Station 1

Work and Potential Energy

Batman, who has mass 85 kg, is on top of a 27 storey building.  Assume each storey is 3 m high.

(a) How much potential energy does Batman have?

(b) How much work is exerted when Batman runs up the stairs in 5 minutes?

(c) Does the amount of work change if Batman walks?

Station 2

Work and Kinetic Energy

A 250 kg pig is shot horizontally out of a pig cannon.

(a) How much kinetic energy does the pig have if it is shot at 45 km/h?

(b) How much work is done by the cannon to shoot the pig from rest?

Station 3

Conservation of Energy (use conservation of Energy)

Batman, mass 85 kg, jumps with a speed of of 5 m/s off of a 27 storey building (each storey is 3m high)

(a) What is Batman's speed when he hits the ground?

(b) Robin, mass 65 kg, makes the same jump (from the same height at the same speed), what is his speed at the bottom?

(c) Marvin the Martian makes the same jump (from the same height at the same speed), on planet Physics, where g=17.5 m/s2.  What is Marvin the Martian's speed when he hits the ground?

Station 4

Power

A 250 kg pig is shot from rest to 45 km/h in 0.5 seconds.

(a) What is the power output of the pig cannon?

(b) What is the power output in having the same pig shot to a height of 55 m in 3 seconds?

Station 5

Heat

A 55 g cube of lead (C=130 J/(kg ºC)) at 250ºC is placed in 250 g of water (C=4186 J/(kg ºC)) at 25ºC and allowed to reach thermal equilibrium.  What is the final temperature of the water and cube?

Station 6

Efficiency

A machine used to lift crates of bananas has as efficiency of 85%.  A crate with mass needs to be lifted 35 m.

(a) How much work is needed to be put into the machine?

(b) If the machine is replaced with a pulley and 85 m of rope must be pulled to raise the crate, what is the tension of the rope?