Name Federico Tatar Date 10/13/23

CRN 88842 GTA Name Merritt

Lab 6: Energy

PHYS 2305

Pre-lab Assignment

Question Pre-1: In Section 1.3, you will consider the gravitational potential, kinetic, and total mechanical energy of a cart moving down an inclined ramp in a cart-Earth system. (Refer to Figure 6. 2). Define the gravitational potential energy to be zero when the cart is at the bottom of the ramp. Write an expression for the gravitational potential energy of the cart-Earth system in terms of the cart's mass m, the cart's position along the inclined ramp x, and the angle of the ramp θ.

Gravitational Potential Energy:

$PE = mgh$ → h is the height after x distance or ramp

$\sin\theta = \frac{h}{x}$

$PE = mg\sin\theta$

Question Pre-2: In the situation described in Question Pre-1, how will the kinetic energy, gravitational potential energy, and total mechanical energy behave over time as the cart rolls down the inclined ramp? (For each type of energy, answer if it decreases, increases, or stays the same.) Explain.

* since there's no friction present in the system, the total mechanical energy will remain constant. Initially, we assume at distance x the cart is at rest.

$TE = PE + KE$

$TE = mg\sin\theta + 0$

* when the cart rolls down the KE will increase

$KE = \frac{1}{2}mv^2$ xs is the distance the cart moves

$v^2 = 0 + 2(g\cos\theta)s$

$KE = mgs\cos\theta$

$PE = mgx\sin\theta - mgs\cos\theta$

Question Pre-3: Assume a spring has an unstretched length x_o. Write an expression for the elastic potential energy of the spring in terms of the position of the end of the spring x and its spring constant k.

Elastic PE = $\frac{1}{2}kx^2$

$U = \frac{1}{2}k(x - x_o)^2$

Question Pre-4: Describe how you will measure the spring constant k in Section 2.2 Measurement of the Spring Constant.

Since $U = \frac{1}{2}kx^2$

$k = 2\frac{U}{x^2}$