Work, Energy + Thermal WS
key

① $W = F \cdot d = 35 \times 4.5 = 157.5\,J = 160\,J$ (Sig Fig).

② A) $\frac{3m}{0.05m} = 60$ times

3) $W = F \cdot d$ $\quad W = \Delta mgh$ $\quad \therefore \quad mgh = F \cdot d$

$$\frac{650 \times 9.8 \times 4}{0.05} = 509,600 \text{ or } 5.1 \times 10^5$$

③ $m = 2300\,kg$ $\quad d = 200\,km \rightarrow 200,000\,m$

$P_{in} = 450\,kW$ $\quad t = 8280\,sec$

$W = F \cdot d$ $\quad P = \frac{W}{t}$ $\quad 450{,}000 = \frac{W}{8280}$ $\quad \times 8280$ $\quad \times 8280$

$W = 3726000000$

$3.7 \times 10^9\,J$

4) A) $W = F \cdot d$ (x 2 up + down) $34 \times 2.3 \times 9.8 \times 2$

$= 1532.72 \times 15 =$

22990 J or 23000 J.

B) $P = \frac{W}{t} = \frac{22990}{46} =$ 499.8 W.

5) A) $W = F \cdot d = \Delta U_g = 450 \times 35 \times 9.8 =$ 154350 J

B) $P = \frac{W}{t} = \frac{154350}{23} =$ 6710.8 W.

6) $P = F \cdot v = 7000 \times 16 =$ 112000 W.

7) A) $PE = mgh$ $45 \times 450 \times 9.8 =$ 198450 J

B) $PE = mgh = 45 \times 200 \times 9.8 =$ 88200 J

↑ lost disp.

8) $KE = \frac{1}{2}mv^2$ $\frac{1}{2}(2300)(18^2) =$ 372600 J

9) A) $\Delta E_K = \frac{1}{2}mv_f - \frac{1}{2}mv_i = \frac{1}{2}(2)(2 - .2)^2 - \frac{1}{2}(2)(6.4) =$ -451.5 J

B) $W = \Delta E_K =$ 451.5 J C) $W = F \cdot d$ $\frac{451.5}{10} = \frac{(10)d}{10}$

$d =$ 45 m

11) $E_p = E_k$ $\quad \sqrt{450 \times 9.8 \times 78 + \frac{1}{2}(450)(11^2) \times 2}$

$E_p + E_k = E_k$ $\quad = 41 \text{ m/s}$

10) $E_p = E_k = mgh = \frac{1}{2}mv^2$ $\quad \sqrt{9.8 \times 15 \times 2} = v$

$v = 17 \text{ m/s}$

12) A) $E_k = \frac{1}{2}mv^2$ $\quad \frac{0.0025 \times 458^2}{2} = 253 \text{ J}$

B) inelastic (no stretch)

C) Converted to heat (friction)

D) $P_B = P_A$ $\quad \frac{0.0025 \times 458 + 0}{6.7 + 0.0025} = (6.7 + 0.0025)v$

$= 0.17 \text{ m/s}$

e) $E_k = \frac{1}{2}mv^2$ $\quad \frac{1}{2}(6.7025)(0.17)^2 = 0.968 \text{ J}$.

f) $253 - 0.0968 = 252.9 \text{ J}$ (Almost all).

(13) $Q = mc\Delta t$

A) $120 \times 4180 \times 20 =$ **10,032,000 J**

B) $9 \times 4180 \times 80 =$ 3,009,600 J

C) $50 \times 385 \times 47 =$ 904,750 J

A) b/c its more heavy.

(14) K → C -273

C → K $+273$

A) $-43^\circ C$
B) 206 K
C) 947 K
D) $707^\circ C$

(15) Iron: $c = 444\ J/kg^\circ C$

$Q = mc\Delta t$ $\quad 23 \times 444 (750 - 180) =$ **607,200 J**

(16) $m_1 = 2.3$ kg brass $\quad m_2 = ?$

$T_i = 67^\circ C \quad T_i = 20^\circ$

$T_f = 29^\circ \quad T_f = 29^\circ$

$c = 380\ J/kg^\circ C \quad c = 4180$

$m_A c_A T_A + m_B c_B T_B = 0$ $\quad (2.3 \times 380 \times (67 - 29)) + (m_2 \times 4180 (29 - 20)) = 0$

$m_2 = 0.88$ kg.

17) $Q = mc\Delta t$

$P = \frac{W}{t} = J$ $\quad 400\ J/s = \frac{J?}{120 \times 60}$ (×120)

$W = 48000\ J$ (in this case ΔE_T)

$Q = mc\Delta t$ $\quad 48000 = 0.25 \times 4180 \times (T_F - T_i)$

$48000 = 1045(T_F - T_i)$

$48000 = 1045 T_F - 1045 T_i$

$48000 = 1045 T_F - 1045(20)$

$48000 = 1045 T_F - 20900$

$+20900 \qquad +20900$

$\frac{68900}{1045} = \frac{1045 T_F}{1045} = \boxed{66°C.}$

18) $T_F = \frac{(m_A c_A T_A + m_B c_B T_B)}{m_A c_A + m_B c_B} = \frac{45 \times 444 \times 95 + 120 \times 4180 \times 20}{45 \times 444 + 120 \times 4180}$

$c_{Al} = 444\ J/kg°C$ $\quad = \boxed{23°C \text{ or } 22.8°C}$

19) Don't worry. $\frac{3.75}{100} = 3.75 \times 1.9\ kJ = 7.125\ kJ \times 1000 = 7125\ J$

$\Delta E = mgh$ $\quad 7125 = \frac{65 \times 9.8 \times h}{65 \times 9.8} = \boxed{11.1m.}$