WEP Test (Pre-AP Physics) Name: Answers

Short Answer (18 pts.)

1. The Conservation of Energy says…(at least one form please)

   Total amount of energy (of all forms) is constant in time.

2. Work changes energy.

3. We discussed a form of potential energy in class—namely gravitational potential energy. For PE_g to be considered in solving an energy problem, what must change about an object?

   The height (or elevation) [otherwise $PE_{g_i} = PE_{g_f}$]

4. In the lab we did to find the power of a person, how did we find the amount of work the person did by climbing the stairs? (Don't give an equation. What principle did we use?)

   Work = ΔPE_g as the person climbed upward - so we found PE_g.

5. As your physics teacher drops a bowling ball on the floor, the ball's potential energy transforms into kinetic energy until all of it is transformed into kinetic energy right before it hits. What happens to this kinetic energy when the ball hits the floor? (Name at least two things.)

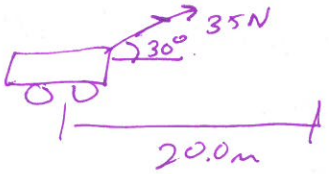
   Is transformed into heat energy (thermal) & acoustic (sound) energy

6. Work/Energy is measured in Joules Power is measured in Watts

   Force is measured in Newtons Mass is measured in Kilograms

Puzzles (Answer the following using ideas of work, energy, and power. 16, 18, 16, 16, 16 pts.)

7. As you are moving into your dorm room at college your little brother uses a rope to tug a small wagon of belongings along the hallway floor. If he tugs with a force of 35.0 N at an angle of 30.0 degrees above the horizontal for a distance of 20.0 m, calculate the work he does.



$W = F x \cos\theta$

$= (35N)(20m)\cos 30°$

$= (700)(.866\ldots)$

606.2177

Ans: 606 J.

8. A 1.20×10^3 kg car, starting from rest, accelerates for 5.00 seconds. The magnitude of the acceleration is 4.60 m/s^2. Determine the final speed of the car, the change in the car's energy, and the power generated by the car's engine.

$v_i = 0$, $KE_i = 0$

$v_f = 4.60 m/s^2 \times 5.00 s = 23 m/s$

$\left(a = \frac{v_f - v_i}{t}\right)$

$KE_f = \frac{1}{2} m v_f^2$

$= \frac{1}{2}(1200kg)(23)^2$

$= 317,400 J$

$\Delta E = KE_f - KE_i$

$= 317,400 - 0$

$P = \frac{\Delta E}{t} = \frac{317,400 J}{5.00 s}$ 63,480 W

(3 s.f.)

Ans: 23.0 m/s

Ans: 317,000 J

Ans: 63,500 W

10. A hockey puck (m = 0.162 kg) with an initial velocity of 45.0 m/s slides across some rough ice for a distance of 18.0 m and leaves the rough patch with a speed of 41.0 m/s. Find the force of friction that acted on the puck.

$W = \Delta E$

$W = \Delta KE$

$W = KE_f - KE_i$

$F x \cos\theta = \frac{1}{2} m v_f^2 - \frac{1}{2} m v_i^2$

$F_f (18) \cos 180^\circ = \frac{1}{2}(.162)(41)^2 - \frac{1}{2}(.162)(45)^2$

$-18 F_f = 136.161 - 164.025$

$-18 F_f = -27.864$

$\frac{-18}{} \quad \frac{-27.864}{-18}$

$F_f = 1.548$

Ans: 1.55 N

11. Imagine that a bullet with a mass of 6.0×10^{-3} kg leaves a rifle at 320 m/s and experiences an average air drag force of 1.2×10^{-3} N. How high can the bullet rise if fired straight up?

$W = \Delta E$

~~$W = KE_f - KE_i$~~

$W = (KE_f + PE_g) - (KE_i + PE_i)$

$v_f = 0$ at top

$h_i = 0$ at bottom

$x = h_f$ since force acts over same distance as bullet rises.

$\theta = 180^\circ$ since $\vec{x}$ up & $\vec{F}_D$ down

$F x \cos\theta = \frac{1}{2} m v_f^2 + mgh_f - \frac{1}{2} m v_i^2 - mgh_i$

$F h_f \cos\theta = \frac{1}{2} m (0)^2 + mgh_f - \frac{1}{2} m v_i^2 - mg(0)$

$(1.2 \times 10^{-3} N)(h_f) \cos 180^\circ = (6 \times 10^{-3} kg)(9.8)(h_f) - \frac{1}{2}(6 \times 10^{-3} kg)(320)^2$

$-1.2E^{-3}(h_f) = .0588 h_f - 307.2$

$-.0588 h_f \quad -.0588 h_f$

$-.0576 h_f = -307.2$

$h_f = 5333.3$ m

Ans: 5300 m

12. You throw something at 5.0 m/sec, and it hits the ground at 9.0 m/sec. How far above ground level are you?

$TME_i = TME_f$

$KE_i + PE_{g_i} = KE_f + PE_{g_f}$

$\frac{1}{2} m v_i^2 + mgh_i = \frac{1}{2} m v_f^2 + mgh_f$

Mass is every term ... so cancel

$\frac{1}{2} v_i^2 + gh_i = \frac{1}{2} v_f^2 + gh_f$ (ground)

$\frac{1}{2}(5)^2 + (9.8)(h_i) = \frac{1}{2}(9)^2 + (9.8)(0)$

$12.5 + 9.8h = 40.5$

$9.8h = 40.5 - 12.5$

$9.8h = 28$

$h = 2.857$

Ans: 2.9 m

~~Bonus~~:

~~I will check out Mr. Bryant's new website design and give him feedback. (+1 for checking the blank and agreeing)~~

~~Calculate the coefficient of friction in number 10 above. (+2)~~