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A 2.0kg solid sphere ($r = 0.10m$) is released from rest at the top of a ramp and allowed to roll without slipping. The ramp is 0.75m high and 5.3 m long. When the sphere reaches the bottom of the ramp, what is

1) the total kinetic energy,
2) the rotational kinetic energy,
3) the translational kinetic energy?

$$\Delta E = 0$$

$$0 = E_f - E_i$$

$$E_f = E_{k_R} + E_{k_T}$$

$$E_i = E_g$$

$$E_f = E_i$$

$$E_{k_R} + E_{k_T} = E_g$$

1) $E_{K_R} + E_{K_T} = E_g = mgh = 2.0\,kg\left(9.81\,m/s^2\right) 0.75\,m$

$= 14.72\,J$

$\boxed{= 15\,J}$

2) $\frac{1}{2} I\omega^2 + \frac{1}{2} mv^2 = E_g$ $\qquad I = \frac{2}{5} mr^2$ $\qquad \omega = \frac{v}{r}$

$\frac{1}{2}\left(\frac{2}{5} mr^2\right)\left(\frac{v^2}{r^2}\right) + \frac{1}{2} mv^2 = E_g$

$\frac{1}{5} mv^2 + \frac{1}{2} mv^2 = E_g$

$.7\,mv^2 = E_g$

$\frac{.2}{.7} = 0.286$ fraction of E_{K_R}

$0.286\left(14.72\,J\right) = \boxed{4.2\,J}$

3) $E_T - E_{K_R} = E_{K_T}$

$14.7\,J - 4.2\,J = 10.5\,J$

$\boxed{11\,J}$