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**S 5 PHYSICS TEST**

**October 2012**

**Paper 1**

**1 hour 05 minutes**

Answer **ALL** questions

Use, where necessary:

Gravitation acceleration, g = 9.81 ms-2

1. (a) In circular motion, what is meant by

(i) angular frequency (1)

(ii) centripetal force (1)

(b) (i) Write down an expression for the tangential velocity of a particle describing a circle of radius r with angular frequency ω. (1)

(ii) A particle describes a circle radius r with a constant speed v.

Show that the accelerating force on it acts towards the centre of the circle and derive an expression the magnitude of the acceleration. (5)

(c) A car of width c and whose centre of gravity is at a height h above the ground goes round a bend of radius r. Show that it will overturn if its speed exceeds (6)

(d) A particle of mass m, is fixed to one end of an inelastic string of length s. The other end of the string is fixed and the particle is whirled in a vertical circle.

(i) At an instant when the string is horizontal, derive an expression for the tension in it. (4)

(ii) Given that m = 1.0 kg, s = 0.5 m and that the string cannot exceed a tension of 121 N, find the maximum angular frequency it can perform without snapping. (4)

2. (a) State Prevost’s theory of exchange with reference to heat radiation. (1)

(b) Explain why metals are better conductors of heat compared to wood.

(4)

(c) The heat radiation received by the earth from the sun is 1.4 x 103 Wm-2. Assuming this 90% of what the sun emits as a black body, estimate the temperature of the sun. (4)

(d) With the aid of a labeled diagram, describe the construction and mode of operation of the optical pyrometer. (5)