Phys Sc 416/30
Pretest 4.1 v 2007

1. Energy can be calculated in both kJ and kWh. A 300 W TV is turned on for the duration of a 1 hour 38 minute movie.

a. Calculate E in kWh.

Note: 1 h 38 min = 98 minutes

E = Pt = 0.300kW(98/60) = 0.49 kWh

b. Calculate E in kJ, keeping in mind that P= VI and E= VIt.

E = VIt. Since P = VI

= 300(98*60s) = 1 764 000 J = 1 764 kJ

c. What is the cost of keeping the TV on for 4 hours if the rate is $0.065/kWh?

Cost = ER
= 0.49 kWh($0.065/kWh) = $0.03 = 3 cents

2. Given a rate of $0.05/kWh, what is the yearly cost of watching a 500W TV if it is turned on for an average of 12 hours per week?

12h *52 = 624 h

E = P*t

= 0.5kW(624h)

= 312 kWh

Cost = E*rate

=312 kWh($0.05/kWh) = $15.60

3. It cost $20 of electricity for Joe to show off his avalanche of X-mas lights to his neighbours. If he turned them on for 12 hours per day from Dec 1 to Jan 4, inclusive, how much energy did he consume? Rate : $0.05/kWh.

Cost = E*rate

20= E(0.05)

E = 400kWh (note from this it would be possible to calculate power, using the time given.)

4. Show that multiplying V by I does indeed yield watts.

1V = 1 J/C 1A = 1C/s

P = VI

=(J/C)(C/s)= J/s = 1W

5. How much heat will a 250 mL glass of water absorb as its temperature climbs from 10^{o} C to 25^{o}C?

Q = mcΔT = 250ml(1g/mL)(4.19 J/[gC])(25 – 10) = 15712.50 J = 16 kJ

6. Would you drink 100 g of a liquid if its temperature increased from 19 to 20^{o}C as it absorbed 0.100kJ of heat from a metal coil? Calculate and explain.

Q = mcΔT

100 J = 100c(20 -19)

c = 1 J/[g C]

Don't drink it! Not only is it not water, but it's not juice or soda either. Anything that is mostly water should have a specific heat close to 4.19 J/[g C]

7. 200 g of ice has just melted. It goes on to absorb 10 000 J of energy. What final temperature will it reach?

8. A 120 V coil drawing 0.10 A of current is placed in 100 g of water for 600 seconds. First calculate the energy released by the coil. Then assume that the water absorbs all of the energy released by the coil to figure out the increase in temperature for the calorimeter.

VIt = mcΔT

120(0.10)(600) = 100(4.19) ΔT

ΔT = 17 ^{o}C

9. **The density of a certain liquid is 0.80 g/ml and its specific heat is 1.5 J/gC. A 200 g piece of 800 ^{O}C Pt is then dropped into it. If the 750 mL of liquid was originally at 10^{o}C, what maximum temperature will the mixture attain?**

$-Q_{hot} = Q_{cold}$

$-m_m C_m(T_f - T_{im}) = m_l c_l(T_f - T_{il})$

$-200(25/195)(x - 800) = 750ml(0.80g/ml)(1.5)(x - 10)$

$x = 32\ ^{o}C$

Note: we obtain the c for Pt by using Mc = 25 for metals;

We obtain the mass of the liquid by multiplying density by volume.

10. If a 3.0 Ω light bulb experiences a 2.0 V potential difference, what is the bulb's power rating?

V=IR
I = V/R = 2.0/3.0 = 0.666…
$P = I^2R = (0.666\ldots)(3) = 1.3\ W$

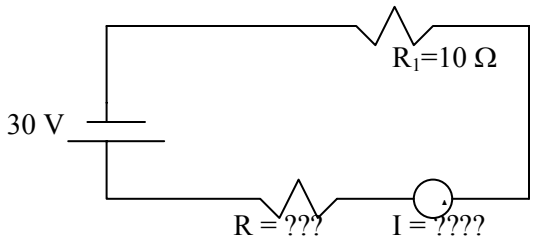
11. Show that the formula $P= I^2R$ will yield watts when current is expressed in amps and resistance in ohms. Note: $1\ \Omega = Js/C^2$

$P = I^2R = (C/s)^2(Js/C^2)$

$$= \frac{C^2}{s^2}\left(\frac{Js}{C^2}\right) = \frac{J}{s} = W$$

Flashback Section

12. Calculate I if the voltmeter at the unknown resistor reads 10V.



$V_1 = 30V - 10\ V = 20V.$

$I = V_1/R_1 = 20/10 = 2A.$

$V_2 = IR_2$

$R_2 = V_2/I = 10/2 = 5\Omega.$

13. Which of the following is NOT homogeneous?

A. a mixture of salt and water
B. a mixture of sand and water
C. NO_2
D. N_2

14. What compound will result from reacting calcium with fluorine gas? Show work and give the compound's molecular formula.

CaF_2. Show calcium losing two electrons, one to each fluorine to create a calcium +2 ion and two fluoride ions(-1) each.

15. Give a chemical characteristic property for…

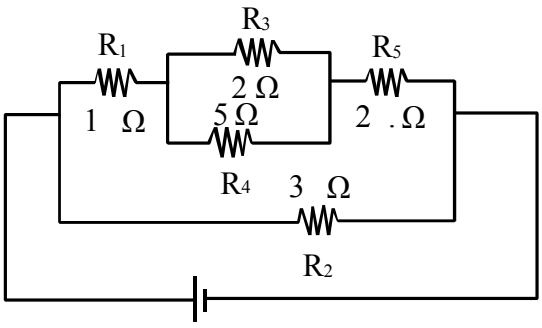
a. Water **turns cobalt chloride pink**

b. carbon dioxide **turns limewater cloudy**

c. hydrogen **pop with burning splint**

d. oxygen **glowing splint bursts into flames**

16. If a 12V battery is used in the circuit below, what is the voltage across R_4?



$R_{top} = 1 + (2^{-1} + 5^{-1})^{-1} + 2 = 4.43\ \Omega.$

$I_{top} = 12V/4.43\ \Omega.. = 2.70\ A$
$V_4 = I_{top}R_{p34} = 2.70\ (2^{-1} + 5^{-1})^{-1} = 3.86\ V$