Electrical Energy Consumption

Some devices require alot of electrical energy to function whereas some need little.
Can you name a device that uses alot of electrical energy? ___ Dryer__

One that uses little electrical energy? ____Flashlight, remote control____

Power is a measure of how much energy is used or produced per unit time.

as an equation it would look like → $P = E / T$

Power (J/s) = Energy (Joules)/Time (seconds)

To simplify the units for power, Power is measured in ___Watts___, symbol __W_____

*note- the units of power (J/s) is expressed as a __Watt___since 1 __J/s___= 1 ___W___

Calculating Power

In order to calculate the power rating of a device we need to find out it's current and voltage.

as an equation it would look like → $P = VI$

Power (W)= Current (A)/Voltage (V)

We can also derive the first equation from this one using the formulas for voltage and current from our previous note:

$P = J/C \times C/s = J/s$

Power Questions

1) The Apple IPhone has a 3.7 V battery and when running draws a current of 0.54 A. What is it's power consumption?

G: V=3.7V
I=0.5A

A: P=VI

P: The Iphone uses 2W of power.

R: P

S: P= 3.7V x 0.5A
= 2W

2) Find the power rating of a toaster if it draws 5 A when plugged into a 110V socket.

P = 110V x 5A
= 550W

Calculating the cost of electrical energy consumption

The price we pay for the amount of electricity we use every month depends on three factors

1) The __power___ ___rating__ of the devices (eg

2) The ___time_____ that the device is used for

3) The ___cost____ _____rate___ set by the power company

To calculate cost used the following formula

Cost = power x time used x cost per kW·h

Cost Questions

1) Joey uses his video game console for 1.5 hours. If the power consumption of the device is 0.10 kW and the rate cost is 8.8 ¢ per kW·h, calculate how much the cost would be in cents.

Cost = P x t x rate cost
= (0.1kW)(1.5h)(8.8cents/kWh)
=1.32 cents

2) The power company in Quebec charges 5.5 ¢ per kW·h. If a ski lift operator runs her ski lift for 10 hours and the power rating of the lift is 3000 kW, calculate the cost in dollars.

Cost = (3000kW)(10h)(5.5cents/kWh)
= 165 000 cents
= $1650

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Percent Efficiency

Most electrical devices convert electrical energy to some other form (light, heat, sound, movement of a motor…)

The energy conversion is never 100%, much energy is lost

The ability of a device to convert electrical energy (input) into useful energy (output) is called its "Percent Efficiency"

The formula for calculating percent efficiency is:

$$\% \text{ Efficiency} = \frac{\text{useful energy output (in J)}}{\text{total energy input (in J)}} \times 100$$

the bigger number

Percent Efficiency Problems

1) An electric kettle requires 210 000J of energy to heat up a pot of water until it boils. If it takes 184 000 J of energy to heat the water, what is the percent efficiency of the kettle?

% efficiency = E output / E input
= (184 000J / 210 000J) x 100
= 87.6%

2) a) A light gives off 54 000 J of light energy but requires 80 000 J to accomplish this. Find the percent efficiency. b) Can you suggest where the lost energy goes to?

% efficiency = (Eoutput /Einput) x 100
= (54 000J / 80 000J) x 100
= 67.5%