**Guided Notes: Kinetic and Potential Energy**

**Big Idea:** Energy can be described as either kinetic energy (the energy of motion) or potential energy (the energy that an object has because of its position).

**Key Concepts:**

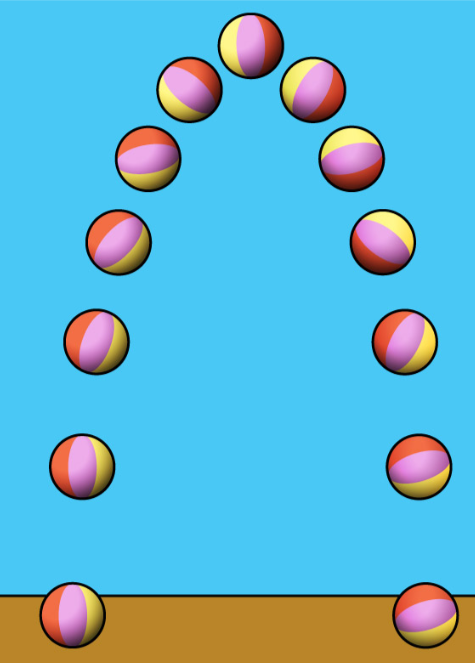
• Kinetic energy is the energy of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

• Potential energy is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy that depends on an object's position relative to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

• As an object's potential energy \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, its kinetic energy \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

• As an object's kinetic energy \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, its potential energy \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

• The law of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ states that energy cannot be created or destroyed, only transferred between forms.



**Real World Examples**

1. When you toss a ball into the air, as it moves upward, its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy decreases while its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy increases. At the top of its path, the ball has maximum \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy and minimum \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy for an instant before falling back down.

2. A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ car uses a solar panel to convert light energy from the sun into \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy, which is then converted into \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy to move the car.

**Guided Notes: Factors that Affect Kinetic Energy**

**Big Idea:** The mass and speed of an object affect its kinetic energy (energy of motion).

**Key Concepts:**

• An object with greater \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ has greater kinetic energy.

• An object moving with greater \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ has greater kinetic energy.

• As an object's mass \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, its kinetic energy \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

• As an object's speed \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, its kinetic energy \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Real World Examples:**

1. When bowling, to make the ball hit the pins with more kinetic energy, you need to either \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the ball's speed or use a ball with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mass.
2. When a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is thrown, it has more kinetic energy and creates a bigger splash than when it is just \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ into water from the same height.

**Guided Notes: Predicting Changes in Kinetic Energy**

**Big Idea:** The kinetic energy of an object depends on its mass and speed/velocity.

**Key Concepts:**

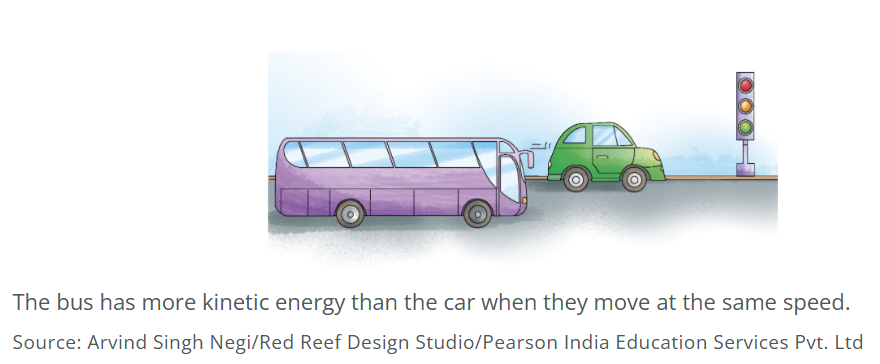
• Kinetic energy is the energy an object possesses because of its \_\_\_\_\_\_\_\_.

• Two factors affect kinetic energy: \_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_\_.

• An object with a higher \_\_\_\_\_\_\_\_ at a given speed will have more kinetic energy than an object with a lower mass at the same speed.

• An object has more kinetic energy at higher \_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_\_\_\_.

• \_\_\_\_\_\_\_\_\_\_ is the speed of an object in a particular direction.



**Real World Examples:**

1. Seatbelts in cars work by providing the \_\_\_\_\_\_\_\_\_ force to stop your forward motion when the car suddenly stops, since your body wants to keep moving at the same speed due to inertia.

2. Skateboarders going downhill have increasing \_\_\_\_\_\_\_\_\_\_ energy as their speed increases but decreasing \_\_\_\_\_\_\_\_\_\_\_\_ energy as their height decreases.

**Guided Notes: Potential Energy of a System**

**Big Idea:** The positioning of multiple objects in a system can influence the system's stored energy (potential energy).

**Key Concepts:**

• Potential energy is the energy stored by an object because of its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

• A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ consists of multiple objects that can have an effect on each other.

• More \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ objects have a greater effect on other objects in the system.

• As an object gets farther away from another object in the system, its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_increases.

• The potential energy of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ increases when the objects within it are farther apart.

A roller coaster with people on it

Description automatically generated

**Real World Examples**

1. A rollercoaster at an amusement park is a good example to understand potential energy. As the rollercoaster goes up a hill, its distance from the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ increases, causing the potential energy of the system to increase.

2. A swing and the Earth form a system. At the highest point of the swing, the potential energy of the system is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ because the distance between the swing and the Earth is greatest.

**Guided Notes: Energy Transfer and Kinetic Energy**

**Big Idea:** Energy can be transferred from one object to another through the movement of objects (kinetic energy).

**Key Concepts:**

• Kinetic energy is the energy of objects in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

• When objects touch or collide, kinetic energy can \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ between them.

• \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ thinking skills help solve problems by analyzing how parts interact.

**A close-up of a hand holding a slingshot

Description automatically generated**

**Real World Examples**

1. In hockey, when a player uses their body's energy to move the stick, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ transfers from their body to the hockey stick. When the moving hockey stick touches the puck, the energy transfers to it, making it move across the ice.

2. Waves in the ocean are an example of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in nature. The moving air has kinetic energy. As the air touches the water's surface, it moves it, transferring \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to the water causing a wave.

**Guided Notes: Using Potential and Kinetic Energy**

**Big Idea:** Humans use technology to store energy resulting from an object's position relative to Earth (potential energy) and/or use energy resulting from an object's motion (kinetic energy).

**Key Concepts:**

• An object that is elevated above the Earth's surface has \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_.

• An object in motion has \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_.

• As an elevated object falls, its \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ is converted to \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_.

• In hydroelectric dams, the \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ of stored water is converted to \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ as it moves through the dam.

• The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ energy of the moving water rotates the turbines to generate \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

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**Real World Examples**

1. A waterfall involves conversion of potential to kinetic energy. The higher the water at the top, the greater the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ it stores initially. As the water falls, this is converted to \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_.

2. Windmills connected to turbines work similarly to hydroelectric dams. The \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ of the wind causes the turbine blades to spin, converting wind's kinetic energy to rotational kinetic energy to generate electricity.