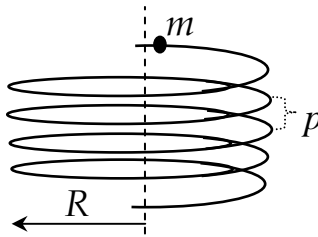


Physics Problems:- January-2011

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- Q1. At $t = 0$ a certain constant horizontal force starts acting on a body which was moving on a smooth horizontal plane initially with a velocity v_0 . At time t it is observed that the speed of the body reduces to half. At time $2t$ the speed further reduces by half. What is the velocity of the body at $3t$?
- Q2. A helix is made out of a smooth, thin & rigid wire as shown, with its axis being vertical. The pitch of the helix is p & the radius is R . A bead of mass m which can slide on this helix is released from a state of rest. Find the total acceleration of the bead after it has completed n turns on the helix. If instead the friction between the wire and the bead has a coefficient μ then after a long time what is the terminal velocity of the bead?
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- Q3. A coaxial cable consists of a internal solid cylindrical wire of radius a surrounded by a thin walled cylindrical shell of radius b . Find the magnetic energy per unit length of this coaxial cable assuming that the current density in the solid inner core is only a function of the distance from the common axis and is given by $j(r) = kr^n$ where n is some integer not equal to -1.
- Q4. Three thin metal plates of very large area are arranged parallel to each other in an isolated space at a temperature of 0 K. Assuming the plates to be black bodies, find the steady state temperature of the middle plate if the left & the right plate are maintained at temperatures $2T_0$ & T_0 respectively.