Work, Energy and Power

1.

A trolley of mass 10kg is initially at rest above a point A on a horizontal floor. A man starts pushing the trolley with a force of 16N along the floor as shown in the diagram above. Point B is 5m away from point A on the floor. Assume that there are no resistive forces against the motion of the trolley.

(a) Calculate the work done by the man in pushing the trolley from A to B.

(b) How much energy does the man transfer to the trolley while pushing it from A to B?

(c) Work out the kinetic energy of the trolley when it reaches B.

(d) Calculate the speed of the trolley at B.

2.

A box of mass 15 kg is at rest on a horizontal floor.

A person starts pushing the object with a horizontal force of 20 N along a straight line.

There is no resistive force opposing the motion of the box.

(a) How much work is done by the person in pushing the box over a distance of 10 m?

(b) State the kinetic energy of the object when it is 10 m away from the starting point.

(c) Calculate the speed of the object when it is 10 m away from the starting point.

3.

A man pushes a trolley horizontally along a straight line on a horizontal floor with a constant force.

The trolley starts moving from rest.

There is no resistive force against the motion of the trolley.

The mass of the trolley is 20 kg.

The man does 120 J of work when pushing the trolley over a distance of 15 m.

(a) What is the size of the force that the man applies on the trolley?

(b) How much energy does the man transfer to the trolley?

(c) What is the speed of the trolley when it has moved 15 m?

4.

This question is about a girl riding a bicycle along a straight line on a horizontal road.

The mass of the girl and the bicycle together is 50 kg.

The bicycle starts from rest. There is a constant driving force on the bicycle during the first 100 m of the journey.

There is no resistive force against the motion of the bicycle and the girl.

The speed of the bicycle after moving the 100 m distance is 12 m/s.

(a) Workout the kinetic energy of the bicycle after moving the 100 m distance.

(b) How much work did the girl do in riding the bicycle over the 100 m distance?

(c) What is the size of the constant driving force that was acting on the bicycle during this 100 m journey?

5.

A car moving at a constant speed of 15 m/s starts accelerating due to a driving force of 500 N.

The car travels with this driving force over a distance of 20 m.

Assume that there are no forces opposing the motion of the car.

The total mass of the car and the passengers inside is 800 kg.

(a) Calculate the initial kinetic energy of the car and the passengers.

(b) Calculate the work done by the driving force.

(c) What speed does the car reach after travelling the 20 m distance?

6.

A boy pushes a trolley of mass 10 kg along a straight line on a horizontal floor.

At an instant when the speed of the trolley is 5 m/s, the boy takes his hands off the trolley.

There is no forward force on the trolley after the boy takes his hands off the trolley. However, there is a constant resistive force (air resistance plus friction) of 10N opposing the motion of the trolley.

(a) Workout the kinetic energy of the trolley at the instant the boy takes his hands off the trolley.

(b) Workout the work done against the resistive force until the trolley comes to rest.

(c) How far does the trolley travel after the boy takes his hands off, before coming to rest?

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7. Assume that the trolley in Question 1 above experiences a resistive force of 5N as it is pushed from A to B.

(a) Calculate the work done by the man in pushing the trolley from A to B.

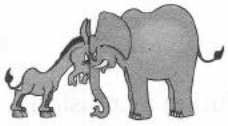
(b) Calculate the work done against the resistive force while pushing the trolley moves from A to B.

(c) Calculate the increase in kinetic energy of the trolley when it goes from A to B.

(d) Work out the speed of the trolley at B.

8.

An elephant exerts a constant force of **1200 N** to push a donkey along a straight flat track at a steady speed of **1 m/s**.



a) Calculate the work done by the elephant if the donkey moves **8 m**.

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b) What form(s) of energy is the work done on the donkey transferred into?

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