

**Quiz BC 07 & 08, and My solution to 06**

**BCQ07** set up

Physical Principles

Details

**BCQ08** Solve for  $v_f = v(H)$

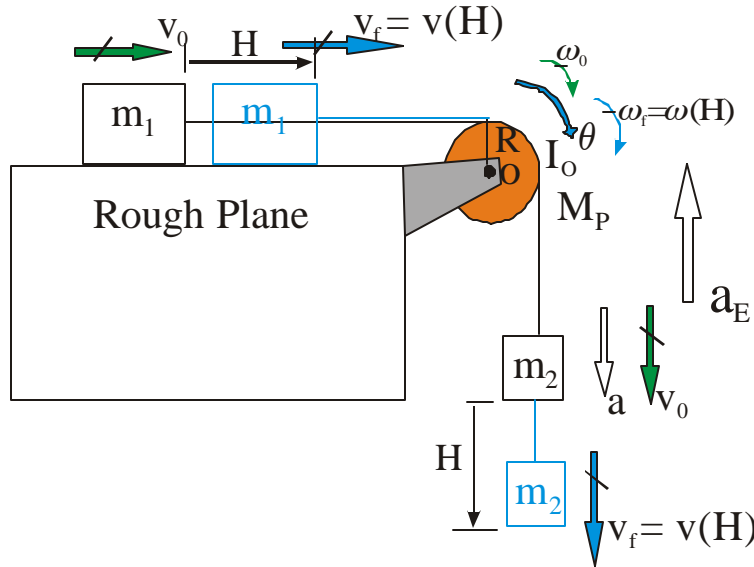
The picture shows the present (initial) situation, **initial state**, of this system.

1.  $m_1$ , with mass of 0.2kg., slides with an initial velocity  $v_0$  over the rough horizontal plane. The coefficients of friction are  $\mu_s = 0.4$  and  $\mu_k = 0.3$ , respectively.

2.  $m_2$ , with mass of 0.5 kg., accelerates as shown

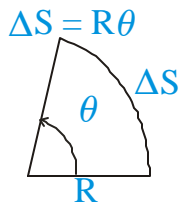
3. The two are connected by a massless, inextensible (won't stretch) string .

4. The string goes over the rim of the pulley of mass  $M_P = 0.$  kg., radius  $R = 0.1$  m, and moment of inertia about its center O of  $I_O = 8 \times 10^{-4}$  kg m<sup>2</sup>. **The pulley rotates with the moving string without slipping.**



**5. The whole system is on the floor of an elevator that has an acceleration  $a_E$ .**

We will want to ultimately want to find the velocity  $v_f$  after  $m_2$  has fallen a height  $H$  by general form **Conservation of Energy**. That is to get  $v(H)$  using general form **Conservation of Energy**.



- a. Sketch the **final state** of the system after  $m_2$  has fallen a height  $H = 0.5$  m below its initial state, include the final velocity  $v_f$ . Be sure to **include all needed** initial and final motional items. You can do it on the above picture. **60 pts**

**See picture above.**

- b. Obtain the relation between the angle,  $\theta$ , that the pulley turns and the height  $H$  and the change in angular velocity in terms of  $H$ . That is, get  $\theta(H)$  and  $\Delta\omega(H)$ . **20 pts each**

$\Delta S = R\theta$  is the linear distance traveled by the rim of the pulley for an angle change of  $\theta$ . This distance must be equal to  $H$ , the distance  $m_2$  falls, if the pulley rotates without slipping (see 4. above).

Further  $\Delta S/\Delta t = R\Delta\theta/\Delta t = \omega$ . So,  $v_f - v_0 = R\omega_f - R\omega_0$ . Therefore  
 $\omega_f - \omega_0 = \Delta\omega(H) = (v_f - v_0) / R = (v(H) - v_0) / R$ .

What's your learning style?

Are you auditory, learn by hearing? Then talk it out loud.

Are you visual, learn by seeing? Then draw pictures, doodles, sketches.

Are you kinesthetic, learn by movement? Then act it out. Pretend