Electric Power and Energy

Name _____
Date _____ per ____ Grp ____

Materials

Demo - Kill-a-Watt device, light socket with standard and CFL bulbs

Student Groups,- Kill-a-Watt device, stopwatches, styrofoam cups, appliances .
possible appliances include (microwave , heaters , hair dryer, Electric kettles - prefer 8 - 12 total)

Part Definitions

1. Voltage is like _____ unit _____

2. There are 2 types of power supply AC or DC

DC is _____ _____ which means it is _____

AC is _____ _____ which means _____

USA this happens _____ / sec - frequency = _____ (Europe is 50 Hz 240V)

Batteries(AA) _____ _____, wall power _____ _____ (Big square plugs change 120V AC to DC 6V, 9V)

3. Current measures the number of electrons flowing per second. Symbol is _____

The standard units are _____, or milliamps ** _____ mA = 1 A

4. Electrical power is the product of _____ x _____ UNIT _____ same as _____/ sec

Because this is a very small unit we usually use kilowatts 1 kilowatt = _____

5. Power = therefore Energy =

6. We actually pay for Energy. The unit could be Joules but kilowatt hours is much bigger and more practical

To find kilowatt hours (kWhr) = $\frac{\text{Power in watts x time in hours}}{1000}$

Electric Power Problems Equation (Basic) Power =

1. a) What **power** is produced when 120 V causes a 2 A current in a piece of equipment?

b) What is the power if the voltage is 350 V and the current is 0.2 A ?

Equation (2) Use Power equation to solve for Current I =

2. How much **Current** do lamps connected to 120 V draw ?

a) 60 W b) 100W c) 15 W

Equation (3) Use Power equation to solve for Voltage . V =

3. Find the voltages for these circuits

a) 360 W , 3 A b) 2400 W , 20 A c) 120 W , 10 A

Part 2 Kill a Watt Unit - gives all details related to power usage of any electric device plugged into standard domestic power

Each group will do 3 different appliances - see teacher chart - then write your groups appliances in the data table - page 2.

The light bulbs will be run as demos by the teacher

1. For the **microwave** put two cups of water in a LARGE styrofoam cup before starting it - set it for **exactly two minutes**
2. Toaster Oven - Dial to position 2 marks from darkest - let run - time and watch the AMPS!
3. For the floor heater or the hair dryer - use the highest setting. - RUN FOR 3 MINS
4. For the electric kettle put in at least 4 cups of water - RUN FOR 3 MINS
5. BE CAREFUL - Expect previously used equipment to be HOT - add fresh COLD water each time.
6. Computer - get up and running with a phet simulation - record Watts when running!
7. Hot plate + pot of water. Put on setting 6 time for 3 mins - watch AMPS

- NOTE there are 2 different versions of the Killawatt unit - identify yours and find the correct instructions

Group _____ type of Killawatt (circle) **Killawatt P3** or Killawatt **EZ** P3

Killawatt p3

1. Plug Killawatt into the socket , and appliance into the killawatt and START stopwatch.

At first it will show **Voltage** - record , then push the buttons in turn to get the **Amps, Watts**. Return to Amps and observe

2. When the time is finished unplug JUST the appliance and push buttons to find **kWhr.** Then unplug Killawatt

EZ Killawatt P3

This unit can hold the information after it is unplugged but we don't really need that feature.

1. Plug in Killawatt EZ and press RESET button - hold until rSET appears , then release

Push MENU button until KWhr appears. It should be zero. If not repeat RESET.

2. Plug in appliance and start stopwatch. Push the MENU button to read **Volts** - record. Push DOWN for **Amps**, DOWN again for **Watts.** Return to Amps and observe

3. When the time is complete unplug appliance and push MENU button to get KWhr and time

Appliance	Rating watts	Time On (mins)	Kill a Watt readings					Calculations	
			V	Amps	Watts	kWhr	Time mins	Time(hours)	kWhr
1.									
2.									
3.									
Std bulb		10							
CFL bulb		50							

Questions

1. Which of your appliances used the most current ? the most power ?

2. Calculate the kWhr for each using Watts and time kWhr = Watts * time in hours/1000

Put answers in last column - SHOW WORK for in the space below

3. Compare your Calculated kWhr reading on the Kill a Watt. Why might they sometimes be different?

4. How much energy would a 1500 W floor heater use in a 30 day month if used 8 hours a day?

5. Calculate the monthly (30 day) energy for 24 hours a day in kWhr

a) new 50 watt fridge

b) old 700 watt fridge (before 1993)

c) the difference between a) b)

d) new fridge savings/year at $0.2 per kWhr

e) is the cost of a new fridge justified?

Bonus Q1 Calculate how long the CFL would need to be on in order to reach .01 kWHr

Bonus Q2 - explain about the fridge to your parents and get their signature and a brief comment!