Ch5 Extra Practice

1. $E_p = mgh = (45\,kg)(9.8\,\frac{N}{kg})(6\,m) = 2646\,J = \underline{2.6\times10^3\,J}$

2a) $W = Fd = E_p = (1.2\,N)(0.03\,m) = \underline{0.036\,J}$

b) $E_k = \frac{1}{2}mv^2 = 0.036\,J = \frac{1}{2}(0.01\,kg)v^2$

$v = \sqrt{\frac{2(0.036\,J)}{0.01\,kg}} = \underline{2.7\,\frac{m}{s}}$

3. $E_k = \frac{1}{2}mv^2 = \frac{1}{2}(1.0\times10^3\,kg)(90\,\frac{km}{h}\times\frac{1000\,m}{1\,km}\times\frac{1\,h}{3600\,s})$

$= \underline{1.3\times10^4\,J}$

4. $E_p = mgh = (75\,kg)(9.8\,\frac{N}{kg})(2.0\times10^3\,m) = \underline{1.5\times10^6\,J}$

5. You will pull with 30kg(9.8N), other side of rope will provide other 30x9.8N & force and the 60kg person will move!

6a) MA = 5 (5 supporting ropes)

b) $MA = \frac{load}{effort}$

$5 = \frac{600N}{effort}$ $\quad effort = \frac{600N}{5} = \underline{120N}$

c) $W = F_r d_r = 600N(1.2m) = \underline{720J}$

d) $1.2m \times 5 = \underline{6m}$

e) $W = F_e d_e = 120N(6m) = \underline{720J}$

7a) MA = 5

b) $\frac{3.5m}{5} = \underline{0.7m}$

8a) MA = 8

b) $\frac{300\,N}{8} = 37.5\,N$

9. $P = \frac{W}{t} = \frac{Fd}{t} = \frac{(75kg)(9.8\frac{N}{kg})(3m)}{2.5s}$

$= 882W \times \frac{1\,HP}{746W} = 1.2\,HP$

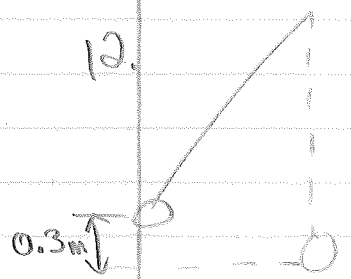
10. $P = \frac{W}{t}$ $W = Pt = 4.0HP \times \frac{746W}{1\,HP} \times 30min \times \frac{60s}{1min}$

$= 5.4 \times 10^6 J$

11. $P = \frac{W}{t}$ $W = Pt = 1500W(60s)$

$= 90,000J = 9.0 \times 10^4 J$

12.



$E = mgh$

1% energy lost each swing
4% energy lost in 4 swings
so 4% of height lost

→ $0.3m - 0.04(0.3m)$

$= 0.288m$

13. $E_K = E_P$

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

$h = \frac{v^2}{2g} = \frac{\left(285\frac{km}{h} \times \frac{1000\,m}{1\,km} \times \frac{1\,h}{3600\,s}\right)^2}{2\,(9.8\,m/s^2)} = 320m$

14a) radiation
b) convection
c) conduction
d) convection
e) convection

15. – the lighter side reflects light, darker side absorbs – spins like light is pushing against the black; black side moves away from the light.

16. igloo is warm because the white snow reflects the heat energy back into igloo.

17. specific heat capacity – the amount of heat required to raise the temperature of 1 kg of a substance by 1°C

18. $373K - 273 = \underline{\underline{100°C}}$

19. The metal is a good conductor (the atoms have loose e^- that can easily move and transfer the energy)

20. $\Delta E = mc\Delta T$

$$P = \frac{\Delta E}{t} = \frac{mc(T_f - T_i)}{t}$$

$$T_f = \frac{Pt}{mc} + T_i = \frac{(1500W)(2 \times 60s)}{(5)(4200)} + 10°C$$

$$= \underline{\underline{18.6°C}}$$

21. $\text{efficiency} = \frac{P_{out}}{P_{in}} = \frac{1346.8}{1500W} = 0.898 \rightarrow \underline{89.8\%}$

$P_{out} = \frac{W}{t} = \frac{mc\Delta T}{t} = \frac{(1.3)(4200)(99-25)}{5\times60} = 1346.8$

22. $\text{eff} = \frac{P_{out}}{P_{in}}$

15% efficient so 85% to heat

$0.85 \times 40W = 34W$ $\quad P = \frac{E}{t}$

$34W = \frac{E}{1s}$

$(34W)(1s) = E$

$E = \underline{34J}$

23. $\text{eff} = \frac{P_{out}}{P_{in}} = \frac{1106W}{1200W} = 0.92 \rightarrow \underline{92\%}$

$P_{out} = \frac{mc\Delta T}{t} = \frac{(0.8)(4200)(99-20)}{4\times60} = 1106W$

24. $\text{eff} = \frac{P_{out}}{P_{in}} = \frac{500W}{600W} = 0.83 \rightarrow \underline{83\%}$