REVISION: MECHANICS 29 APRIL 2014

Lesson Description

In this lesson we revise:

- vertical projectile motion
- work-energy theorem
- power

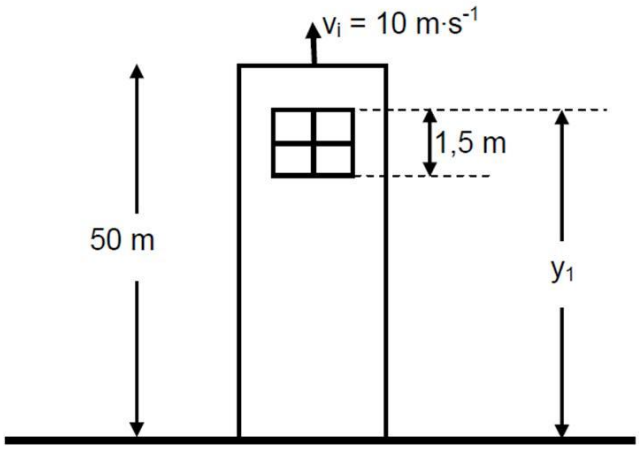
Improve your skills

Vertical Projectile Motion

Question 1

(Adapted from Feb-March 2012 Paper 1)

A stone is thrown vertically upward at a velocity of 10 m.s^{-1} from the top of a tower of height 50 m. After some time the stone passes the edge of the tower and strikes the ground below the tower. Ignore the effects of friction.



1.1. Draw a labelled free-body diagram showing the force(s) acting on the stone during its motion

1.2. Calculate the

1.2.1. Time taken by the stone to reach its maximum height about the ground

1.2.2. Maximum height that the stone reaches above the ground

1.3. Using the ground as reference (zero position), sketch a position-time graph for the entire motion of the stone.

On its way down, the stone takes 0,1 s to pass a window of length 1,5 m, as shown in the diagram above. Calculate the distance (y_1) from the top of the window to the ground.

Work – Energy Theorem

Question 1

A motorbike of mass 800kg, travels across a smooth horizontal surface at a constant velocity of 12 $m.s^{-1}$. The biker applies brakes which exerts a force of 2 500N on the motorbike causing it to come to a stop.

a.) What was the net work done on the motorbike while travelling at constant velocity?

b.) What was the net work done on the motorbike while braking?

c.) Calculate the distance the bike travelled while braking.

Question 2

An object is pulled at angle of 30° to a horizontal surface with a force of 40 N. The frictional force experienced by the object is 12 N. The object travels a distance of 3 m under these conditions.

a.) Calculate the net work done on the object

b.) If it was originally travelling at 1 $m.s^{-1}$, calculate its final velocity after travelling the 3 m.

Work and Power

Question 1

A 5 kg trolley moves along a horizontal frictionless surface at a constant velocity of 2,5$m.s^{-1}$ until it comes to a ramp that is inclined at an angle of 12° to the horizontal. The surface of the ramp is rough. The trolley comes to rest after moving a distance of 1,2m up the ramp.

a.) Calculate the work done by gravity on the trolley

b.) Calculate the magnitude of the force of kinetic friction exerted on the trolley

Question 2

A motor car with a mass of 800 kg accelerates from rest to a speed 25 $m.s^{-1}$ in 20 s. What is the motor car's power?