Physics
Leaving Certificate
Higher Level

Past Exam Questions on
Speed, Displacement, Velocity

Q12 Section B 2012

12 Answer any **two** of the following parts (*a*), (*b*), (*c*), (*d*).

(*a*) An Olympic hammer thrower swings a mass of 7.26 kg at the end of a light inextensible wire in a circular motion. In the final complete swing, the hammer moves at a constant speed and takes 0.8 s to complete a circle of radius 2.0 m.

(i) What is the angular velocity of the hammer during its final swing? (6)
(ii) Even though the hammer moves at a constant speed, it accelerates. Explain. (4)

Calculate
(iii) the acceleration of the hammer during its final swing (9)
(iv) the kinetic energy of the hammer as it is released. (9)

Pat O'Callaghan of Kanturk, who won two Olympic gold medals for the hammer throw.

Q6 Section B 2009

6. State Newton's laws of motion. (12)

Show that $F = ma$ is a special case of Newton's second law. (10)

A skateboarder with a total mass of 70 kg starts from rest at the top of a ramp and accelerates down it. The ramp is 25 m long and is at an angle of 20° to the horizontal. The skateboarder has a velocity of 12.2 m s^{-1} at the bottom of the ramp.

Calculate

(i) the average acceleration of the skateboarder on the ramp.
(ii) the component of the skateboarder's weight that is parallel to the ramp.
(iii) the force of friction acting on the skateboarder on the ramp. (18)

The skateboarder then maintains a speed of 10.5 m s^{-1} until he enters a circular ramp of radius 10 m.

What is the initial centripetal force acting on him?

What is the maximum height that the skateboarder can reach? (12)

Sketch a velocity-time graph to illustrate his motion. (4)

(acceleration due to gravity = 9.8 m s^{-2})