#### Lecture Outline

# Chapter 23: Electric Current

#### Sections 7-8:

- Electric Power
- Compact Fluorescent Lamps (CFLs)
- Light-Emitting Diodes (LEDs)



#### **23.7 Electric Power**

- Electric power
  - Rate at which electric energy is converted into another form
  - In equation form:

Power = current x voltage P - V

$$P = IV$$

## units of power: watts, W or kilowatts 1 kW = 1000 W

### **Ex. Calculating Power**

A toaster draws 0.75 amperes of current when operated at 120 V. Calculate the power expended. Power = current x volts P = (0.75 A) x (120 V) = 90 watts = 90 W

→ Notice that W is a unit that stands for watts → In the equation work W = F d, W stands for work.

#### Power is the rate of converting energy

Since: Power =  $\frac{energy}{time}$ 

Solved for: energy = power x time

Previously, we used energy units = joules Because energy can be written as power x time, an alternative unit that can be used for energy is... energy units = power units x time units = kilowatt-hours = kWh

 $\rightarrow$  kWh is an *energy* unit.

### Ex. A bill from the Power Company

Power company supplies *energy*. They bill you in "cents" per kWh. If energy costs 15 cents per kWh.



 $\rightarrow$  costs \$0.15 to run a 1000 W (1 kW) iron for an hour.

Ex. It costs \$0.15 per kWh. How much will it cost to run a **500 W** refrigerator for **24 hours**?

 $\frac{\$0.15}{kWh} \times 500 \text{ W} \times \frac{1 \ kW}{1000 \ W} \times 24 \ \text{h} = \$1.80$   $\rightarrow \text{ Notice how the units cancel.}$ 

# 3 types of lamps.

1. Incandescent lightbulbs

Produce light by heating a thin wire called a filament.

Over 90% of electrical energy is converted to *heat*, not light.

Will soon be "history."







2. Fluorescent lightbulbs: Produce less heat, so are cooler to the touch Are more efficient (more electrical energy is transformed into light) Contain Hg (mercury), a poison and hazardous waste. CFL =Must be disposed compact of properly. fluorescent

lamps:





3. LED= light emitting diode
Same tech as power indicators:
A sandwich of silicon emits light.
Higher initial cost,
but lower in long run.
Most efficient lamp type.









# **Comparing Lamps**



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heat

Contains Hg

No Hg

#### **Copy answers to turn in for Classwork:**

24. When you make your household electric payment at the end of the month, which are you billed for: voltage, current, power, or energy?

26. What is the relationship among electric power, current, and voltage?

27. Which of these is a unit of power and which is a unit of energy: a watt, a kilowatt, a kilowatt-hour?

# 28. How does the heat emitted by lamps affect their efficiency?

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40. An electric toy draws 0.5 A from a 120-V outlet. Show that the toy consumes 60 W of power.

41. Calculate the power of a hair dryer that operates on 120 V and draws a current of 10 A.

Upload your classwork now:

Page 447: Questions: #24, 26, 27, 28, and Plug and Chug: #40 and 41

**Tomorrow (still at home):** Rest of Chapter 23.

#### Monday (still at home all week) Test