Name_

Review Worksheet Energy Circular Motion and Stuff

Mods

- 1. How much elastic potential energy would be stored if a spring has a spring constant of 400 N/m and was stretched from 0 to 0.40 meters?
- 2. How much additional energy would the same spring store if stretched from 0.40 to 0.80 m?

3. A hill is **150. m** long and makes an angle of **20.0**⁰ with the horizontal. As a 7**5.0-kg** jogger runs up the hill, **how much work does gravity do** on the jogger?

4. An **120.0-N** box of clothes is pulled **15.0** m up a **35.0**⁰ ramp by a force of **125** N that points along the ramp. If the **coefficient of kinetic friction** between the box and ramp is **0.30**, **calculate the change in the box's kinetic energy**.

5. A 3.50 x 10³-kg car starts from rest at the top of a driveway 8.0 m long that is sloped at 30.0⁰ with the horizontal. If an average friction force of 5.0 x 10³ N impedes the motion, what is the speed of the car at the bottom of the driveway?

- 5. A 1500 kg car is traveling at a constant speed of 40 m/s.
 - a. How much energy is transferred to internal energy as the car comes to rest?
 - b. If the car stops in 200 meters, what is the average force applied to the car?
- 6. A 1.9 kg kitten jumps down from a 1.5 meter high fence.
 - a. What is the kitten's ΔE_g ?
 - b. What will be the kitten's speed when it reaches the ground?

- 6. A 105. g dart rests up against a spring that has been compressed 0.075 meters.
 - a. If 2.25 J of work were required to compress the spring, what is its spring constant?
 - b. What is the maximum velocity of the dart after the spring has transferred its energy to it?
 - c. If the dart were fired vertically, what height would it reach?

- 7. Tarzan swings on a **40.0-m** long vine initially inclined at an angle of **30.0⁰** with the vertical. What is his **speed at the bottom** of the swing if he does the following?
- a) Starts from rest.

Formula Set-Up with Units

Answer _____

b) **Pushes off with a speed of 6.00 m/s**. Formula Set-Up with Units

Answer

8. A child sits on a carousel at a distance of **3.5 m from the center** and rotates through an **arc length of 6.5 m**. What is the angular displacement of the child?

9. A test car moves at a constant speed of **21.5 m/s** around a circular track. If the distance from the car to the center of the track is **50.0 m**, what is the centripetal acceleration of the car?

- An 88.4-kg bicyclist is riding at a linear speed of 14.5 m/s around a circular track with a radius of 42.5 m.
 - a. Find the magnitude of the frictional force that maintains the bike's circular motion.
 - b. What is the coefficient of friction between the tire and the road?

11. Deimos, a satellite of Mars, has an average radius of 6.3 km and a mass of 5.0 x 10¹⁵ kg. Calculate the gravitational force applied to a rock with a mass of 3.0 kg that lies on the surface of Deimos.

Planet	Radius of rotation (10 ¹⁰ m)	Period T (y)	$\begin{array}{c} T^{2}\!/\!a^{3} \\ (10^{-34}y^{2}\!/\!m^{3}) \end{array}$
Mercury	5.79	0.241	
Venus	10.8	0.615	
Earth	15.0	1	
Mars	22.8	1.88	
Jupiter	77.8	11.9	
Saturn	143	29.5	
Uranus	287	84	
Neptune	450	165	
Pluto	590	248	

12. Data confirming Kepler's Law of Periods comes from measurements of the motion of the planets.

Data from Halliday, Resnick, Walker, Fundamentals of Physics 4th Ed Extended. Table 15-3

From the data above fill in the missing column and then calculate the mass of the Sun using Kepler's 3rd law for 3 of the planets.