Physics 11 Unit 3 Energy Worksheet #1

Key

Name: _____ Date: _____

- $KE = E_K = \frac{1}{2} mv^2$
- $PE = E_p = mgh$
- $E_i = E_f$
- $W = F\,d$
- $P = W/t$

1. How much energy (work) does it take to drag a box across as desk 4m using a 7 N force?

$W = F \cdot d = 7 \cdot 4 = 28$ Joules

2. If the above box is dragged the 4 m in 8 seconds, how much power was required?

$P = W/t = \frac{28}{8} = 3.5$ Watts

3. What is the KE of a 1400 kg car travelling at 25 m/s?

$KE = E_K = \frac{1}{2} mv^2 = \frac{1}{2}(1400)(25)^2 = 437{,}500$ J.

4. How much work did it take to lift a 55 kg box up onto a 1.2 m high table?

$Force = F_g = mg = (55)(9.8) = 539$ N

$W = F \cdot d = F \cdot h = (539)(1.2) = 646.8$ J

5. How much work did it take to drag a 40 kg box 3 m across a floor if the coefficient of friction is 0.7?

① $F_g = mg = (40)(9.8) = 392$ N ② $F_F = \mu F_\perp = (.7)(392) = 274.4$ N

$F_\perp = F_g$

③ $W = F \cdot d = (274.4)(3) = 823.2$ J

6. A hot wheels car starts at the top of a ramp, 1.6 m above the ground. Assuming no energy is converted to heat during the run, how fast should the car be going at the bottom?

Total $E_i = E_f$

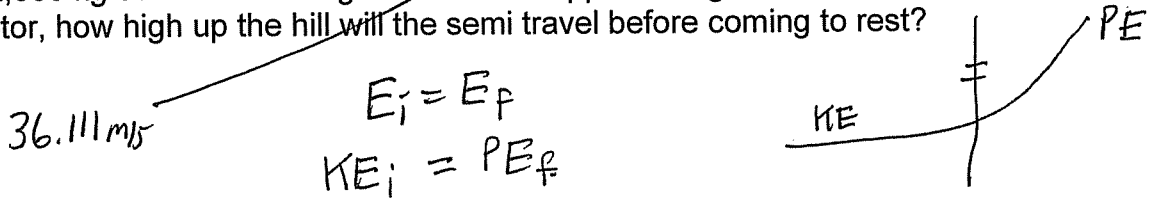
$PE_i + KE_i = PE_f + KE_f + heat$

$mgh = \frac{1}{2}mv^2$ — in this case mass does not matter.

$(9.8)(1.6) = \frac{1}{2}(v)^2$

$v = 5.6$ m/s

7. A 82,000 kg semi is travelling at 130 km/hr approaching a hill. If the driver shuts off the motor, how high up the hill will the semi travel before coming to rest?



$E_i = E_f$

$KE_i = PE_f$

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

$\frac{1}{2}(36.1)^2 = (9.8)h$?

$h = 66.5$ m

8. A 800 kg car if travelling at 34 m/s at the bottom of a hill. How high up the hill will the car travel if 180,000 J of energy are converted to heat during the run up the hill?

$E_i = E_f$

$KE_i = PE_f + 180{,}000$ Heat.

$\frac{1}{2}mv^2 = mgh + 180{,}000$

$\frac{1}{2}(800)(34)^2 = (800)(9.8)(h) + 180{,}000$

$462{,}400 = 7840h + 180{,}000$

$282{,}400 = 7840h$

$h = 36.0$ m

9. If a 2.2 kg mass is to be lifted 28 m in 45 sec, how powerful of a motor would you need?

/4

$P = \frac{W}{t} = \frac{F \cdot d}{t} = \frac{(21.56)(28)}{45}$

$F_g = mg = 21.56$ N

$= 13.4$ W.