Name Answer Key Date _____

Honors Physics Energy WS #1H

Period _____ Mrs. Nadworny

Work

Directions: Read online textbook pages 167 – 171. Solve the following problems using the GUESS method and proper significant figures. Be sure to show ALL work.

1. The amount of work done against friction to slide a box in a straight line across a uniform, horizontal floor depends most on the

   (A) direction of the box's motion (C) speed of the box

   (B) time taken to move the box (D) distance the box is moved

2. Two weightlifters, one 1.5 meters tall and one 2.0 meters tall, raise identical 50.-kilogram masses above their heads. Compared to the work done by the weightlifter who is 1.5 meters tall, the work done by the weightlifter who is 2.0 meters tall is

   A) less B) greater C) the same

3. A 60.-kilogram student climbs a ladder a vertical distance of 4.0 meters in 8.0 seconds. Approximately how much total work is done against gravity by the student during the climb?

   A) 2.4×10^3 J B) 2.4×10^2 J C) 2.9×10^2 J D) 3.0×10^1 J

4. The work done in lifting an apple one meter near Earth's surface is approximately

   A) 1 J B) 100 J C) 0.01 J D) 1000 J

5. The total work done in lifting a typical high school physics textbook a vertical distance of 0.10 meter is approximately

   A) 0.15 J B) 15 J C) 1.5 J D) 150 J

6. How much work is done by the force lifting a 0.1-kilogram hamburger vertically upward at constant velocity 0.3 meter from a table?

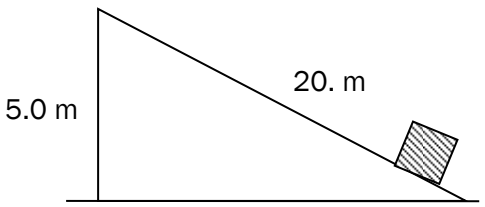
   A) 0.03 J B) 0.3 J C) 0.1 J D) 0.4 J

7. A 1.6 kg box is to be raised up to a height of 5.0 meters by pushing it up a 20. meter frictionless incline.

   a. Calculate the angle of the incline.

   $$\theta = \sin^{-1}\left(\frac{O}{H}\right) = \sin^{-1}\left(\frac{5.0m}{20.m}\right) = 14^0$$

   b. Calculate how much force is needed to push the box up the hill at a constant speed.



$F_{parallel} = F_g \sin\theta = mg\sin\theta$

$= 1.6kg(-9.81\frac{m}{s^2})\sin 14°$

$= 3.8N$ downhill

$F_{app} = -F_{g\|} = 3.8N$ uphill

$F_g = mg = 1.6kg(-9.81\frac{m}{s^2}) = 16N$ down

$F_{parallel} = F_g \sin\theta = -16N\sin 14° = 3.9N$ downhill

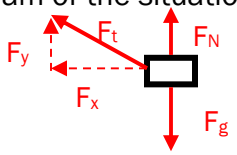
$F_{app} = -F_{g\|} = 3.9N$ uphill

   c. Calculate the work done by the student.

$$W = F_A d = 3.9N(20.m) = +78J$$

Continued on next page

8. Belle Zaringing, a physics student who is commonly tardy, is being dragged to the left across a frictionless surface by a rope that makes an angle of 30.0^0 with the ground. The rope has a tension of 670. N and the student is dragged 10.7 meters.
   a. Draw a free body diagram of the situation.



   b. What are the horizontal and vertical components of the applied force?

$$Fx = F\cos\theta = 670.N\cos 30.0° = 580.N \text{ left}$$
$$Fy = F\sin\theta = 670.N\sin 30.0° = 335N \text{ up}$$

   c. How much work is done in moving the student across the floor?

$$W = F_x d = 580.N(10.7m) = +6210J$$

9. Aretha Holly does 910 J of work lifting a box off the ground to a height of 1.8 meters. What is the **mass** of the box?

$$m = \frac{W}{gd} = \frac{910J}{(9.81\frac{m}{s^2})(1.8m)} = 52kg$$

Answers in size order: 3.8 or 3.9, 14, 52, 76 or 78, 335, 580., 6210