Ramakrishna Mission Residential College(Autonomous)

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Sample Question for Admission Test 2016

PHYSICS

1. Fill in the blanks of the following :

(i) A solid cylinder rolls on a horizontal table without slipping. Then the fraction of its total kinetic energy associated with rotation is …….

(ii) A vessel contains oil (density 0.8 gm/cc) over mercury (density 13.6 gm/cc). A solid sphere floats with half volume immersed in mercury and the other half in the oil. The density of the material of the sphere is …….

(iii) Two trains are moving towards each other at speeds of 72 km/h and 54 km/h relative to the ground. The first train sounds a whistle of frequency 600 Hz. The frequency of the whistle (in Hz) as heard by a passenger in the second train before the trains meet is (speed of sound in air is 340 m/s) : …….

(iv) A sphere of radius R has a uniform distribution of electric charge in its volume. At a distance x from its center and for x < R the electric field is directly proportional to ……

(v) The plates of a parallel plate capacitor are charged up to potential difference of 100 V. Now a 2 mm thick plate is inserted between the plates. Then to maintain the same potential difference, the distance between the plates is increased by 1.6 mm. Dielectric constant of the plate is ……

(vi) An electric kettle has two heating coils - one brings its water to boil in 10 minutes and the other in 20 minutes. If the two heating coils are made on simultaneously, the water in the kettle will boil in ……..... min.

(vii) When two magnets are held together in a vibration magnetometer and are allowed to oscillate in earth's magnetic field with like poles together, 12 oscillations per minute are made but for unlike poles together only 4 oscillations per minute are executed. Ratio of their magnetic moment is ……

(viii) The maximum velocity of electrons ejected from a photoelectric emitter when radiation falls on the latter is found to be 1.8×10^{6} ms^{-1}. Assume that the charge to mass ratio of electron is 1.8×10^{11} coulomb/kg The stopping potential (in volt) is …….

2. Solve the following problems :

(i) An artificial satellite of mass m is revolving round earth at an altitude of R/2, where R is the radius of the earth. What extra energy must be given to the satellite to increase its altitude to R?

(ii) A convex lens of focal length 10 cm and a convex mirror are placed coaxially 10 cm apart. A point object is placed at a distance of 20 cm in front of the lens on its axis. It is found that the image formed by the combination coincides with the object. Find the focal length of the mirror.

(iii) An electron is moving along X-axis with velocity 10^{6} m/s and enters into a region of electric field of intensity 100 V/m acting perpendicular to the X-axis. If the field acts over a distance of 2 cm along X-axis, calculate the deflection of electron when it leaves the electric field.

(iv) The emf of a standard cell balances across 150 cm length of a wire of potentiometer. When a resistance of 2 ohm is connected as a shunt with the cell, the balance point is obtained at 100 cm. Find the internal resistance of the cell.