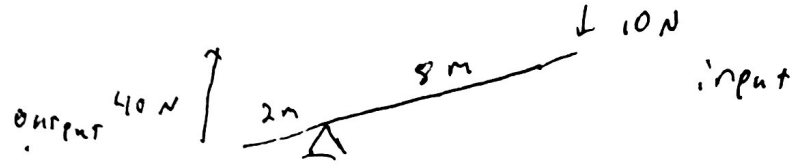
Review Physics 3/6

1) What are the six simple machines?

2) Define machine, efficiency, photosynthesis, cellular respiration

3) What is the mechanical advantage of this lever



4) If a machine takes in 100 J of energy & does 85 J of work, what is the efficiency of the machine?

5) If the same machine consumed the 100 J of energy in 0.05 sec, what is the power consumption of the machine?

6) A 2000 kg car has an initial velocity of 20 m/s & then applies the brakes & skids to a stop.
   a) How much work did friction do on the car?
   b) If the force of friction was 5000 N, how far did the car go?

7) What minimum power must a motor deliver to lift a 1000 kg elevator at a constant velocity of 3.0 m/s?

8) What is the potential energy of a 100 kg boulder on top of a 5 m ledge? If it falls, with how much kinetic energy will it strike the ground? What is the speed on impact?

useful equations) Mechanical advantage = $\frac{\text{output force}}{\text{input force}} = \frac{\text{input distance}}{\text{output distance}}$

efficiency = $\frac{\text{output work}}{\text{input energy}}$ $P = \frac{W}{t}$ (Power = $\frac{\text{work or energy}}{\text{time}}$) $P = F \cdot v$ (Power = Force · velocity)

$W = \Delta E$ (work = change in energy) $W = F d \cos\theta$ (work = Force · distance cos(angle between vectors))

$PE = mgh$ (potential energy = mass · gravity · height) $KE = \frac{1}{2}mv^2$ (kinetic energy = $\frac{1}{2}$ mass · velocity^2)

$g = 9.8\ m/s^2$

Solutions Physics review 3/6

1) pulley, lever, ramp, wheel & axle, wedge, & screw

2) A machine is a device used to multiply forces or simply to change the direction of forces. Efficiency is the ratio of useful work output to energy input. Photosynthesis is a process used by plants & other organisms to convert light energy to chemical energy. They take sunlight, water, & carbon dioxide to produce sugar & oxygen

energy from sun $+6H_2O + 6CO_2 \rightarrow C_6H_{12}O_6 + 6O_2$

Cellular respiration - ~~a set of robotic~~ how ~~animals~~ organisms get energy from sugar & oxygen & produce water & carbon dioxide

$C_6H_{12}O_6 + 6O_2 \rightarrow$ energy $+ 6H_2O + 6CO_2$

3) $\text{Mechanical advantage} = \frac{\text{output force}}{\text{input force}} = \frac{40N}{10N} = 4$

or $\text{Mechanical advantage} = \frac{\text{input distance}}{\text{output distance}} = \frac{8m}{2m} = 4$

4) $\text{efficiency} = \frac{\text{output work}}{\text{~~input~~ energy input}} = \frac{85J}{100J} = 0.85$ ~~or~~ 85%

5) $P = \frac{W}{t}$ $\frac{\text{energy consumption}}{\text{time}}$: power consumption $P = \frac{100J}{0.05\,sec} =$ **2000 Watts**

6) a) $W = \Delta E$ $E_0 = KE = \frac{1}{2}mv^2 = \frac{1}{2}(2000kg)(20\,m/s)^2 = 400,000J$

$E_f = 0$ $\Delta E = E_f - E_0 =$ **$-400,000J = W$**

b) f ←—m—→ d $\theta = 180°$ $\cos 180° = -1$ $W = Fd\cos\theta = -400,000J$ $-(5000N)d = -400,000J$

$d = \frac{-400,000J}{-5000N} =$ **80 m**

7) F, mg $F = mg$ $F = (1000kg)(9.8\,m/s^2) = 9800N$ $P = F \cdot v$ $P = (9800N)(3\,m/s) =$ **29,400 Watts**

8) $PE = mgh = (100kg)(9.8\,m/s^2)(5m) =$ **4,900 J** energy is conserved **KE = 4900 J**

$KE = \frac{1}{2}mv^2 = 4900J$ $v = \sqrt{\frac{2(4900J)}{100kg}} =$ **9.9 m/s**