

Ch. 7 Homework Solution

Ch. 7 Energy

504
Phy 101

①

Questions

2, 5, 8, 12, 26, 27, 30, 35, 36
39, 40, 49, 51, 52

Exercises

1, 3, 6, 9, 13, 17, 19, 22, 23

Q's

②) Total energy includes all possible forms of energy including gravitational, kinetic, thermal, etc. Total energy is ALWAYS conserved. Mechanical energy can be conserved if it is in an isolated system - no friction or external forces.

⑤) $\Sigma KE = 0$ means NO motion $KE = \frac{1}{2}mv^2$ is always a positive quantity.

$\Sigma \vec{p} = 0$ means the vector sum is zero. So, two momentums in opposite directions can give a total mom. of zero, even if objects are moving.

⑧) $KE_{red} = \frac{1}{2}m(2v)^2 = \frac{4}{2}mv^2 = 2mv^2$

$KE_{blue} = \frac{1}{2}m(v)^2 = \frac{1}{2}mv^2$

$$KE_{red} = 4 KE_{blue}$$

Q's

②

12. If the jet moves at constant speed, its $KE = \frac{1}{2}mv^2$ is also constant. However, since it is moving in a circle, the velocity is always changing so the direction of momentum changes.

26. Again, if you change the direction of the motion of an object, its momentum changes but its KE can stay the same. If its KE is changed, the momentum automatically changes.

27. $W = F \cdot d = \Delta KE = \Delta PE$

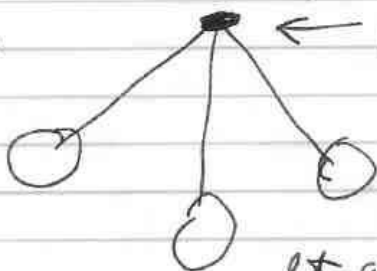
$$W_A = 5N(5m) = 25 Nm$$

$$W_B = (4N)(7m) = 28 Nm$$

$$\boxed{W_B > W_A}$$

30. If the firefighter did not squeeze his legs & feet around the pole, he/she would speed up the entire way down the pole. So, if terminal velocity is reached, this means that the feet/legs are using friction to slow down.

35.



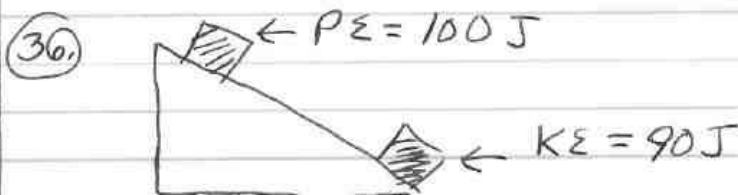
Point of contact experiences friction & thus some KE transfers to thermal energy & the pendulum loses mechanical energy. It goes less high on each swing.

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③

Q's



Generally, $\text{Tot E (top)} = \text{PE}$
 $\text{Tot E (bottom)} = \text{KE}$

If 2 quantities are not equal, some energy is lost! 10 J are lost to friction while sliding down the incline.

③⑨.) As dribble basketball, total energy changes from all PE at top of dribble to some KE & some PE while it falls to total KE just before striking the ground. On the rebound the opposite occurs.

④⑦.



a) $\text{KE} = \frac{1}{2}mv^2$ will be different for all 3 creatures.
 - dif't masses.

b) $\text{PE} = mgh$ is different for all - dif't masses

c. $F = \Delta \text{KE} = Fd$ will be different due to dif't masses.

d. Speed is dependant on accel. due to gravity is the same for all 3 since none will reach terminal velocity.

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(4)

Q5

(49) $Power = 600\text{ W} = 600\text{ J/s} = \frac{\text{Work}}{\text{Time}}$

if you decrease the time to do the work to less than 1 second, more than 600 J of work will be done.

(51) $\text{kWh} = \text{Power}(\text{Time}) = \text{Work or Energy}$

(52) $P_{\text{val}} = \frac{1200\text{ J}}{10\text{ sec}} = 120\text{ W}$

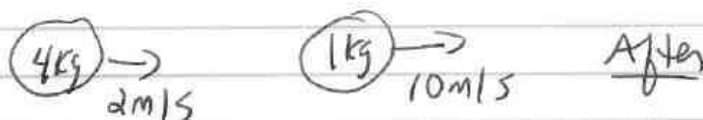
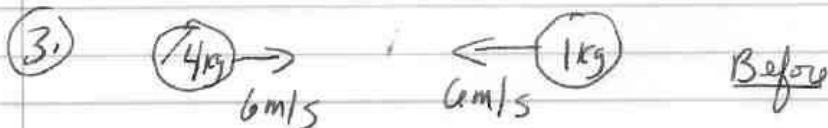
$P_{\text{val}} > P_{\text{ave}}$

$P_{\text{ave}} = \frac{5000\text{ J}}{50\text{ sec}} = 100\text{ J/s}$

Exercises

(1) $KE = ? \quad m = 1400\text{ kg} \quad v = 30\text{ m/s}$

$KE = \frac{1}{2} m v^2 = \frac{1}{2} (1400\text{ kg}) (30\text{ m/s})^2 = 630,000\text{ J}$



Σ 's

⑤

$$\textcircled{3} \text{ (cont)} \quad P_{\text{bef}} = \Sigma m v = 4 \text{ kg} (6 \text{ m/s}) - 1 \text{ kg} (6 \text{ m/s}) = 18 \text{ kg m/s to right}$$

$$P_{\text{aft}} = 4 \text{ kg} (2 \text{ m/s}) + 1 \text{ kg} (10 \text{ m/s}) = 18 \text{ kg m/s to right}$$

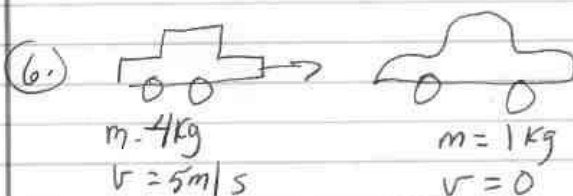
$$P_{\text{net}} = P_{\text{aft}}$$

$$KE_{\text{bef}} = \Sigma \frac{1}{2} m v^2 = \frac{1}{2} (4 \text{ kg}) (6 \text{ m/s})^2 + \frac{1}{2} (1 \text{ kg}) (6 \text{ m/s})^2 = 90 \text{ J}$$

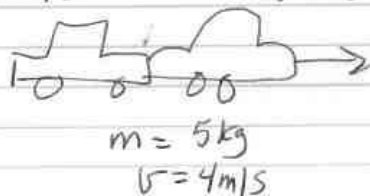
$$KE_{\text{aft}} = \frac{1}{2} (4 \text{ kg}) (2 \text{ m/s})^2 + \frac{1}{2} (1 \text{ kg}) (10 \text{ m/s})^2 = 58 \text{ J}$$

$$KE_{\text{bef}} > KE_{\text{aft}}$$

Yes collision could occur
momentum is conserved
& KE is transformed



$$KE_{\text{bef}} = \frac{1}{2} (4 \text{ kg}) (5 \text{ m/s})^2 + 0 = 50 \text{ J}$$



$$KE_{\text{aft}} = \frac{1}{2} (5 \text{ kg}) (4 \text{ m/s})^2 = 40 \text{ J}$$

 10 J are lost

6

E's

9. $KE_i = 4J$ $KE_f = 12J$ $d = 2m$

$\Delta KE = W = F \cdot d$

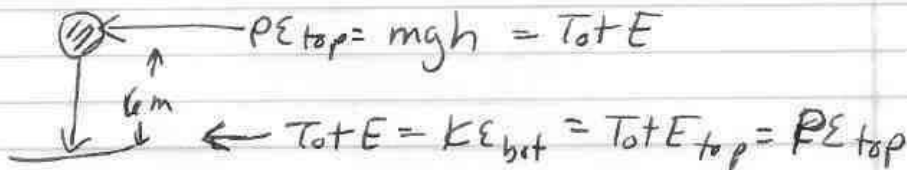
$F = \frac{\Delta KE}{d} = \frac{12J - 4J}{2m} = \boxed{4N}$

13. $m = 55kg$ $d = 720m$ high

$\Delta PE = W = (mg h) = 55kg(9.8m/s^2)(720m)$

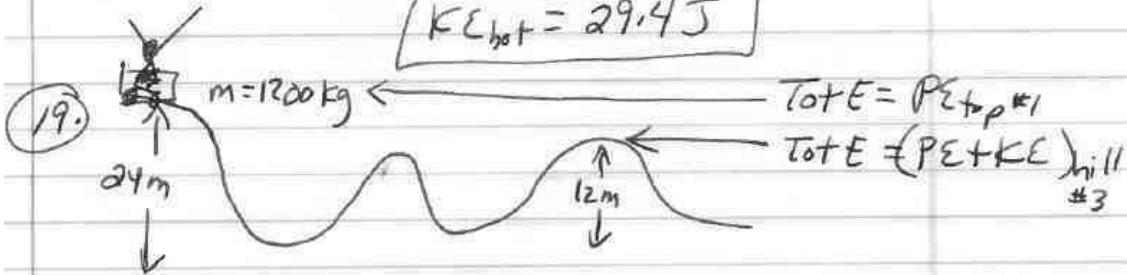
$\boxed{W = 388,080J}$

17. $m = 0.5kg$ $h = 6m$



$KE_{bot} = PE_{top} = mgh = (0.5kg)(9.8m/s^2)(6m)$

$\boxed{KE_{bot} = 29.4J}$



$KE_{top, hill \#3} = PE_{top, hill \#1} - PE_{top, hill \#3} = mg(h_1 - h_3) = (1200kg)(9.8m/s^2)(12m) = \boxed{141,120J}$

Ch. 7 HW

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Phy!E's

$$(22.) \quad m = 80 \text{ kg} \quad v = 10 \text{ m/s} \quad t = 3 \text{ sec}$$

$$\text{Power} = \frac{\Delta \text{KE}}{\text{time}} = \frac{\frac{1}{2} m (v_f^2 - v_i^2)}{3 \text{ sec}}$$

$$\text{Power} = \frac{\frac{1}{2} (80 \text{ kg}) (10 \text{ m/s})^2}{3 \text{ sec}} = \boxed{1333 \text{ W}}$$

$$(23.) \quad \text{CD player} \quad P = 15 \text{ W} \quad , \quad t = 8 \text{ hrs}$$

$$\text{Power} = \frac{\text{Energy}}{\text{Time}}$$

$$\text{Energy} = (15 \text{ W}) (8 \text{ hours}) \left(\frac{60 \text{ min}}{\text{hr}} \right) \left(\frac{60 \text{ sec}}{\text{min}} \right)$$

$$\boxed{\text{Energy} = 432,000 \text{ J}}$$