Electricity and its production

What is electricity ?

- Electricity – electrical energy and movement of charge

- Electrical Power (P) – the rate of transformation of electrical energy.
  - Measured in watts
  - 1 W = 1 J/s

$$P = \frac{\Delta E}{\Delta t}$$

$1\ W = 1\ \frac{J}{s}$

Practice Problems on pg. 505

Practice

1. What is the power rating of a digital camera that transforms 120 J in 25 s? T/I [ans: 4.8 W]
2. How much power does a hair dryer require to transform 198 000 J of energy in 15 min? T/I [ans: 220 W]

1. $P = \frac{\Delta E}{\Delta t}$

$P = 120\ J / 25\ s$

$P = 4.8\ W$

2. $15\ \text{min} \times \frac{60\ s}{\text{min}} = 900\ s$

$P = \frac{\Delta E}{\Delta t}$

$P = \frac{198\ 000\ J}{900\ s}$

$P = 220\ W$

Measuring electrical energy

- Measured in kilowatt hours (kWh)
- kilowatt hour (kWh) – measure of electrical energy
- 1 kWh = 3.6 million joules
- To describe electrical energy generated by a power plant use megawatt hours (MWh)

Practice problems pg. 506

Practice

1. A compact fluorescent light bulb operates with 7.0 W of power. Calculate the energy it needs to provide light for 24 h. Answer in joules. T/I [ans: 6.0×10^5 J]
2. Convert your answer in Question 1 to kilowatt hours. T/I [ans: 0.17 kWh]

1. $P = 7.0\ W$

$\Delta t = 24\ h$

$= 24\ h \times \frac{60\ min}{1\ h} \times \frac{60\ s}{1\ min}$

$= 86\ 400\ s$

$P = \frac{\Delta E}{\Delta t}$

$\Delta E = P \Delta t$

$= (7.0\ W)(86\ 400\ s)$

$= 604\ 800\ J$

$= 6.0 \times 10^5\ J$

2) $605\,000\,\text{J} \times \frac{1\ \text{kWh}}{3\,600\,000\,\text{J}}$

$\Delta E = 0.17\ \text{kWh}$

Some work for you to do !

- Read 11.1 pgs. 504 – 507
- Pg. 507 #2-5
- Read 11.3 pgs. 510 - 513