132 in workbook

Complete the table below.

<b>Form of Energy</b>	<b>Definition</b>	<b>Classified as kinetic energy or potential energy</b>
mechanical kinetic energy		kinetic energy
	the energy of the random motion of the particles that make up a substance	kinetic energy
sound energy		
	the energy due to the position of an object relative to a reference point, such as the	potential energy

# DISCUSSION QUESTIONS

## \*WE WILL DO TOGETHER

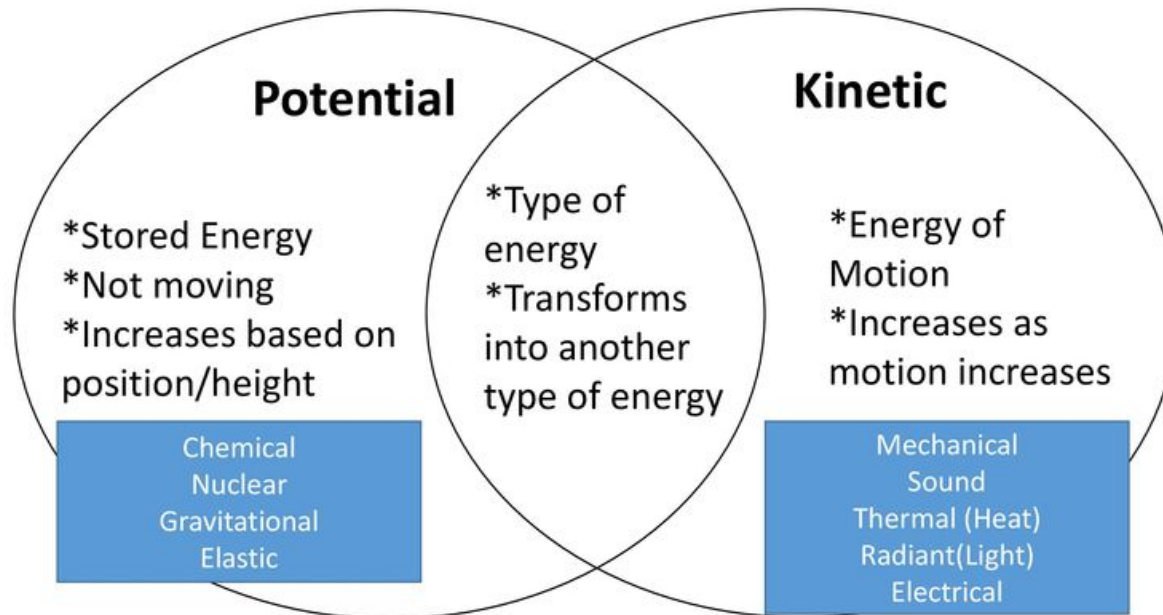
1. Use a Venn diagram to compare kinetic and potential energy.
2. Give one example of each of the following:
  - a) a form of kinetic energy
  - b) a form of potential energy
  - c) a form of energy that has both kinetic and potential energy

# DISCUSSION QUESTIONS

## \*WE WILL DO TOGETHER

- I. Use a Venn diagram to compare kinetic and potential energy

### Venn Diagram of Kinetic vs. Potential Energy



2. Give one example of each of the following:

a) a form of kinetic energy

b) a form of potential energy

c) a form of energy that has both  
kinetic and potential energy

2. a) any one of mechanical kinetic energy, radiant energy, thermal energy, sound energy, electrical kinetic energy

b) any one of chemical potential energy, elastic potential energy, gravitational potential energy, nuclear energy, electrical potential energy, magnetic potential energy

c) electrical energy



# ENERGY CAN BE TRANSFERRED OR TRANSFORMED.

- **Law of conservation of energy:** law stating that energy is neither created nor destroyed, but is transformed from one form of energy to another or transferred from one object to another

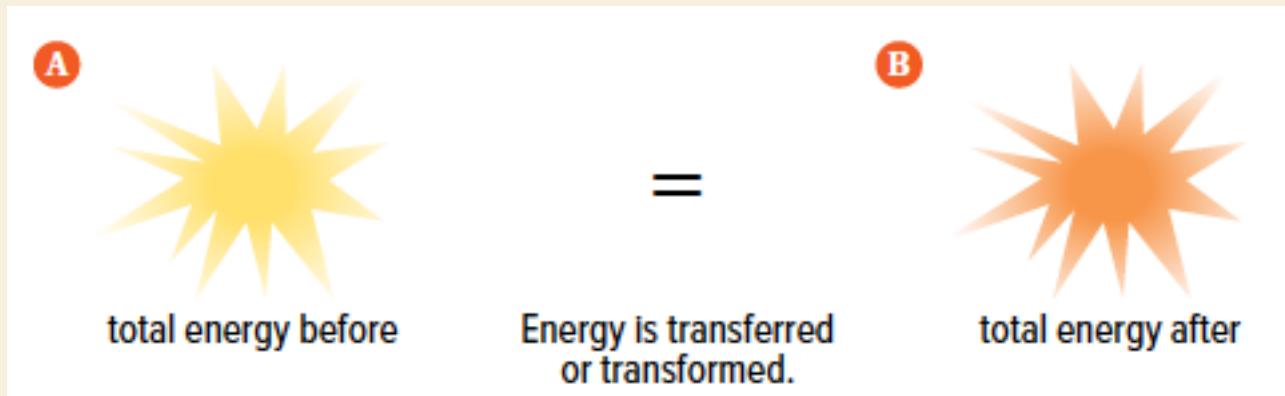


Figure 3.4: According to the law of conservation of energy, energy present before energy transfer or transformation (A) is equal to energy present afterward (B). The form of energy may change (the shapes differ in colour), but the amount of energy remains equal (the size of the shape is the same).

# ENERGY TRANSFORMATION, ENERGY TRANSFER, AND SYSTEMS

- When energy transformations occur, some of the energy is converted into a form that is not useful and it is considered to be “lost.”

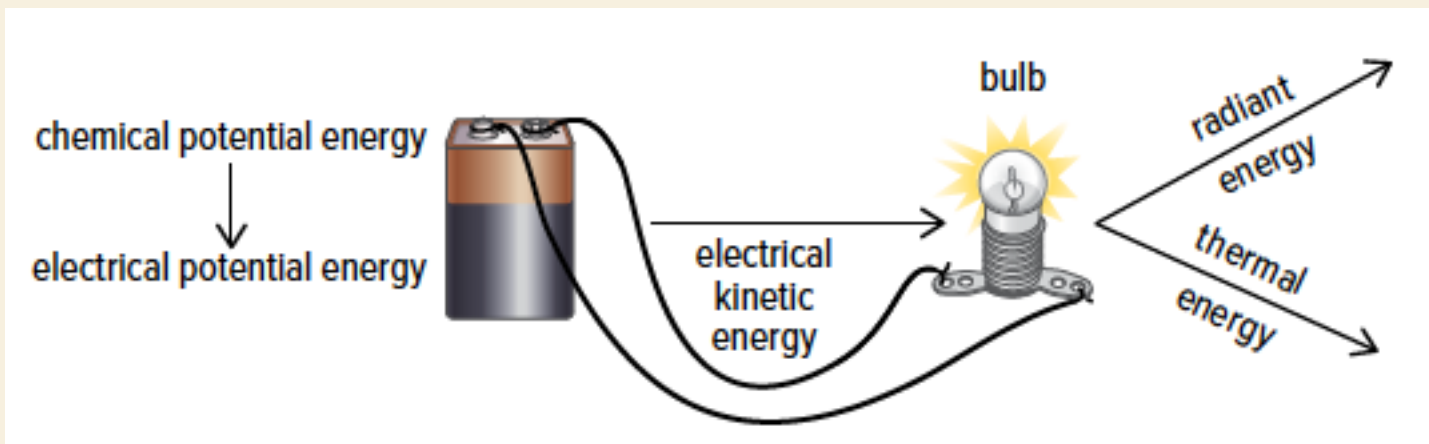
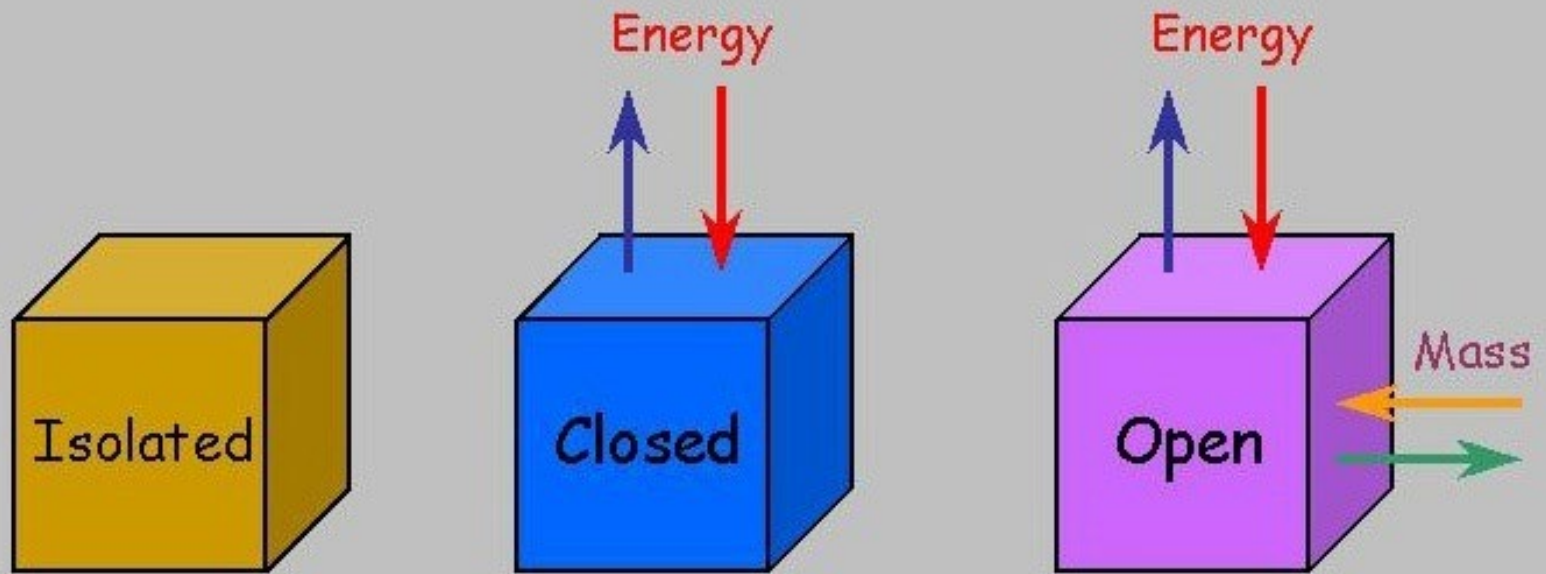


Figure 3.5: Energy is both transformed and transferred in this image, but it is never destroyed. The result is that a useful task is carried out.

# TYPES OF SYSTEMS

- There are three types of systems:
  - 1) Open system: a system that can exchange both energy and matter with its surroundings
  - 2) Closed system: a system that can exchange only energy but not matter with its surroundings
  - 3) Isolated system: a system that cannot exchange energy nor matter with its surroundings



*Three Types of Systems*

# COMPARING ENERGY TRANSFER AND TRANSFORMATION

- When energy is *transferred*, it stays in the same form.
- When energy is *transformed*, it changes into another form of energy.

- How is energy transferred?  
Transformed?



# DISCUSSION QUESTIONS

1. Describe the law of conservation of energy.
2. How do energy transfer and transformation differ?  
How are they similar?
3. Use an example from your everyday life to show how you could change an open system to
  - a) a closed system
  - b) an isolated system

# DISCUSSION QUESTIONS

- I. Describe the law of conservation of energy.
  - I. I. The law of conservation of energy states that energy is neither created nor destroyed. Rather, it is transformed from one form of energy to another or transferred from one object to another.

# DISCUSSION QUESTIONS

2. How do energy transfer and transformation differ?  
How are they similar?

a) **Different:** In energy transformation, one form of energy is transformed into another form of energy. In energy transfer, the form of energy remains the same as the energy is transferred from one object to another.

**Similar:** Energy transfer and transformation both obey the law of conservation of energy. They both enable useful tasks to be carried out. They can both occur within a system or between a system and its surroundings.



# DISCUSSION QUESTIONS

3. Use an example from your everyday life to show how you could change an open system to

a) a closed system

b) an isolated system

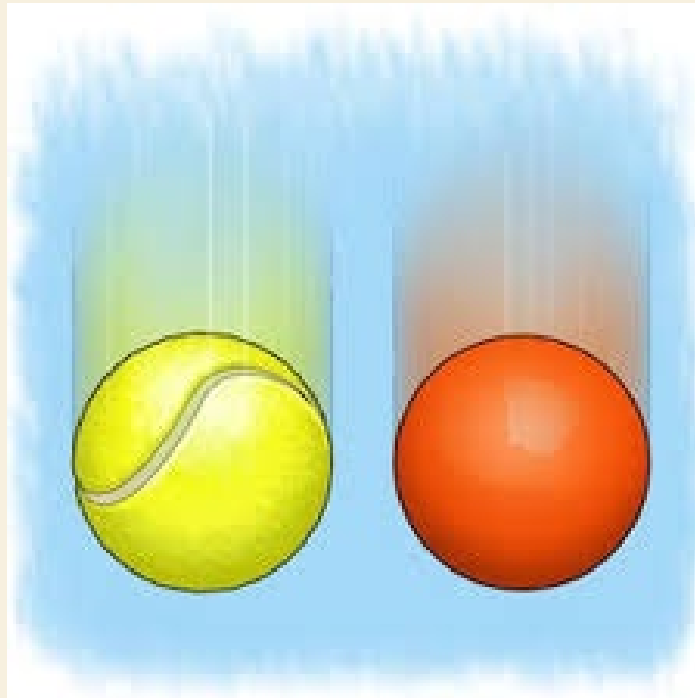
Sample answer: a) I could change an open system to a closed system by putting a lid on a cup of tea. b) I could change the closed system to an isolated system by wrapping the cup of tea in insulation.

# TIME OUT

- Pg 133 in workbook

# TIME OUT

- Energy Thought Experiment



# PHYSICAL QUANTITIES CONTRIBUTE TO DIFFERENT FORMS OF ENERGY.

- Physical quantities (e.g., height, mass, speed, etc.) can affect different forms of energy.
- For example, the higher the object is above the ground, the more gravitational potential energy it has.



# MODELLING ENERGY TRANSFER & TRANSFORMATION

