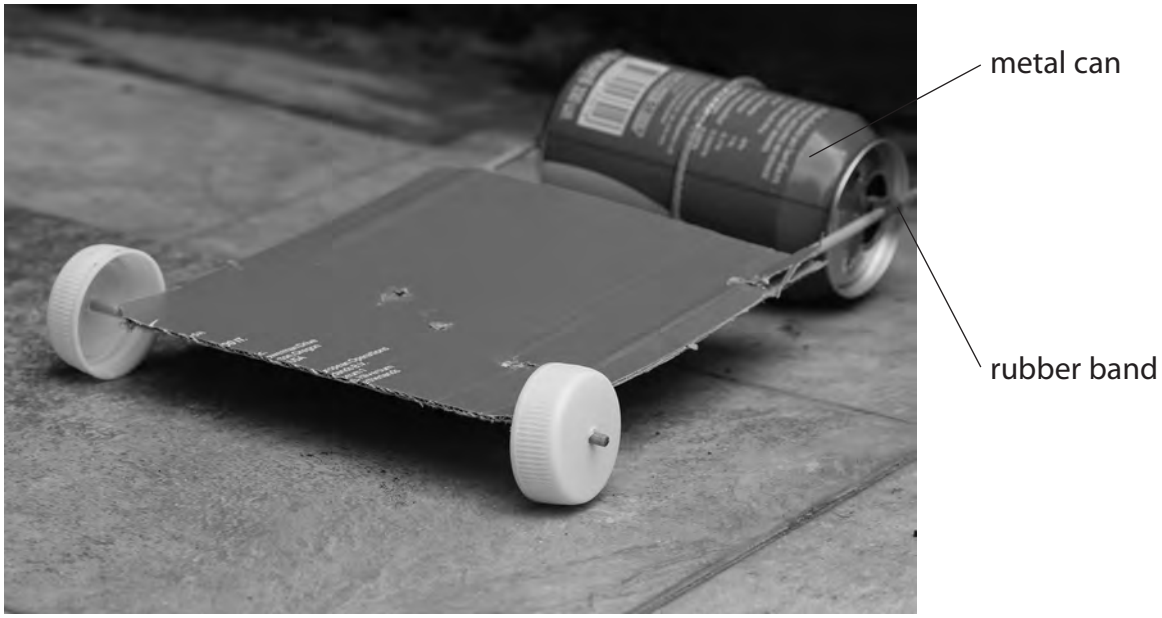
8 The photograph shows a toy car. When the toy car is pulled backwards, energy is stored in the elastic store as the rubber band is twisted.



(Source: Mama Belle and the kids/Shutterstock)

When the car is released, some of the energy from the elastic store is transferred to the kinetic store of the car.

The remaining energy is transferred into the thermal store of the surroundings.

(a) State what is meant by the principle of conservation of energy.

(1)

.....

.....

(b) The car is pulled backwards so that there is 165 J of energy in its elastic store.

When the car is released, this energy is transferred to the car's kinetic energy store with an efficiency of 15 %.

(i) State the formula linking efficiency, useful energy output and total energy output.

(1)

(ii) Calculate the energy transferred into the thermal store of the surroundings.

(4)

energy transferred to thermal store = ... J

(iii) Draw a labelled Sankey diagram for this energy transfer.

(3)

(c) The car is pulled backwards again.

When released, 45 J of energy transfers into the car's kinetic store.

The car travels a distance of 7.5 m during this energy transfer.

(i) State the useful work done on the car.

(1)

work done = ... J

(ii) Calculate the mean accelerating force acting on the car.

(3)

accelerating force = ... N

(Total for Question 8 = 13 marks)