Science 9

Physics V

Name:
Date:
Block:

1. **Power**
2. **Sustainability**
3. **Generating Electrical Energy**

Power

There are two main ways that we are able to measure electrical energy:

- _____ and _____
- _____

These two ways of measuring out electrical energy is related to the _____ output by the load. _____ _____ is the _____ that _____ _____ is used by a load.

- Electrical power is measured in watts (W) or kilowatts (kW)
  - 1 kW = 1000 watts

Appliances all have a power rating (the rate that they use energy).

Table 3.2 Typical Power Ratings of Appliances

Appliance	Typical Power Rating (kW)
Clock	0.0050
Clothes dryer	5.0
Washing machine	0.50
Coffee maker	1.0
Computer	0.20
Dishwasher	1.8
Freezer	0.34
Microwave oven	1.5
Toaster	1.1
Vacuum (portable)	1.6

Example:

- Lightbulb: 100 W
- Iron: 1000 W

If we compare the power rating of a light bulb and an iron that is on for the same length of time, the iron will use _____ more energy.

Kilowatt-hours

Electrical energy used by an appliance over a period of time is measured in _____ (kWh). We can find this quantity by first looking at the power rating of the appliance and by measuring the amount of time the load has been used.

Example: If you used a 1.8 kW dishwasher for 2.0 hours, how many kilowatt-hours of electrical energy would you have used?

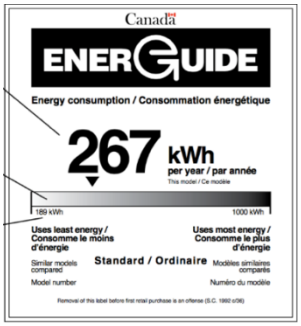
Example: If a 1600 W vacuum has been turned on for 30 minutes, how many kilowatt-hours of electrical energy would have been used?

In our homes and in buildings, we are able to measure the amount of electrical energy used by using a _____ _____. A smart meter is able to measure how energy use changes in a building over the course of a day.

Sustainability

Many appliances that we buy are able to tell us how much energy it uses through two labels:

- _____ labels
- _____ _____ ® label



What is the EnerGuide label?
This is a label that gives details about the _____ of _____ that an appliance uses during _____ _____ of normal use

- Large number: Shows how much energy is used in one year of normal use
- Shaded bar: Shows how the appliance compares with similar ones on the market
- Numbers on the shaded bar: Gives a range of efficiency for yearly energy use

What is the ENERGY STAR ® label?
This is a label that is located on appliances. It tells us if a product is an _____ _____ appliance. Appliances with this label use _____ _____ energy compared with a standard product in the same category.

In our homes, we may have appliances that continue to use energy even if it is not on. This is called a _____ _____.

- A phantom load occurs when _____ energy is being _____ on a device when it is turned _____
  - Appliances in stand-by mode (TVs, computers) are actually "on" and have phantom loads
  - Phantom loads account for about 900 kWh of energy use each year in the average home

In order to save energy, unplug your devices when not in use!

Practice Questions:

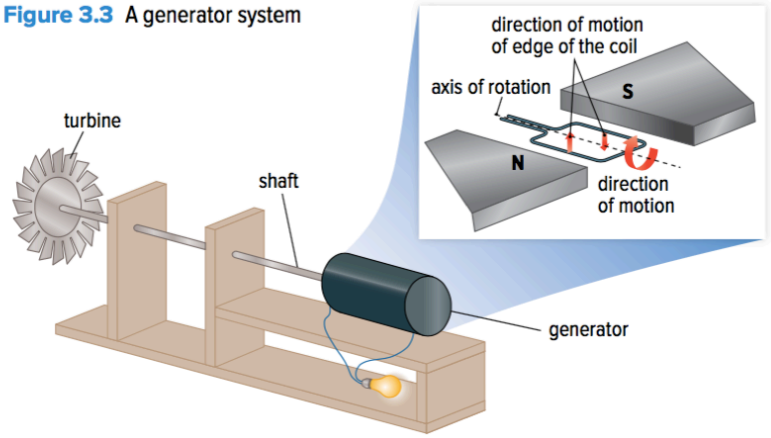
1. If a 2000 W dishwasher has been turned on for 45 minutes, how many kilowatt-hours of electrical energy would have been used?

2. Explain how electrical energy can be used by an electric toothbrush that is plugged in but is not running

Generating Electrical Energy

How do we generate electrical energy through sustainable ways?
In order to generate electrical energy, most stations will use a _____ _____. A generator system is composed of three main parts:

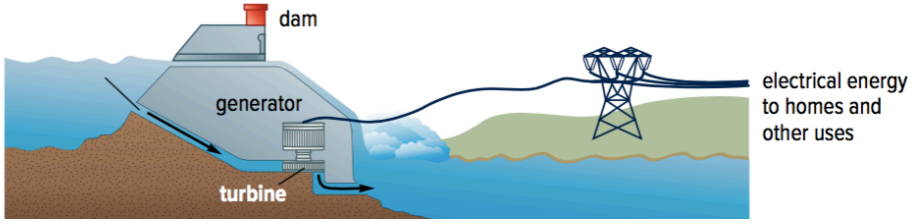
- _____: steam, water, or wind will cause the turbine to spin
- _____: The shaft connects the turbine to the generator; if the turbine spins, the shaft spins
- _____: Kinetic energy from the shaft is transformed into electrical energy in the generator



In BC, much of our energy is supplied through _____ energy.

- _____ station: will use the kinetic energy from the water as it flows downhill to turn a turbine in order to generate electrical energy

Water flowing through a dam spins giant turbines, which spin a generator to produce electrical energy.



- _____ station: water flowing freely in a river turns a turbine

Other ways of generating electrical energy:

- _____ _____: kinetic energy of the wind is transformed into electrical energy as the wind moves the turbine of the generator system
- _____ _____: Photovoltaic cells within the solar panel transform solar energy into electrical energy. The solar energy is absorbed by the electrons in the photovoltaic cells which allows them to flow.
- _____ _____: Steam from the Earth's crust can be used to turn turbines in the generator system.