

## Power : Notes/W.S.-40

The electric power of a device is equal to the energy used per unit time.

$$\text{POWER} = \frac{\text{ENERGY}}{\text{TIME}}$$

The symbol for power is P (units are watts W). The symbol for energy is E (units are joules J). The symbol for time is t (units are seconds s). Therefore:

$$P = \frac{E}{T}$$

It can also be shown by using the equations;  $V=E/Q$  and  $I=Q/t$  that;

$$P = I \bullet V$$

The typical electric power ratings for some common appliances are shown below. In general, appliances that produce heat have the highest power ratings.

television	85 watts
room heater	1,200 watts
light bulb	50 watts
hair dryer	850 watts
small computer	20 watts
toaster	850 watts
microwave	500 watts
oven	12,000 watts (maximum)

Problems:

- 1) A kettle consumes 90,000 J of energy in 60 seconds. Find the power.
- 2) A light bulb has a voltage of 120V across it. The current is 0.75A. Find the power of the bulb.
- 3) The power of a television set is 85W.
  - a) Find the current, if the voltage is 120V.
  - b) Find the energy consumed by the TV in one hour.
- 4) A 750 watt toaster has a voltage across it of 120V. Find the current.
- 5) Find the amount of time necessary for a 75W light bulb to emit 2400J of energy.
- 6) A small computer can run on a battery. The power of the computer is 35W.
  - a) How many joules of energy are required each hour?
  - b) What is the voltage of the battery if the average current is 1.4A.
- 7) If  $P=E/t$ ,  $V=E/Q$  and  $I=Q/t$ , show that:  $P=I \times V$ .

Answers: 1) 1500W, 2) 90W, 3)a) 0.71A, b) 306,000J, 4) 6.25A, 5) 32s, 6)a) 126,000J, b) 25V, 7)  $P=E/t=(VQ)/(Q/I)=VI$ .