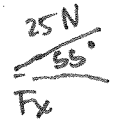
Name Key Hour _____

Work-Energy Review/Practice Test

Work-Energy Test: _____≈70_____ pts on ____Friday 12/11___

Concepts: (20 Multiple Choice and True/False)

1. What variables does PE depend on? If you double the height, what happens to the PE?
   mass, gravity, height ×2
2. If you double the velocity, what happens to the KE? WHY?
   ×4 $\frac{1}{2}mv^2$ velocity is squared
3. What are the units of the following items:
   energy, work, power, force, distance
   J J watts N m
4. The Joule is equal to what other unit? (use work equation to help) $W=F\cdot d$ $J=Nm$ $N\cdot m$
5. What are these the definitions for?
   - Energy transferred by a force through a distance work
   - Rate at which work is done power
   - Push or a pull force
   - Energy of position PE
   - Energy of motion KE
   - Ability to do work energy
6. What does conservation of energy state?
   energy not lost – just transferred from 1 form to another
7. If you start with 8 J of KE and lose 3 J of KE, how much PE should be gained? 3 J
8. When can you use the $a_y=(V_{fy}-V_{iy})/\Delta t$ equation with projectiles?
   with angled projectiles ONLY
   * only works at the ½ way point
9. Are V_{iy} and Δy the same thing when using projectiles? NO
   (So when you are looking for height...you can't stop after finding V_{iy}!)
10. If you start at a height of 12 m and fall 8 m...what is h_i=12, h_f=4 Δy=8
11. How many watts are in a 24 hp engine?
    $24\ hp \times \frac{746\ watts}{1\ hp} = 17904\ watts$
12. You pull a sled with a force of 25 N at an angle of 55° N of E, and it moves a distance of 10 m. Find the work done. (Remember-it moves horizontally so you need Fx!)



$\cos 55° = \frac{F_x}{25}$

$F_x = 14.34\ N$

$W = F\cdot d$

$(14.34)(10) = \boxed{143.4\ J}$

Problems: (Short Answer) There will be 5 problems on the test...similar to these ones.

1. A 1 kg balloon car accelerates from 0 to 3 m/s in 2.5 sec. Find its horsepower.

$a = \frac{3-0}{2.5} = 1.2\ m/s^2$

$P = \frac{W}{\Delta t} = \frac{m\cdot a\cdot d}{\Delta t} = \frac{1(1.2)(3.75)}{2.5} = \frac{1.8\ watts}{746} = \boxed{.0024\ hp}$

$\Delta x = v_i\Delta t^0 + \frac{1}{2}a\Delta t^2$

$\frac{1}{2}(1.2)(2.5)^2$

$\Delta x = 3.75\ m$

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2. Rudolph (250 lbs) accidentally falls off a 11.5 m roof while delivering presents. After falling 6 m, he remembers he can fly! Find his velocity at this point using both conservation of energy and a 1-D motion equation. $\Delta y =$ 6, hi= 11.5, hf= 5.5

Conservations of energy:

$mgh_i + \frac{1}{2}mv_i^2 = mgh_f + \frac{1}{2}mv_f^2$

$(9.8)(11.5) = (9.8)(5.5) + \frac{1}{2}v_f^2$

$112.7 = 53.9 + \frac{1}{2}v_f^2$

$58.8 = \frac{1}{2}v_f^2$

$v_f = 10.84 \frac{m}{s}$

1-D motion equation:

$v_f^2 = v_i^2 + 2a\Delta y$

$v_f^2 = 2(9.8)(6)$

$v_f = 10.84 m/s$

3. A **25 gram** pendulum is released from an initial height of 0.25 m. Calculate the **velocity** it will be traveling at the bottom of its swing. What is its **kinetic energy**?

$25g = .025\ kg$

$mgh_i + \frac{1}{2}mv_i^2 = mgh_f + \frac{1}{2}mv_f^2$

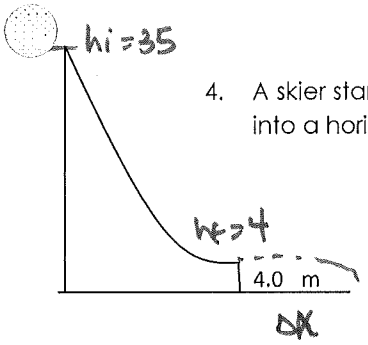
$9.8(.25) = \frac{1}{2}v_f^2$

$v_f = 2.21 \frac{m}{s}$

$KE = \frac{1}{2}mv^2$

$\frac{1}{2}(.025)(2.21)^2$

$KE = .061\ J$



4. A skier starts from rest 35 m above the ground. If he leaves the track at a height of 4 m and turns into a horizontal projectile, how far away (Δx) from the end of the track should he land?

(1) CE

$mgh_i + \frac{1}{2}mv_i^2 = mgh_f + \frac{1}{2}mv_f^2$

$(9.8)(35) = (9.8)(4) + \frac{1}{2}v_f^2$

$343 = 39.2 + \frac{1}{2}v_f^2$

$303.8 = \frac{1}{2}v_f^2$

$v_x = v_f = 24.6 \frac{m}{s}$

(2) $\Delta y = v_{iy}\Delta t + \frac{1}{2}a_y\Delta t^2$

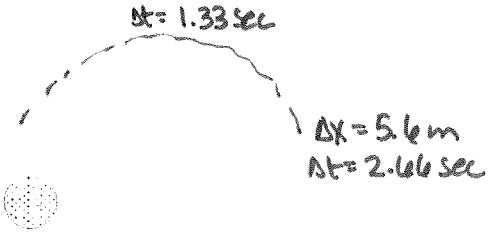
$-4 = \frac{1}{2}(-9.8)\Delta t^2$

$\Delta t = .904\ sec$

(3) $v_x = \frac{\Delta x}{\Delta t}$ $\quad 24.6 = \frac{\Delta x}{.904}$

$\rightarrow \Delta x = 22.2\ m$

5. A disc (15 **grams**) shot out of a Zoom-O at an angle travels 5.6 m in 2.66 sec. Calculate the potential energy at its maximum height. for PE we need height (Δy)



(1) Find v_{iy} (at ½ way pt)

$a_y = \frac{v_f - v_{iy}}{\Delta t}$

$-9.8 = \frac{-v_{iy}}{1.33}$

$v_{iy} = 13.03 m/s$

(2) Find Δy

$\Delta y = v_{iy}\Delta t + \frac{1}{2}a_y\Delta t^2$

$(13.03)(1.33) + \frac{1}{2}(-9.8)(1.33)^2$

$\Delta y = 8.666m$

$1.5g = .015\ kg$

$PE = m \cdot g \cdot h$

$(.015kg)(-9.8)(8.66)$

$-1.27\ J$