Electrical Power & Energy

Chapter 7-3

Electrical Power

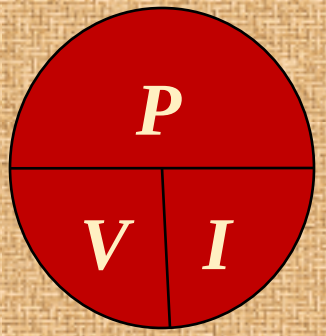
- Power is the rate at which work is done
- Electrical energy is easily converted into other forms of energy
  - –Mechanical-Fans blades
  - –Thermal-Hair dryer

Electrical Power

- Electrical Power is the rate at which electrical energy is converted into other forms of energy

$$P = (V)(I)$$

- Power = current x voltage
- Unit is watts (W) or kilowatts (kW)



Practice

- A toaster oven is plugged into an outlet that provides a voltage difference of 120 volts. What power does the oven use if the current is 10 amps?

V = 120 volts

I = 10 amps

P = (V)(I)

P = (120)(10)

P = 1200 watts or 1.2kW

Practice

- A VCR that is not playing still uses 10 W of power. What is the current if the VCR is plugged into a 120-V electrical outlet?

V = 120 volts

P = 10 watts

$$I = \frac{P}{V}$$

I= 10/120

I = 0.83 amps

Practice

- A flashlight bulb uses 2.4 W of power when the current in the bulb is 0.8 A. What is the voltage difference?

P = 2.4 watts

I = 0.8 amps

$$V = \frac{P}{I}$$

V = 2.4/0.8

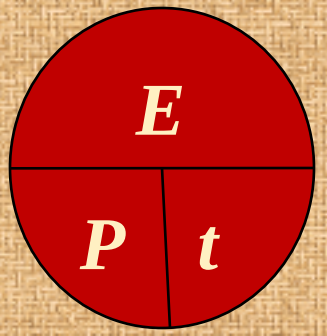
V = 3 volts

Electrical Energy

- The amount of electrical energy used depends on the power required by the appliance and the length of time the appliance is used.

Electrical Energy

- Energy = power x time
- E = Pt
- Unit for Electrical Energy is kilowatt per hour (kWh)



Practice

- A refrigerator operates on average for 10 hours a day. If the power rating of the refrigerator is 700 W, how much electrical energy does the refrigerator use in one day?

t = 10 hours

P = 700 watts Convert to kw P = 0.7 kW

E = Pt

E = (0.7)(10)

E = 7 kilowatts per hour = 7 kWh

Practice

- A TV with a power rating of 200 W uses 0.8 kWh in one day. For how many hours was the TV on during this day?

$E = 0.8$ kWh

$P = 200$ watts Convert to kw $P = 0.2$ kW

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

$t = 0.8/0.2$

$t =$ 4 hours

Cost of Using Electrical Energy

- Multiplying the electrical energy used by the amount of the power company charges for each kWh.
- Total cost=(Power)(time)(cost)
- $=(kWh)(cost)

For example: If a 100 watt light bulb is left on for 5 hours and the power company charges 10 cents per kWh, the total cost of using the light bulb would be…

= (0.1 kWatts)(5 hours)($0.10) = $0.05