Key

Chapter 10 review Part 2

1) Know the following vocabulary words: Energy, Work, Power, Efficiency, Ideal Machine, Mechanical Advantage, Ideal Mechanical Advantage, Effort force, Resistant force, Effort displacement, Resistant displacement, Input Work, Output Work, Simple machines (know all 6), Compound machine, Friction, and change in Kinetic Energy.

2) Know the formulas for:
   a. Power
   b. Work
   c. Work Input/Work Output
   d. Kinetic Energy
   e. Work-Energy Theorem
   f. Angle Between Force and Displacement
   g. Mechanical Advantage
   h. Ideal Mechanical Advantage
   i. Efficiency
   j. Total Force
   k. Total Work

3) Do pages 278 – 279 in the book problems:
   52 - 59, 61, & 66

4) Study book problems from pages 261, 262, 264, 265, & 272. Rework the problems on a separate piece of paper.

5) Study all worksheets for chapter 10. Rework the problems on a separate piece of paper.

6) If a machine is used to produce a greater effort force, what other quantity has been decreased? Effort distance is decreased.

7) Explain how a screwdriver can be two different simple machines. In your explanation include which is more important for each machine the diameter of the handle or the length of screwdriver.

① Axle + wheel by driving a screw + having a Larger diameter of the handle is better
② Lever to pry a lid open + having a Longer screwdriver is better

8) In her job, Kayla is handed several books. She carries them across the library and hands them to the librarian. She thinks she works hard, but her brother tells her that she does not work on the books. Why is Kayla's brother correct? How might she accomplish the same tasks while doing work on the books?

Kayla's brother is correct becouse ~~force~~ force is perpendicular to the distance ∴ NO Work is done. If Kayla used an Inclined plane to push the books to the librarian then work could be applied on the books.

9) From problem 8, use the formula for work done when the direction of force is at an angle to the direction of motion to show why no work is done on the books.

$W = f \cdot d \cdot \cos\theta$

$f \cdot d \cdot \cos 90^\circ \rightarrow$ Perpendicular

$f \cdot d \cdot 0 = 0$ ∴ NO work is done.

10) Knowing the relationship between work and kinetic energy using the Work-Energy Theorem, give an example of how work can increase the kinetic energy of an object.

Since $W = \Delta KE$ due to the Work Energy theorem, More energy would move the object more in the direction of the force ∴ More work will occur.

11) Nate and Greg exert a total force of 546 N in moving a heavy bookcase 12 m. Greg exerts twice as much force as Nate exerts. How much work does each person do?

$F_{Total} = F_{Nate} + F_{Greg}$ $F_{Greg} = 2F_{Nate}$

$F_{Total} = F_{Nate} + 2F_{Nate}$ $\frac{F_{Total}}{3} = \frac{3F_{Nate}}{3} = \frac{546}{3} = F_{Nate}$

$F_{Nate} = 182\,N$ $F_{Greg} = 364\,N$

$W_{Nate} = 182 \cdot 12 = 2{,}184\,J \rightarrow 2.18 \times 10^3\,J$ $W_{Greg} = 364 \cdot 12 = 4{,}368\,J \rightarrow 4.37 \times 10^3\,J$

12) Alex works at Home Depot and lifts an 8.5 kg carton from the floor to a height of 0.85 m, carries it 58 m at constant speed across the store and places it on a shelf 1.45 m above the floor. How much work does Alex accomplish?

$W_1 = F \cdot d = m \cdot g \cdot d = (8.5)(9.8)(.85) = 70.81\,J$ or $7.08 \times 10\,J$

$W_2 = F \cdot d = m \cdot g \cdot d = (8.5)(9.8)(0.6) = 49.98\,J$ or $5 \times 10\,J$

$W_1 + W_2 = 70.81 + 49.98 = 120.79\,J$ or $1.2 \times 10^2\,J$

(27) $f_e = 225\,N$ $d_r = 13\,cm$

$f_r = 1250\,N$ $Eff = 88.7\%$

$MA: \frac{F_r}{F_e} = \frac{1250}{225} = 5.56$

$IMA: \frac{d_e}{d_r} = \frac{13cm}{d_r}$

$E = \frac{MA}{IMA} \times 100$

$88.7 = \frac{5.56}{\frac{13cm}{d_r}} \times 100$

$\frac{W_o}{W_{in}} = \frac{F_r d_r}{F_e d_e} \cdot 100 = Eff$

$\cancel{(f_e)} \frac{(1250)(13)}{(225)\cancel{(f_e)}} = .887 \cdot f_e$

$\frac{(1250)(.13)}{(225)(.887)} = d_e = .81m$

(EC)

(28)

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(52) $W = F \cdot d = m \cdot g \cdot d = (150)(9.8)(8) = 1 \times 10^4 J$

$1.2 \times 10^4 J$

(53) $W = F d = m \cdot g \cdot d \Rightarrow \frac{W}{g \cdot d} = m \quad \frac{176}{(9.8)(0.3)} = 59.9\,g$

$5.99 \times 10\,g$

(54) $W = F d = m \cdot g \cdot d\,(84 \cdot 9.8 \cdot 1.2) = 987.8\,J$

$9.88 \times 10^2 J$

(55) $W = F \cdot d \Rightarrow F = \frac{W}{d} = \frac{220000}{8m} = 27{,}500N$

$2.75 \times 10^4 N$

* (56) $W = F d = (551N)(161000m) = 8.87 \times 10^7 J$

km to m

(57) $P = \frac{W}{t} = \frac{F \cdot d}{t} = \frac{15 \cdot 251}{30} = 125.5W$

$1.26 \times 10^2 W$

or $1.26 \times 10^{-1} KW$

(58) $W = F \cdot d = m \cdot g \cdot d = (2.2)(9.8)(1.25) = 26.95J$

$F \cdot d = m \cdot g \cdot d = (2.2)(9.8)(.35) = 7.55J$

$W_1 = 26.95J$

$W_2 = 7.55J$

$34.5J$

(59) a) $W = F \cdot d = (300N)(30) = 9000J$

b) $P = \frac{W}{t} = \frac{9{,}000J}{3} = 3000W$

$3KW$

(61) $W = f \cdot d \cdot \cos\theta$

*Km to m $(88)(1200)(\cos 41) = 7.97 \times 10^4 J$

(66) $W = f \cdot d \cdot \cos\theta$

$(225)(65.3)(\cos 35) = 1.2 \times 10^4 J$