# GED Science
# Day 7

# Essential Questions

What is energy?

What types of energy exist?

How do we know that things have energy?

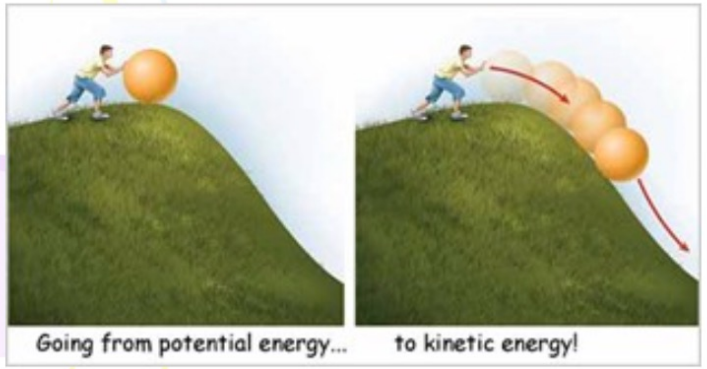
How is energy transferred and conserved?

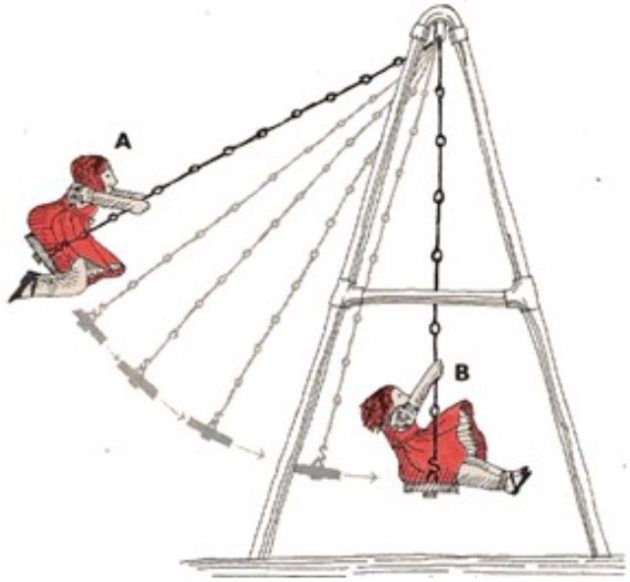
# Look and Observe

- What is this object?
- What do you notice happening?

# What are potential and kinetic energy?

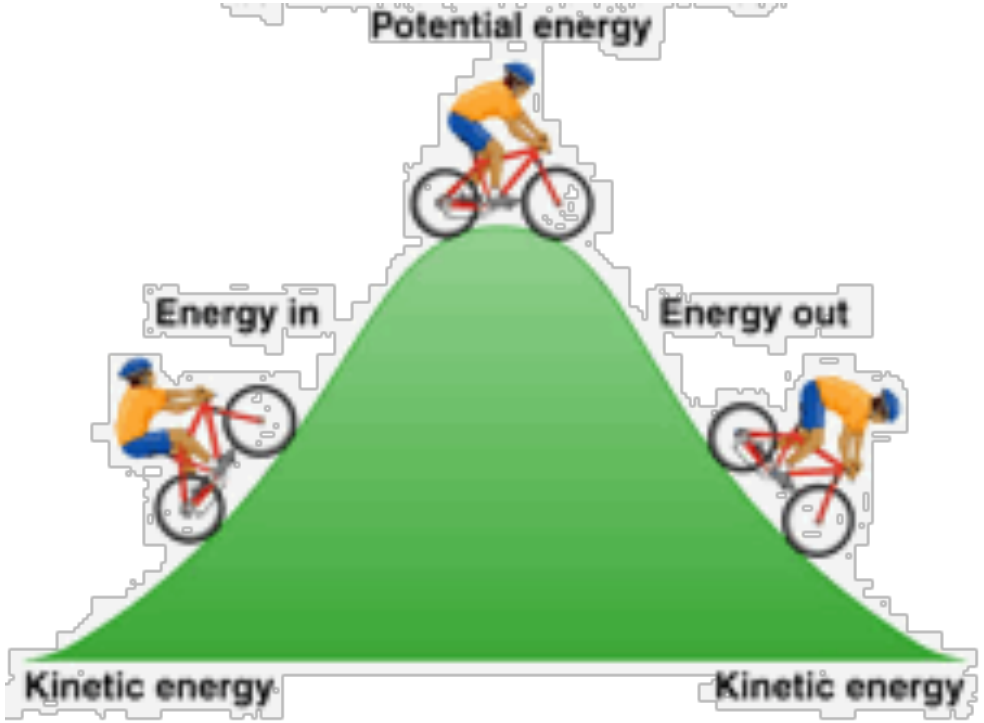
- Potential energy is stored energy or energy waiting to be released.
- Kinetic energy is released energy or energy in motion.



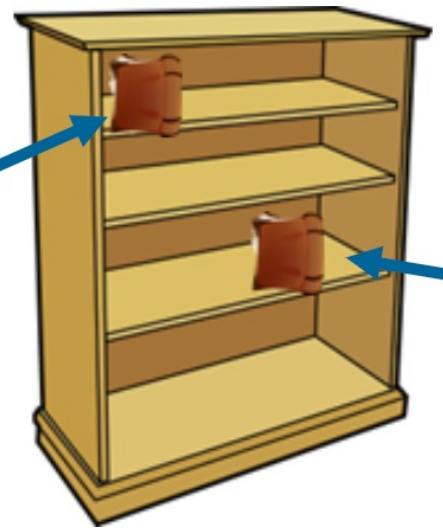
# How does potential energy work?

- When something has potential energy it has the ability to *possibly* move based on its position or size.



# How does position affect potential energy?

1. The higher an object is off the ground the more work was needed to get it there.
2. The more work it takes to move the object to more potential energy it will have.



**More energy need to move book= more potential energy**

**Less energy need to move book= Less potential energy**

# How does size affect potential energy?

1. The larger something is the more work is needed to move the object.
2. The more work needed to move the object the more potential energy it has.

Chihuahua= pick up with one hand= less potential energy

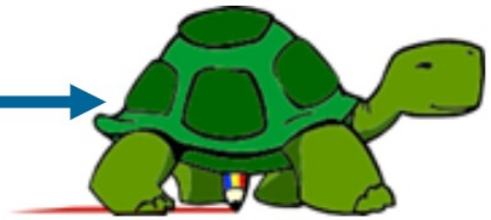
Really big dog=hard to move=more potential energy

# How does kinetic energy work?

- Any moving object has some kinetic energy.
- The faster something is moving the more kinetic energy it has.

Puppy running=fast=more kinetic energy

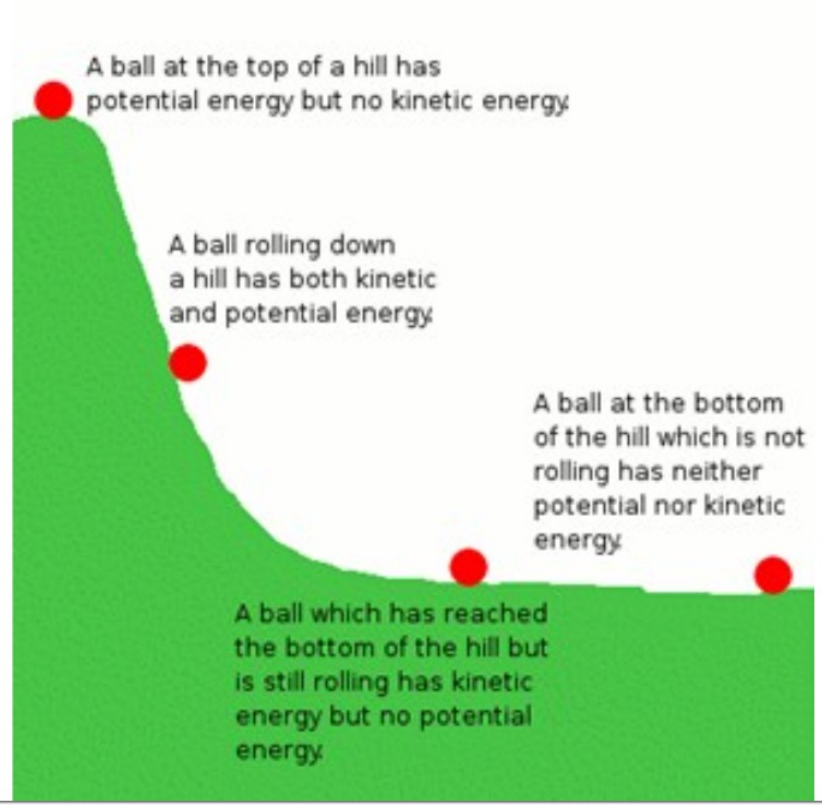
Turtle=slow=less kinetic energy



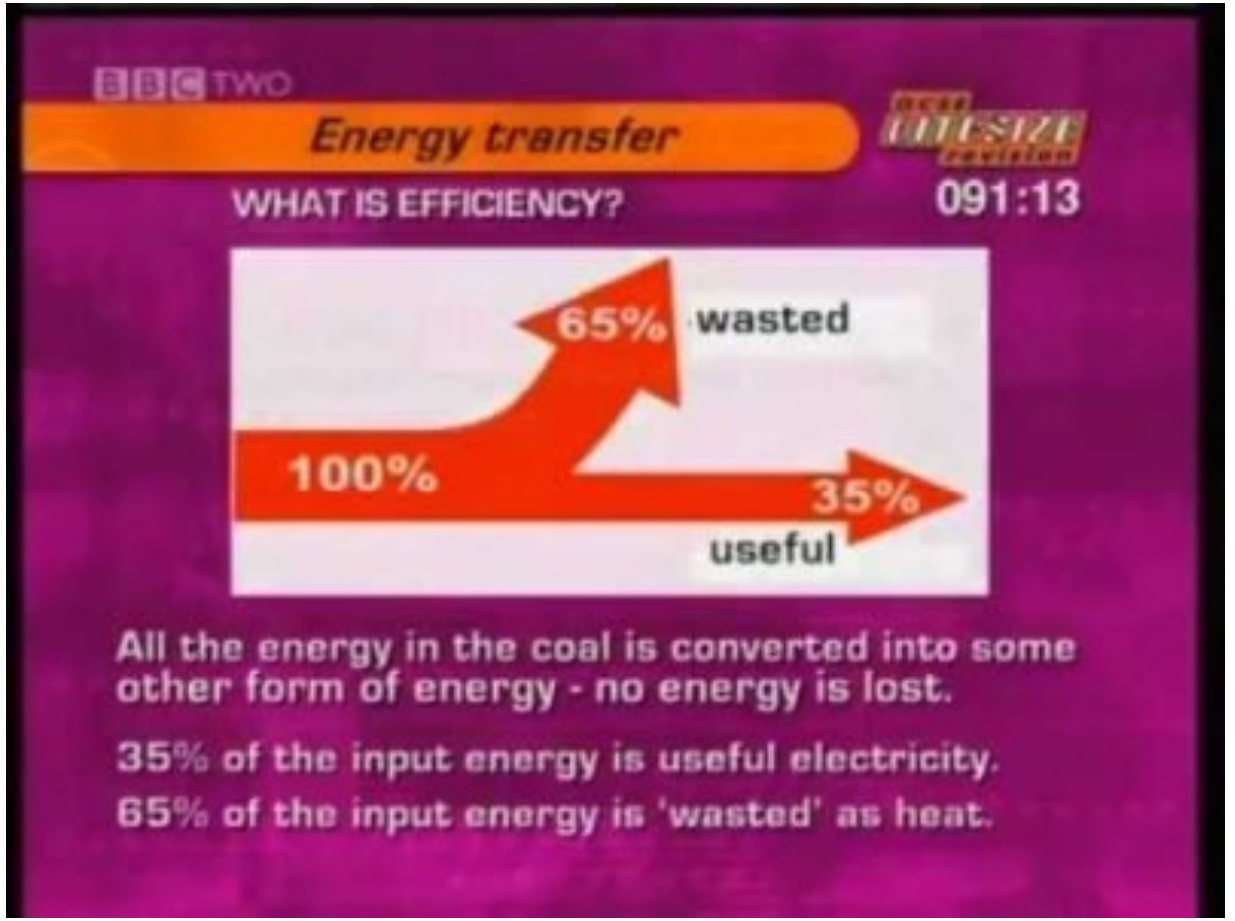
# Can objects have both potential and kinetic energy?

- Yes! Objects in motion can go through stages of both potential and kinetic energy.

**Example**



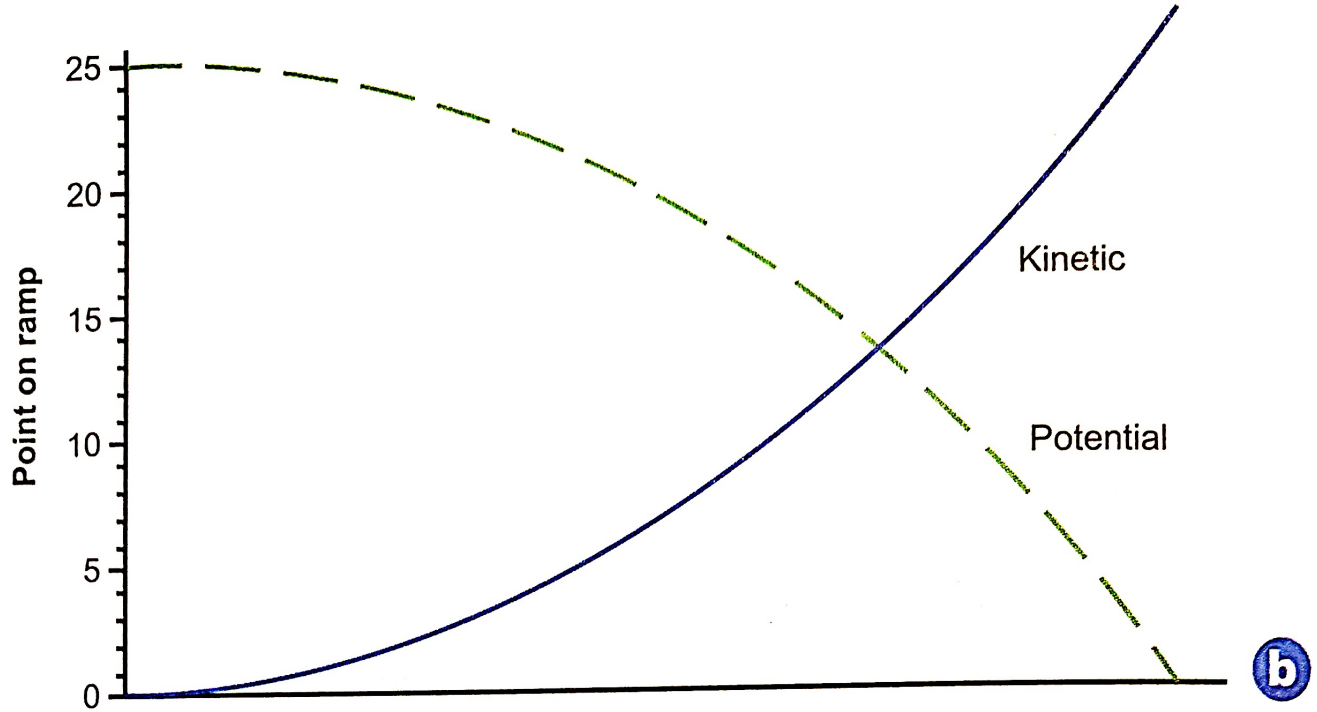
# Energy Transfer Video



# POTENTIAL ENERGY AND KINETIC ENERGY

Scientists have observed that all energy is either stored, as potential energy, or in motion, as kinetic energy. Potential energy is often associated with energy of position. For example, a stone on Earth's surface is said to be storing energy. If you raise the stone with respect to Earth's surface, you are increasing its potential energy. If you drop the stone, the potential energy becomes energy of motion, or kinetic energy. Mechanical energy is the sum of a system's potential energy and kinetic energy.

The graph shows how energy changes when a toy car rolls from the top of a steep ramp (Point 25) to the bottom (Point 0). The potential energy and kinetic energy of the toy are shown at various points along the ramp. Potential energy is greatest at Point 25.

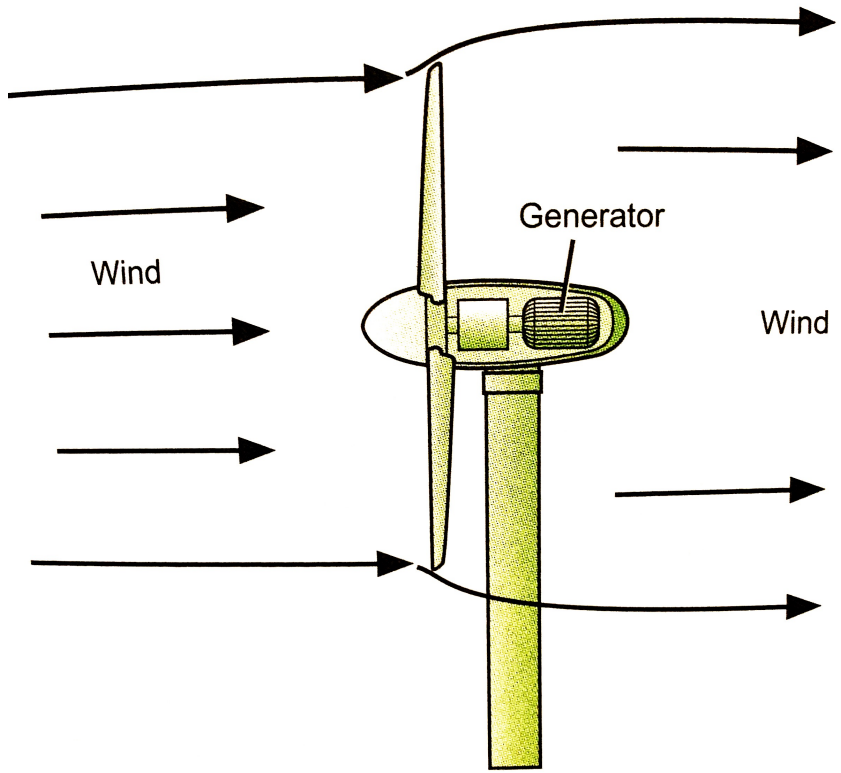



1. What interpretation is supported by the data in the graph?

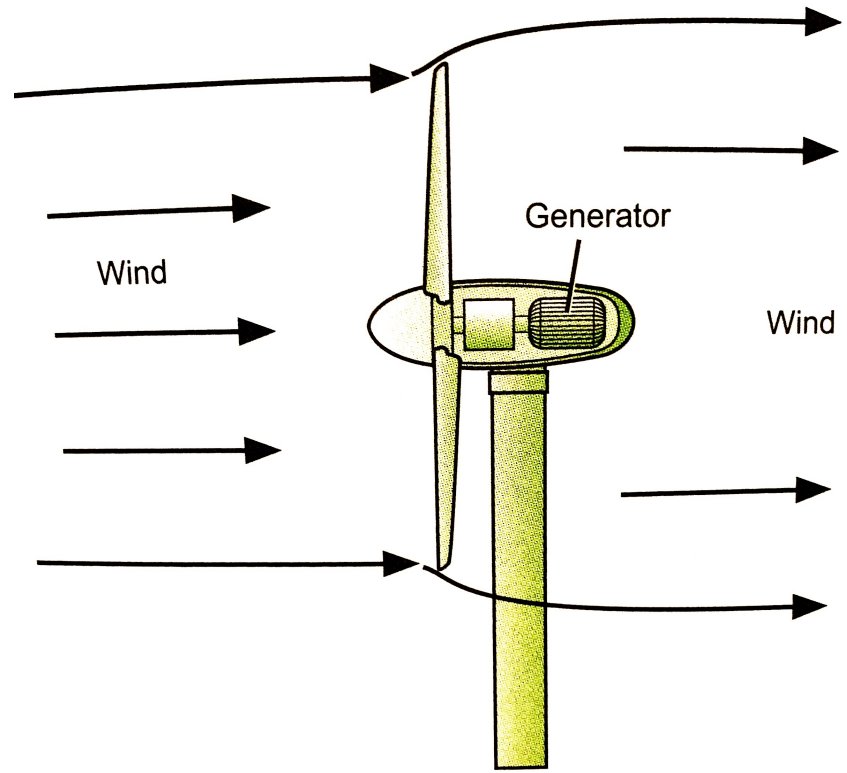
   A. As potential energy decreases, kinetic energy increases at the same rate.
   B. An object can have potential energy or kinetic energy, but not both.
   C. An increase in potential energy causes an increase in kinetic energy.
   D. As potential energy decreases, kinetic energy decreases at the same rate.

# ENERGY IN A WIND TURBINE

The total amount of energy in a system is the sum of the system's potential energy and kinetic energy. Consider a machine such as a wind turbine. A traditional windmill uses the kinetic energy of the wind to do work, such as pumping water or grinding grain. A wind turbine takes the process one step further, converting kinetic energy into electrical energy, as shown in the diagram.



2. The diagram represents an observation of a wind turbine in the presence of wind. What happens to the wind's energy as it passes through the turbine?

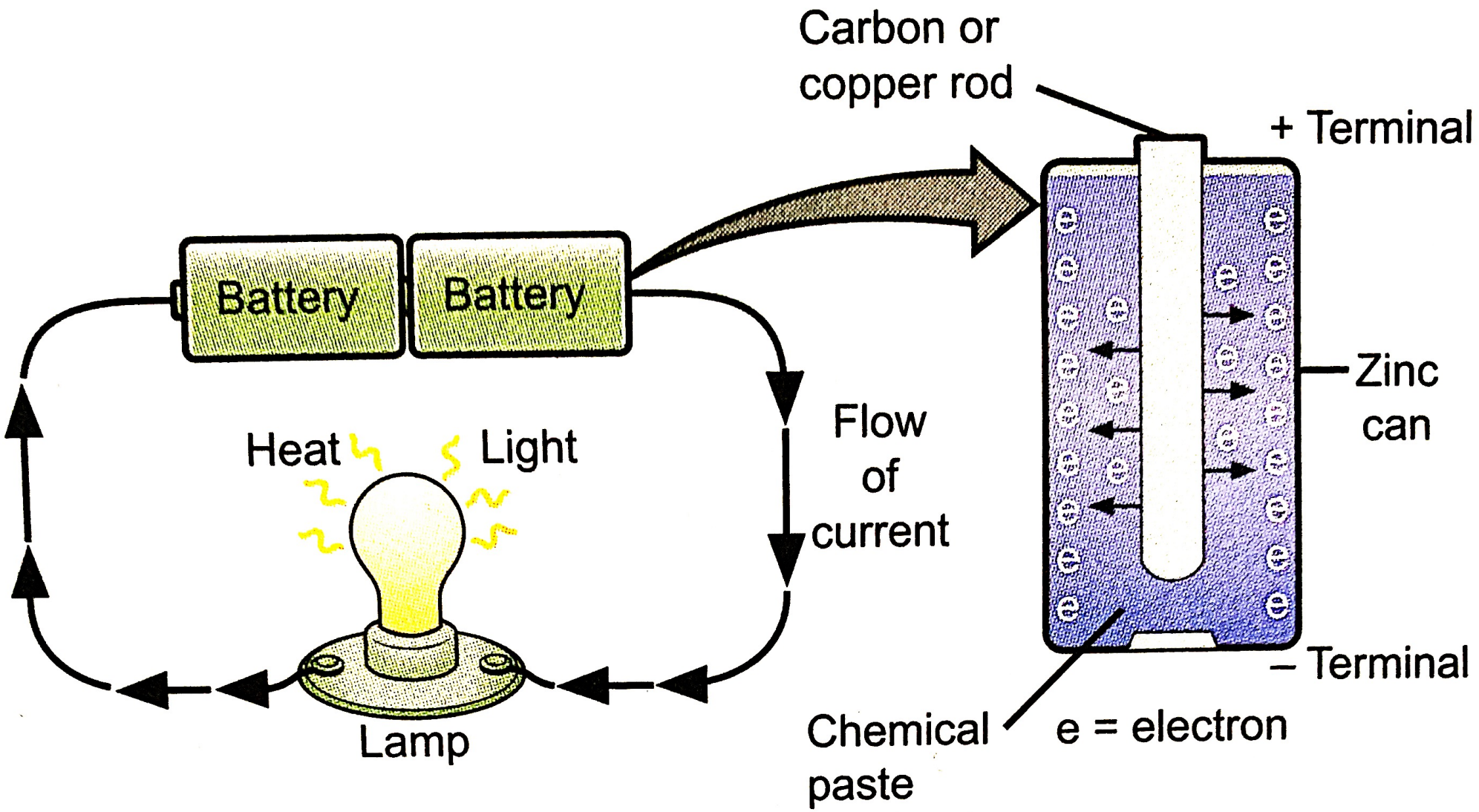



A. The kinetic energy of the wind is greater before it strikes the blades than after it strikes the blades.
B. The potential energy of the wind is the same before and after it strikes the blades.
C. The kinetic energy of the wind is greater after it strikes the blades than before it strikes the blades.
D. The potential energy of the wind is changed to kinetic energy by the wind turbine.

# HOW BATTERIES WORK

Potential energy is stored as chemical energy in a non-rechargeable battery. Chemical reactions inside the battery cause electrons to collect on the zinc shell. That potential energy changes to electrical energy once a circuit is completed between the (positive) carbon rod and (negative) zinc shell. The resulting electrical energy can be changed into other forms of energy, as shown in the diagram. As the chemical paste in the battery reacts with the metals in the battery, the metals eventually decompose and the battery "dies."

# How Batteries Work



3. Which statement describes what happens to the battery's stored energy in this system?

A. It changes from electrical, heat, and light energy to chemical energy.
B. It changes from chemical energy to electrical, light, and heat energy.
C. It changes from light and heat energy to chemical and electrical energy.
D. It changes from electrical energy to heat, light, and chemical energy.

4. What would happen to the energy in this system if the wire were disconnected from one terminal of the battery?

A. The electrical energy would change to potential energy.
B. The light and heat energy would change to chemical energy.
C. Energy would stop changing from potential chemical energy into other forms.
D. Energy would stop changing from kinetic chemical energy into other forms.

# Classifying Potential or Kinetic Energy

Various forms of energy can be classified as being either a potential energy source or a kinetic energy source. Classify the phrases in the word box as examples of potential or kinetic energy.

| | | |
|---|---|---|
| standing at the top of a slide | throw a curve ball | book on a high shelf |
| wind up for the pitch | a battery | a speeding car |
| juice in an orange | frog leaping into the water | execute a swan dive |
| move downhill in a roller coaster | book falls from a high shelf | a parked car |
| roll down a grassy hill | move down a slide | |
| an unburned lump of coal | frog sitting on a lily pad | |

| Potential Energy | Kinetic Energy |
|---|---|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

# The Various Forms of Energy

Match each term in the word box to its definition.

| | | |
|---|---|---|
| sound energy | radiant energy | thermal energy |
| mechanical energy | nuclear energy | chemical energy |
| electrical energy | kinetic energy | potential energy |
| forms | | |

1. _____ This is stored energy of an object or material. It is the energy that an object has due to its position.

2. _____ This is the energy associated with movement of electrons through a wire or circuit.

3. _____ This is the energy produced when an atom splits apart (fission) or wher two atoms join to form one atom (fusion).

4. _____ This is the energy of motion. The faster an object moves, the more of this it has.

5. _____ This is the energy of an object due to the motion of its atoms and molecules. An object that feels hot has more of this inside it than it does after it has cooled down.

6. _____ This is energy that can travel in waves and can move through empty space.

# The Various Forms of Energy

Match each term in the word box to its definition.

| | | |
|---|---|---|
| sound energy | radiant energy | thermal energy |
| mechanical energy | nuclear energy | chemical energy |
| electrical energy | kinetic energy | potential energy |
| forms | | |

7. _____ This is the energy stored in the connections between atoms. As chemical reactions take place to release these connections, this energy is released.

8. _____ All energy can change from one of these to another.

9. _____ This is the energy of vibrations carried through solids, liquids, or gases. It travels in waves, but it cannot move through empty space.

10. _____ This is the energy of an object do to its motion, position, or condition. It is the combined total of potential energy and kinetic energy of an object.

# Energy Transfers

Energy can change from one form to another. We commonly change energy from one form to another as we use it. Match each term in the word box to its description. Some terms are used more than once.

| | | | |
|---|---|---|---|
| radiant | chemical | electrical | thermal |
| mechanical | sound | nuclear | |

1. _____ When you shout at a friend, you are changing mechanical energy into this form.

2. _____ When you set food under a heat lamp to warm it, you are changing radiant energy into this form.

3. _____ When you turn on a CD player, you are using this form of energy to produce sound energy.

4. _____ At a power plant nearby, matter is changed into energy to produce this form of energy.

5. _____ Eating a healthy breakfast provides this form of energy, which is turned into mechanical and thermal energy as you play, study, and move.

6. _____ Plug in a fan to a source of electrical energy. The electrical energy is transformed into this form to move the fan blades.

# Energy Transfers

Energy can change from one form to another. We commonly change energy from one form to another as we use it. Match each term in the word box to its description. Some terms are used more than once.

| | | | |
|---|---|---|---|
| radiant | chemical | electrical | thermal |
| mechanical | sound | nuclear | |

7. _____ Plug a lamp into an electrical socket and you turn electrical energy into this form of energy.

8. _____ Radiant energy from the sun is turned into this form when plants undergo photosynthesis.

9. _____ As plants decompose, their chemical energy may become stored as coal or natural gas. These chemical energy sources can be turned into this form of energy as they are burned at a power plant.

10. _____ As fuel is burned at a power plant, the energy released turns a turbine, whose movement is an example of this kind of energy.

11. _____ Energy leaves a power plant in the form of this kind of energy.

# Wind Farms

# Why is it important to have alternative forms of energy?

# Match as many words with meanings as you can!

| | | | | |
|---|---|---|---|---|
| _____ | 1. | harness | a) | necessary |
| _____ | 2. | convert | b) | to eat grass |
| _____ | 3. | atmosphere | c) | not deep |
| _____ | 4. | essential | d) | a new method, idea, or product |
| _____ | 5. | obstruction | e) | to control and use something |
| _____ | 6. | graze | f) | something that can be maintained at a certain level |
| _____ | 7. | offshore | g) | a layer of gases around the earth |
| _____ | 8. | shallow | h) | a resource that can be used many times |
| _____ | 9. | innovation | i) | located at sea, a certain distance from the coast |
| _____ | 10. | renewable | j) | an obstacle, something blocking the way |
| _____ | 11. | sustainable | k) | to transform |

# Reading

1. Energy is essential to modern society. We use gasoline to power our cars and electricity to light and warm our homes. But it is also possible to **harness** the power of the wind in order to create energy. This is why we have wind farms.

2. Wind farms are places where many wind turbines are gathered together. A turbine is a machine that produces energy by rotating quickly. It can be powered by wind, water, gas, or steam. Turbines need to be connected to generators, which **convert** the mechanical energy of the turbine into electricity.

3. Although most people think of wind energy as being a separate type of power, it is actually another form of solar energy. This is because one of the factors necessary to create wind is the uneven heating of the sun through the **atmosphere**.

4. Wind farms can cover miles of land. The largest one in the world is located in Gansu, China, and contains over 7,000 turbines! Of course, it is **essential** for wind farms to be located in a very windy place. The wind needs to blow at an average speed of more than 4.5 meters per second. Ideally, the land should be flat and free from man-made **obstructions** that could block the wind. The spaces between the turbines can be used for other purposes, such as growing crops or providing areas where farm animals can **graze**.

5. Some wind farms are even located **offshore**, which is convenient because it can be incredibly windy out in the middle of the ocean. The first offshore wind farm was built in 1991 in Denmark. Until 2017, most offshore wind farms had fixed foundations, which meant that they had to be built in **shallow** water. Now, however, floating wind farms are becoming more common.

6. Using wind power is not a new idea. People have used wind power for thousands of years. In fact, the Persians were using wind-powered grain mills between AD 500 and 900. In the United States, a man named Daniel Halladay invented a windmill in 1853 that was used for pumping water on farms. This **innovation** actually played a large part in the expansion of the railroads because water was required to run steam engines.

7. Using wind to create energy is becoming more popular because wind energy is **renewable**. Unlike nuclear power plants, which can be harmful to the planet and also very expensive to run, and oil, which is a limited resource, wind is both free and limitless. It is unlikely the planet will run out of wind! Wind energy is therefore one of the more **sustainable** forms of power. Currently, 3% of the United States' electric power comes from wind. However, experts are predicting that by 2030, that number will have grown to 20%. Indeed, as people become more conscious about energy consumption, wind farms could become the power of the future!

## Did You Know?

Can you guess what the first wind-powered invention was? Sailboats! The ancient Mesopotamians were the first to understand that wind could be useful for transportation. Mesopotamian sailboats, invented in 1300 BC, were useful because they helped fishermen access fish from the middle of deep lakes and rivers.

## A. True, False, or Not Mentioned?

Read the statements below. If the statement is true, write T beside the sentences. If it is false, write F and correct the information in your notebook. If it is not mentioned, write NM.

_____ 1. Wind energy is a type of solar energy.

_____ 2. Daniel Halladay was the first person to use wind power.

_____ 3. The largest wind farm in the world is located in China.

_____ 4. Offshore wind farms are more expensive to run than wind farms on land.

_____ 5. 20% of the electricity in the United States comes from wind.

_____ 6. Turbines must be connected to a generator in order to create electricity.

## B. Ask & Answer

Practice asking and answering the following questions with your partner. Then write your answers in complete sentences in your notebook.

1. What is a wind turbine?
2. How many turbines does the largest wind farm in the world contain?
3. How much wind is necessary to operate a wind farm?
4. How can the spaces between the turbines be used on a wind farm?
5. When and where was the first offshore wind farm built?
6. How did Daniel Halladay's invention play a part in the expansion of the railroads in the United States?
7. What are the advantages of using wind energy?

# Discussion

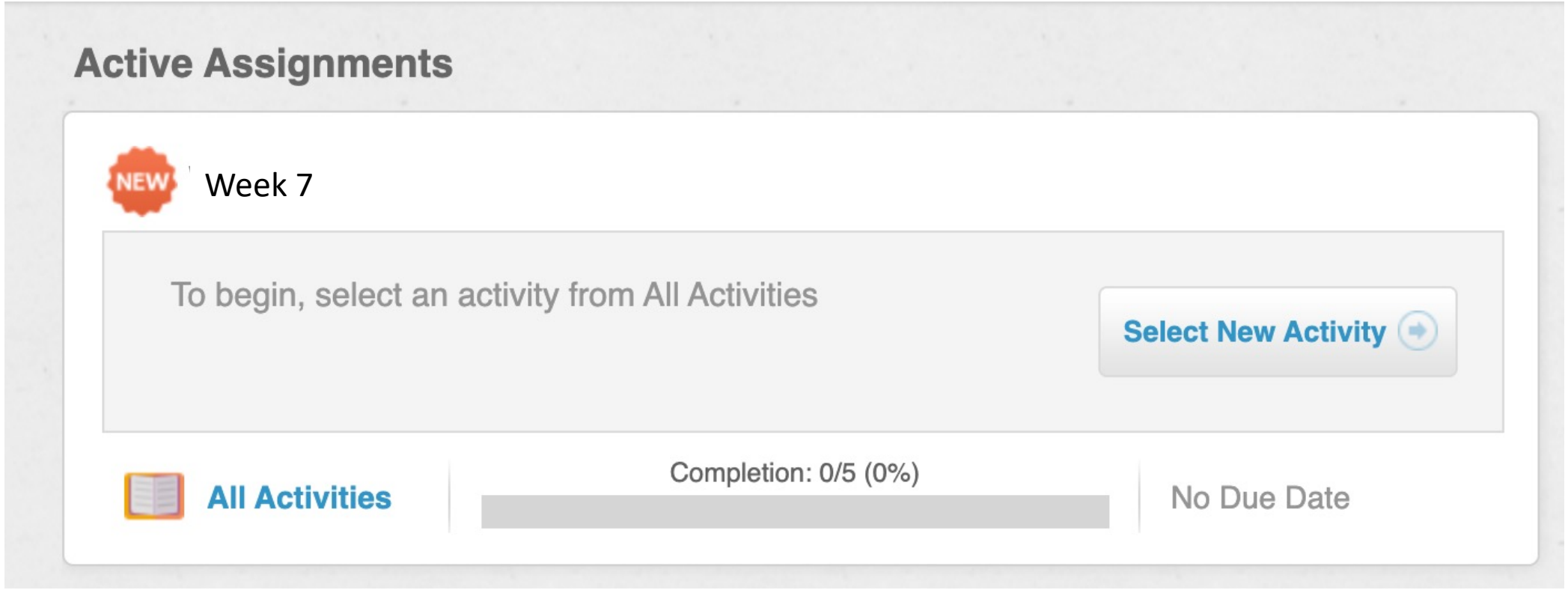
1. Have you ever seen a wind farm? Did you know what it was?
2. Are electric cars becoming more popular in your country? Why or why not?
3. Why is it important for sources of energy to be sustainable?

# Research

In this lesson, you learned about wind energy, but you also learned that there are other types of energy. Get into a small group and do some research together to answer the following questions.

1. What are the different types of energy?
2. What are the advantages and disadvantages of each one?
3. Which form of energy is most commonly used in your country? Can you guess why?
4. In your opinion, which form of energy is the best? Make sure you explain your answer.

# Homework!


Active Assignments
NEW
Week 7
To begin, select an activity from All Activities
Select New Activity
All Activities
Completion: 0/5 (0%)
No Due Date