Multiple Choice Questions

1) C units of density are $\frac{\text{mass}}{\text{volume}}$

2) A

3) D $\frac{1\ \text{kwh}}{29000\ \text{J/g}} \times \frac{3.6\times10^{6}\ \text{J}}{\text{kwh}} = 120\ \text{g}$

4) B $15\ \text{gal} \times 3.8\ \text{l/gal} \times 750\ \text{g/l} \times 42{,}000\ \text{J/g} \times \frac{1\ \text{kwh}}{3.6\times10^{6}\ \text{J}} = 500\ \text{kwh}$

5) B Gas car with 20% efficient engine goes $\frac{300\ \text{mi}}{500\ \text{kwh}}$
$= 0.6\ \text{mi/kwh}$
elec motor is 80% efficient so can do $2.4\ \text{mi/kwh}$
$2.4\ \text{mi/kwh} \times 9\ \text{kwh} = 22\ \text{mi}$

6) A $\frac{1\ \text{kwh}}{0.5\ \text{kw}} = 2\ \text{hr}$ ← $200\ \text{W} + 300\ \text{W} = 500\ \text{W} = 0.5\ \text{kw}$

7) A

8) C overcoming friction generates heat

9) D

10) A Efficiency is 30% so 3 kwh heat → 1 kwh elec + 2 kwh wasted heat

11) A $\frac{\text{mass of } {}^{2}H_2O}{\text{mass of } {}^{1}H_2O} = \frac{16+2+2}{16+1+1} = 1.1$

12) A KE/molecule is the same so fastest = lightest
so $\frac{1}{2}mv^2$ the same

13) C $\frac{\Delta V}{V} = 3\alpha\Delta T$ so $\frac{0.1}{8} = 3\times2\times10^{-4}\,\Delta T \Rightarrow \Delta T = 20\,C$

14) B $\text{CoP} = \frac{\text{heat out}}{\text{work in}} \Rightarrow \text{work in} = \frac{\text{heat out}}{\text{CoP}} = \frac{1\ \text{J}}{4}$