Answer on Question # 83102, Physics / Quantum Mechanics

Question 1. *A minimum force* $5\,N$ *is required to make a body of mass 2kg move on a horizontal floor. But a force* $4\,N$ *is required to maintain its motion with a uniform velocity. Calculate coefficient of static friction and coefficient of kinetic friction.*

Solution 1. Coefficient of static friction is $\mu_s = F_{min}/mg = 4/(2 \cdot 10) = 0.2$. Coefficient of kinetic friction is $\mu_k = F/F_N = F/mg = 5/(2 \cdot 10) = 0.25$. □

Question 2. *A box of mass* $70\,kg$ *is pulled by a horizontal force of* $500\,N$ *on the surface of the floor. When the box moves, the co-efficient of friction between the floor and the box is* 0.5*. Calculate the acceleration of the box.*

Solution 2. $F - \mu mg = ma \Rightarrow a = F/m - \mu g = 500/70 - 0.5 \cdot 10 = 15/7 \approx 2.143 m/s^2$. □

Question 3. *The mass of metal sphere is* $6\,g$*. it is rotated* 4 *times per sec by fastening it at the end of a thread length* $3\,m$*. What is its angular momentum?*

Solution 3. $\omega = 2\pi f$, $I = mr^2 \Rightarrow L = I\omega = mr^2 \cdot 2\pi f = 6 \cdot 10^{-3} \cdot 3^2 \cdot 2\pi \cdot 4 \approx 1.36\,m^2 \cdot kg/s$. □

Question 4. *A wheel weighing* $5\,kg$ *and radius of gyration about an axis is* $0.2\,m$*. What is its moment of inertia? In order to produce angular acceleration of* $2\,rad/s^2$ *in the wheel. What magnitude of torque is to be applied?*

Solution 4. Moment of inertia is $I = mr^2 = 5 \cdot 0.2 = 1\,kg \cdot m^2$. Magnitude of torque is $M = I\frac{d\omega}{dt} = 1 \cdot 2 = 2\,N \cdot m$. □