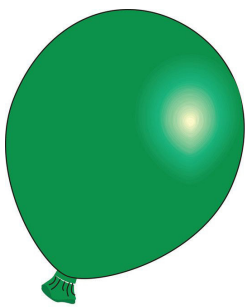


Kinetic and potential energy

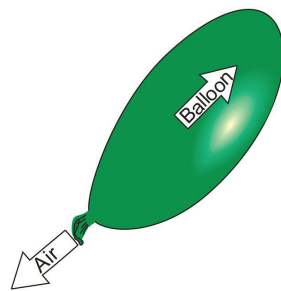
■ Motion and energy

Motion • is all around us: everything in the universe moves, from the electrons that move around the atom to the Earth that moves around the Sun. Even if an object does not apparently move, it still may be moving ••: all of us may appear to be sitting still on our sofa watching TV, but we are actually moving along with the Earth as it moves around the Sun.

Energy makes things move or causes a change in the position or state of an object. Energy can be defined as the capacity for doing work. **Work** is done when a force moves an object over a given distance. The capacity for work, or energy, can come in many different forms but they are classified into two main categories: potential and kinetic energy.



Potential Energy



Kinetic Energy

■ Potential energy

Potential energy is **latent** energy in an object at rest. Any object or substance stores energy as a result of its position: when that position changes, the stored energy will be released and therefore converted to other forms of energy, such as kinetic, heat, electric and so forth. Energy, in fact, can never be created or destroyed, it can only change its form. For example, if we compress a **spring** to close it inside a small box, we apply a force that transfers energy to the spring. The spring will store that energy until we open the box and it is released. Gravitational and elastic potential energy are but two examples of this form of energy, which also includes **nuclear** and **chemical energy**.

■ Examples of potential energy

Gravitational potential energy refers to the energy in an object that is held in a vertical position against the force of gravity working to pull it down. The amount of gravitational potential energy an object has depends on its height and mass: it increases as weight and height increase. **Elastic potential energy** is energy stored in objects that can be **stretched** or compressed such as trampolines, rubber bands and **bungee cords**. The more an object can stretch the more elastic potential energy it has.

■ Kinetic energy

Kinetic energy is energy an object has because of its motion. It depends on the mass and the speed achieved: the faster an object is moving, the more kinetic energy it has. Every object in motion has kinetic energy, which can also be transferred between objects and transformed into other kinds of energy. There are five types of kinetic energy: **radiant, thermal, sound, electrical** and **mechanical**.

Motion is studied by the branch of physics called mechanics.

This phenomenon, called "relative motion" was first described by Galileo Galilei in 1632 using the example of a ship travelling at a constant velocity on a **smooth** sea; any observer below the **deck** would not be able to tell whether the ship was moving or stationary.

bungee cord: *fune/corda elastica*
deck: *ponte*
drop: *discesa*
to gain: *acquisire*
latent: *latente, potenziale*
to lift: *sollevare*
ride: *giro*
smooth: *calmo, liscio*
spring: *molla*
to stretch: *allungarsi*
train: *fila*

1 Find synonyms for these words in the text.

- | | |
|--------------------|--------------------|
| 1. Type | 5. Luminous |
| 2. Hidden | 6. Altitude |
| 3. Flexible | 7. Velocity |
| 4. To extend | 8. To convey |

2 Complete the sentences.

- Energy can be defined as
- Potential energy is
- Gravitational energy refers to
- Elastic energy is
- Kinetic energy is
- Energy can neither be nor
- Energy can only be either or

3 Read the text and choose a suitable word to complete it.

Potential and Kinetic Energy in a Roller Coaster

The modern roller coaster derives from tall ice slides in Russia, which first appeared in the 17th century. This is the reason why they are often called "Russian Mountains". They became a form of popular entertainment throughout Russia and above all in St. Petersburg.

A roller coaster **ride** is a thrilling **1.** which involves physics, more specifically the physics of work and energy. A mechanical device applies a force to the **train** of cars **to lift** it to the top of a high hill. Once the cars are lifted to the top of the hill, gravity starts **2.** its force. Energy goes on changing from potential into **3.** and vice versa. At the **4.** of the hill, the cars possess a large quantity of **5.** potential energy. The car's large quantity of potential energy is due to the fact that they are on the highest point above the ground: in fact, gravitational energy depends on the **6.** and mass of an object. As the cars descend the first **drop**, they lose much of this potential energy because they lose height. The cars subsequently **gain** kinetic energy and therefore **7.**: kinetic energy depends, in fact, on the mass and the speed of the object. Thus, their original potential energy is transformed into kinetic energy. As the **8.** continues, the train of cars are continuously losing and gaining height. Each **9.** in height corresponds to the loss of speed as kinetic energy is transformed into potential energy. Each **10.** in height corresponds to a gain of speed as potential energy is transformed into kinetic energy.

Adapted from: <https://www.physicsclassroom.com/mmedia/energy/ce.cfm>

- | | | | |
|---------------------|---------------|-------------|------------------|
| 1. a. experience | b. toy | c. show | d. match |
| 2. a. playing | b. showing | c. exerting | d. charging |
| 3. a. kinetic | b. elastic | c. static | d. gravitational |
| 4. a. bottom | b. side | c. top | d. base |
| 5. a. gravitational | b. mechanical | c. elastic | d. static |
| 6. a. weight | b. height | c. strength | d. length |
| 7. a. length | b. height | c. weight | d. speed |
| 8. a. tour | b. ride | c. journey | d. trip |
| 9. a. loss | b. waste | c. gain | d. supply |
| 10. a. supply | b. waste | c. gain | d. loss |