Activity 2.1 Throw the ball

Throwing balls

What to use:

The CLASS will require:

- a balcony overlooking a clear outside area
- two tennis balls
- a student good at throwing.

What to do:

Step 1
Read Discussion questions 1-4.

Step 2
One student throws the ball vertically as high as possible.

Step 3
All students carefully observe the ball, with the discussion questions in mind.

Step 4
Another student stands on the balcony with the second ball. The first student tries to vertically throw the ball level with the balcony student. This may take practice.

Step 5
As the ball reaches the top of its flight the balcony student drops the other ball as close as possible to the first, so they fall together. Students with mobile phones might like to video the descent of the balls.

Step 6
As a class watch the videos in the link below. Observe the mechanical energies involved in the roller-coaster. Then compare the flights of the two balls; one is thrown up, the other is dropped.

Discussion:

1. What makes the ball fly into the air?

2. When is the ball travelling the fastest?

3. When is the ball travelling the slowest?

4. What happens to the motion of the ball as it rises and falls?

5. In the video, how did the downward motion of the thrown ball compare to that of the dropped ball?

6. How did the thrown ball originally get its energy? How did the dropped ball get its energy?

? Why does a ball travel the way it does when you throw it into the air?
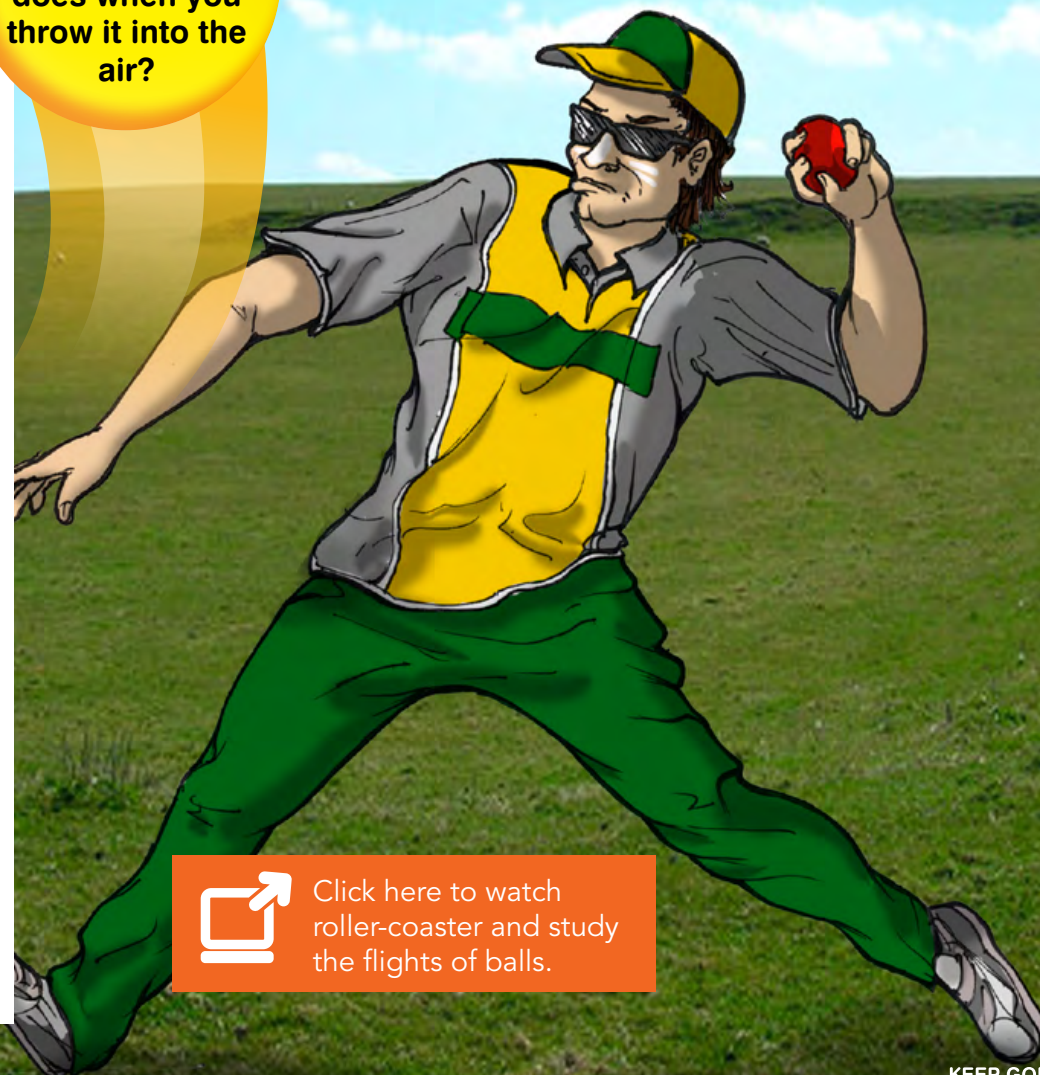
Click here to watch roller-coaster and study the flights of balls.

KEEP GOING →

MECHANICAL ENERGY EXPLAINED

The thrower transfers **MECHANICAL ENERGY** to the ball. As the ball is moving, this is in the form of **KINETIC ENERGY**. As the ball rises, this energy is transformed into **GRAVITATIONAL POTENTIAL ENERGY**.

KINETIC ENERGY

This is energy of movement.

All moving objects have kinetic energy (KE).

You can calculate the kinetic energy of an object using the equation:

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

m is the mass in kg.

v is the velocity in m/s.

Kinetic energy is measured in Joules (J).

GRAVITATIONAL POTENTIAL ENERGY

This is energy of position. The higher the ball, the greater its gravitational potential energy (GPE).

An object gains GPE whenever it is lifted against Earth's gravity.

You can calculate the GPE of an object using the equation:

$$GPE = 9.8mh$$

m is the mass, in kg.

h is the vertical height, in m.

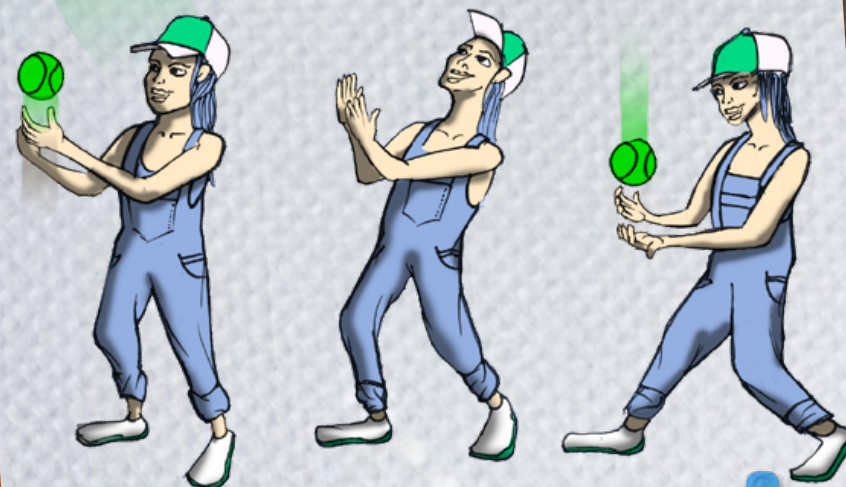9.8 is the acceleration of a falling object in m/s²

Gravitational potential energy is measured in Joules (J).

Mechanical energy of a thrown ball

KE = 0 J
GPE = 100 J

KE = 100 J
GPE = 0 J

KE = 100 J
GPE = 0 J

MECHANICAL ENERGY

Mechanical energy is the combined total of kinetic and gravitational potential energies. When the ball was thrown up, the moment it left the thrower's hand, its total mechanical energy was conserved and did not change. All the kinetic energy gradually transformed to gravitational potential energy, until the ball reached its highest point. Then it transformed back to kinetic energy as the ball picked up speed during its fall.