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General Physics I, Quiz3
PHYS10400, Class year 98
11-03-2009

SN:_____, Name:_____

Chapter 11-12, Serway; ABSOLUTELY NO CHEATING!
Please write the answers on the blank space or on the back of this paper to save resources.

P11.45 (a) $\tau = |\vec{r} \times \vec{F}| = |\vec{r}||\vec{F}|\sin 180° = 0$

Angular momentum is conserved.

$$L_f = L_i$$
$$mrv = mr_i v_i$$
$$v = \boxed{\frac{r_i v_i}{r}}$$

(b) $$T = \frac{mv^2}{r} = \boxed{\frac{m(r_i v_i)^2}{r^3}}$$

(c) The work is done by the centripetal force in the *negative-r*, inward direction.

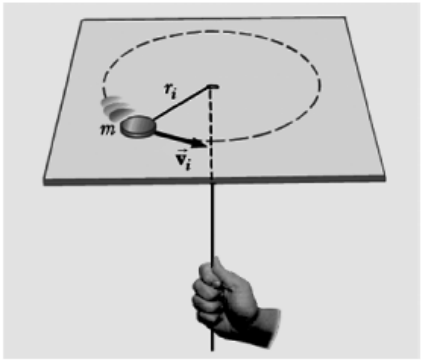

FIG. P11.45

METHOD 1:

$$W = \int F \cdot d\ell = -\int T dr' = -\int_{r_i}^{r} \frac{m(r_i v_i)^2}{(r')^3} dr' = \frac{m(r_i v_i)^2}{2(r')^2}\Bigg|_{r_i}^{r}$$

$$= \frac{m(r_i v_i)^2}{2}\left(\frac{1}{r^2} - \frac{1}{r_i^2}\right) = \boxed{\frac{1}{2}mv_i^2\left(\frac{r_i^2}{r^2} - 1\right)}$$

METHOD 2:

$$W = \Delta K = \frac{1}{2}mv^2 - \frac{1}{2}mv_i^2 = \boxed{\frac{1}{2}mv_i^2\left(\frac{r_i^2}{r^2} - 1\right)}$$

(d) Using the data given, we find

$$v = \boxed{4.50 \text{ m/s}} \qquad T = \boxed{10.1 \text{ N}} \qquad W = \boxed{0.450 \text{ J}}$$

1. (a) $m_2 g \quad T_2 = m_2 a$

$$T_2 = m_2(g \quad a) = 20.0 \text{ kg}\,(9.80 \text{ m/s}^2 \quad 2.00 \text{ m/s}^2) = \boxed{156 \text{ N}}$$

$$T_1 \quad m_1 g \sin 37.0° = m_1 a$$

$$T_1 = (15.0 \text{ kg})(9.80 \sin 37.0° + 2.00) \text{ m/s}^2 = \boxed{118 \text{ N}}$$

(b) $$(T_2 \quad T_1)R = I\alpha = I\left(\frac{a}{R}\right)$$

$$I = \frac{(T_2 \quad T_1)R^2}{a} = \frac{(156 \text{ N} \quad 118 \text{ N})(0.250 \text{ m})^2}{2.00 \text{ m/s}^2} = \boxed{1.17 \text{ kg} \cdot \text{m}^2}$$

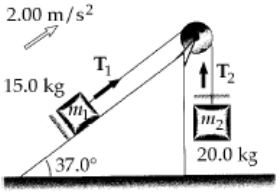

Fig. 1