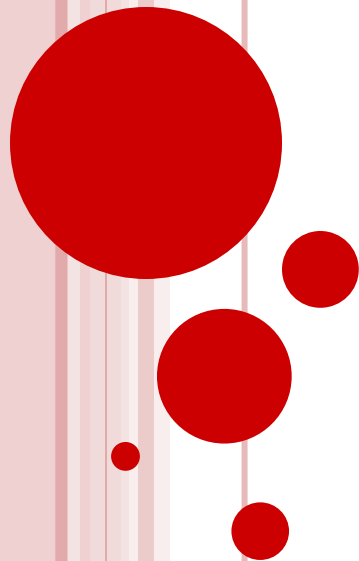


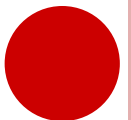
UNIT D ELECTRICAL PRINCIPLES & TECHNOLOGIES



Science 9

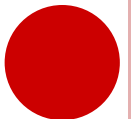
LEARNING GOALS

- Investigate and interpret devices that convert various forms of energy
- Describe technologies for the transfer and control of electrical energy
- Identify and estimate (using calculations) energy inputs and outputs for various devices and systems
- Evaluate the efficiency of energy conversions
- Describe societal and environmental implications of the use of electrical energy



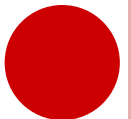
SKILLS GOALS

- Ask science-based questions
- Design an experiment when given a question
- Conduct an investigation
- Analyze and interpret my qualitative and quantitative data
- Work collaboratively with my peers



ATTITUDE GOALS

- Show interest in science
- Appreciate how different ideas from all over the world mix together to bring about understanding
- Take my time and consider various approaches to investigations, problems and issues
- Begin to recognize my impact on the environment
- Work safely in the science classroom and lab



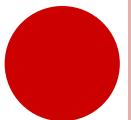
FOCUSING QUESTIONS

- How do we obtain and use electrical energy?
- What scientific principles are involved?
- What approaches can we use in selecting, developing and using energy-consuming devices that are efficient and effective in their energy use?



CONCEPT 1 VOCABULARY TERMS

- Energy
- Chemical energy
- Thermocouple
- Electromagnet
- Commutator
- Brushes
- Armature
- Electromagnetic induction



CONCEPT 1 – ENERGY

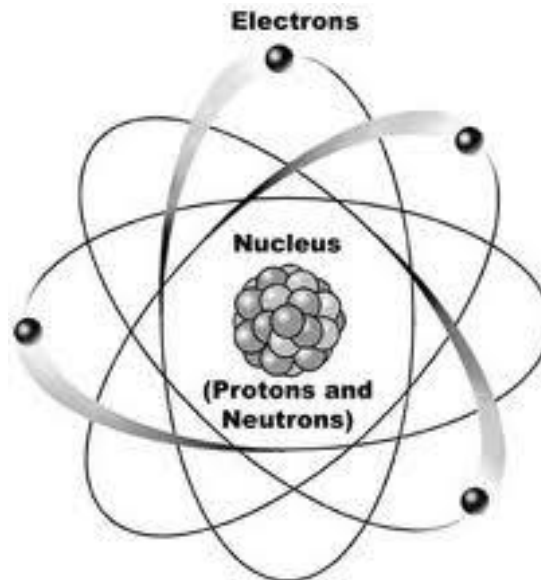
Learning Concept

- **Identify, describe** and **interpret** examples of:
 - Mechanical energy
 - Chemical energy
 - Thermal energy
 - Electrical energy
 - Light energy



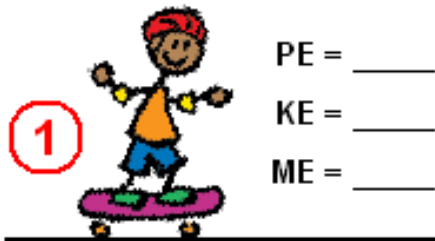
CONCEPT 1 – ENERGY

- **Electrical energy** is the energy of **charged particles**
 - Transferred when **electrons** move from place to place
 - Can be generated from various other types of energy



CONCEPT 1 – ENERGY

- Mechanical energy is both the kinetic energy (E_k) and the potential energy (E_p) in a system



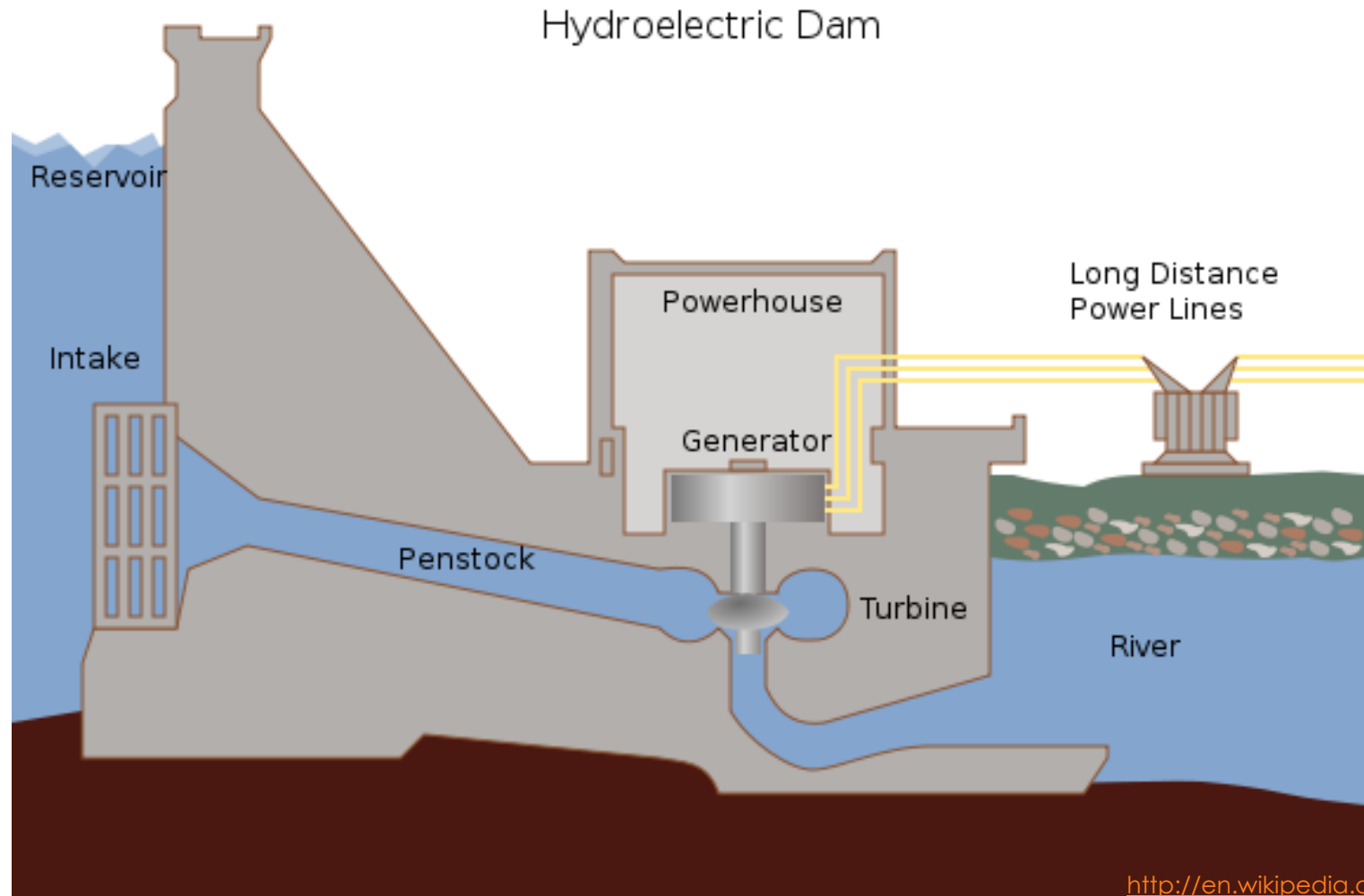
$m = 60 \text{ kg}$
 $v = 8 \text{ m/s}$



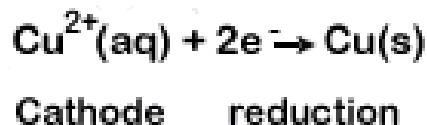
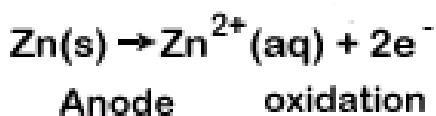
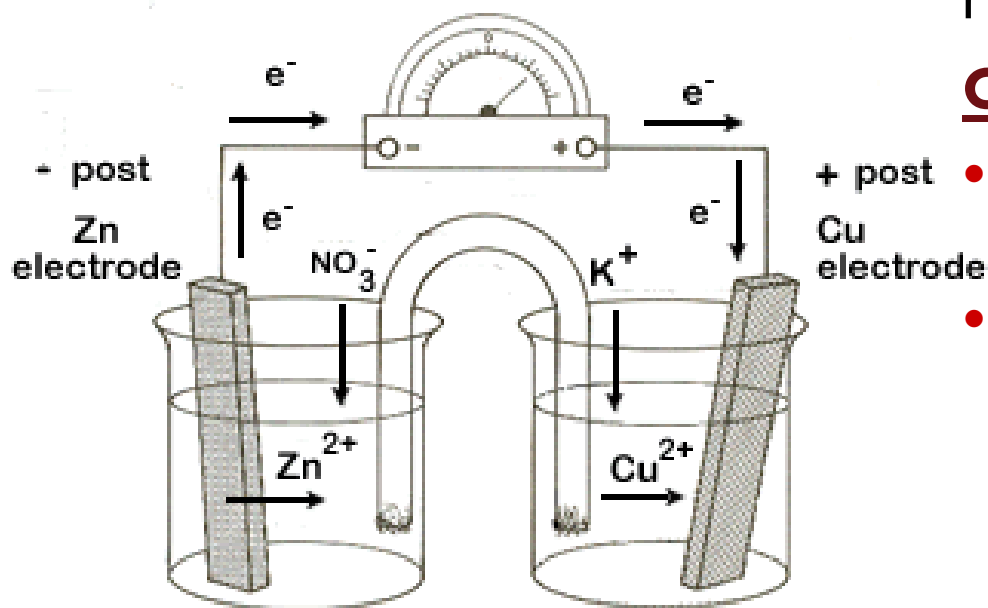
PE = _____
KE = _____
ME = _____
v = _____
h = _____



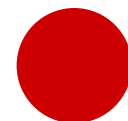
CONCEPT 1 –ENERGY



CONCEPT 1 – ENERGY

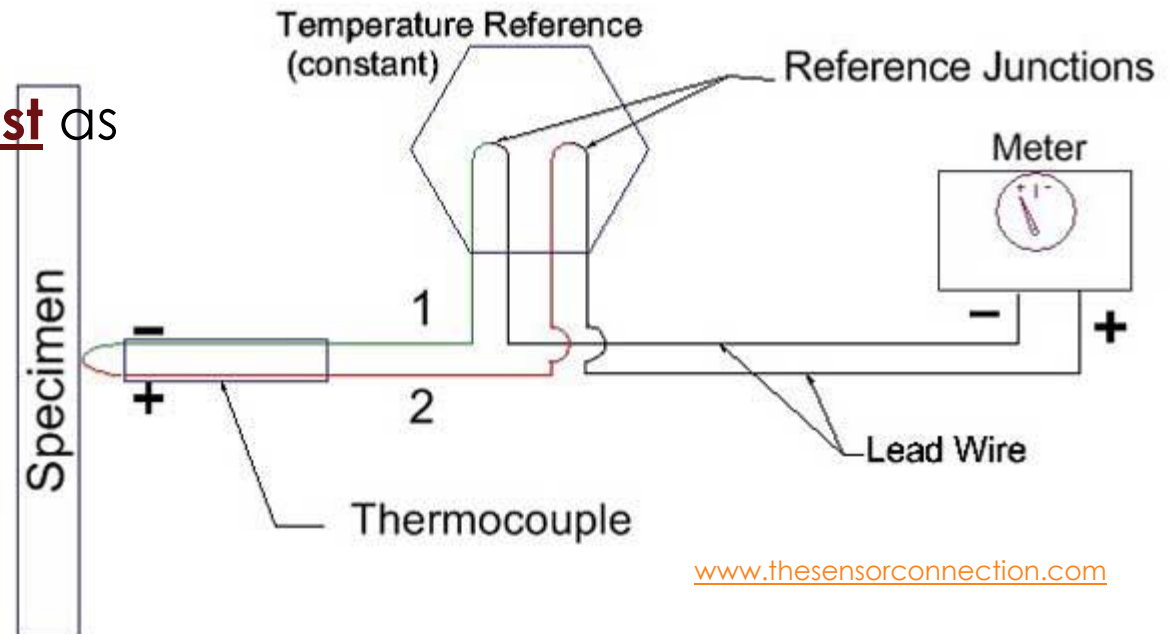


- Chemical energy is released from a chemical reaction
- Dry cells – electrolyte chemicals are in a paste
- Wet cells – uses a liquid electrolyte



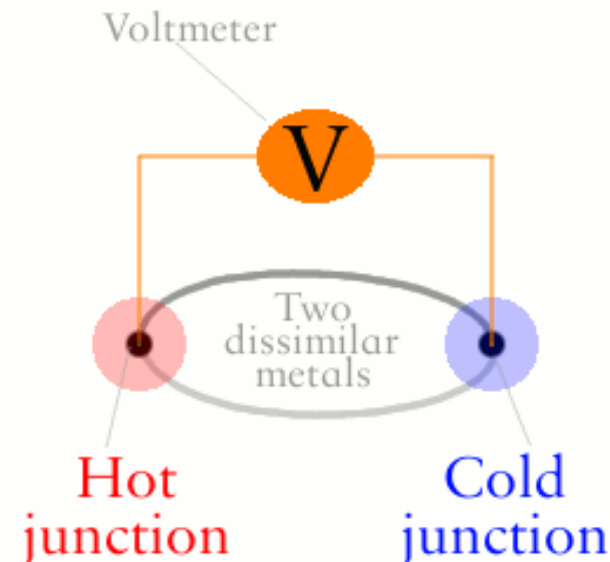
CONCEPT 1 –ENERGY

- Thermal energy is the total kinetic energy of all the particles in a substance
 - Most energy is lost as heat



CONCEPT 1 – ENERGY

- A **thermocouple** is a **temperature sensor** at the **junction** between two different metals
 - Produces a **voltage proportional** to the **temperature difference** between the hot and cold wires

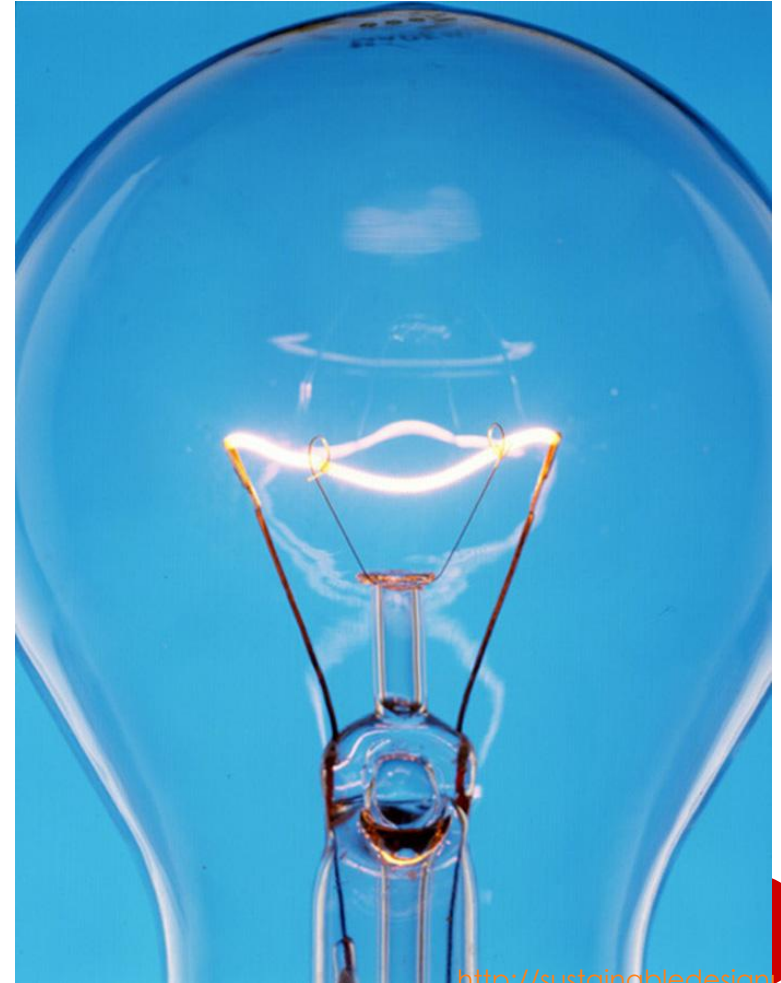


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CONCEPT 1 – ENERGY

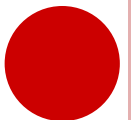
- **Incandescent light** bulbs require enough electrical energy to make a **piece of metal glow brightly** yet not get so hot it melts and breaks
 - **Resistance** causes it to heat up and give off light



CONCEPT 1 – ENERGY

Learning Concept

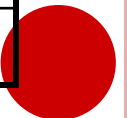
- **Investigate** and **describe** evidence of energy transfer and formation



CONCEPT 1 – ENERGY

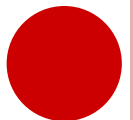
- You can use various devices to transform electricity into other forms of energy

Examples of Devices that Convert Energy		
Input Energy	Device	Output Energy
Electrical	Toaster	Thermal
Chemical	Flashlight	
Electrical	Blender	
Chemical	Battery-operated clock	



CONCEPT 1 - ENERGY

- While a thermocouple converts thermal energy into electrical energy, other devices do the opposite
 - Ex. Heaters, ovens
 - The energy from the electrical charges is transferred to the atoms of the heating elements
 - The heating elements warm up and heat the oven



CONCEPT 1 - ENERGY

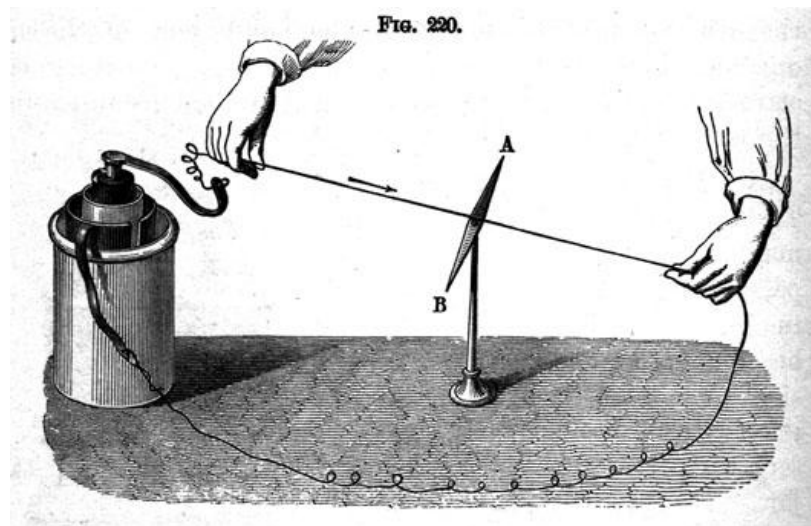
Learning Objective

- Construct, use and evaluate devices for transforming
 - Electrical energy into mechanical energy
 - *Electromagnet & motors*
 - Mechanical energy into electrical energy
 - *Generators*



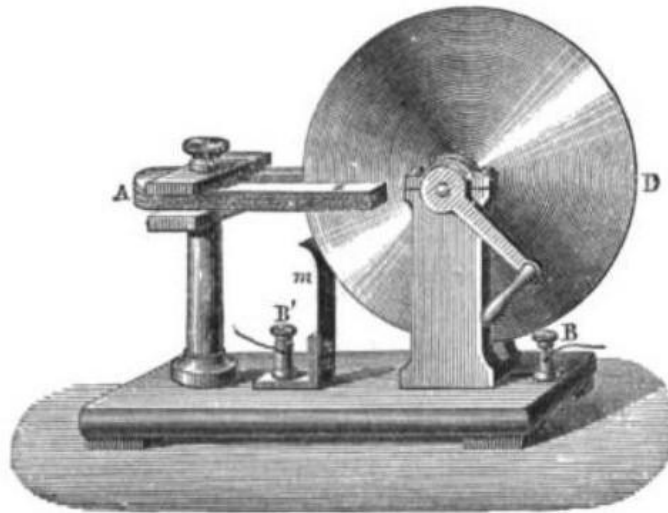
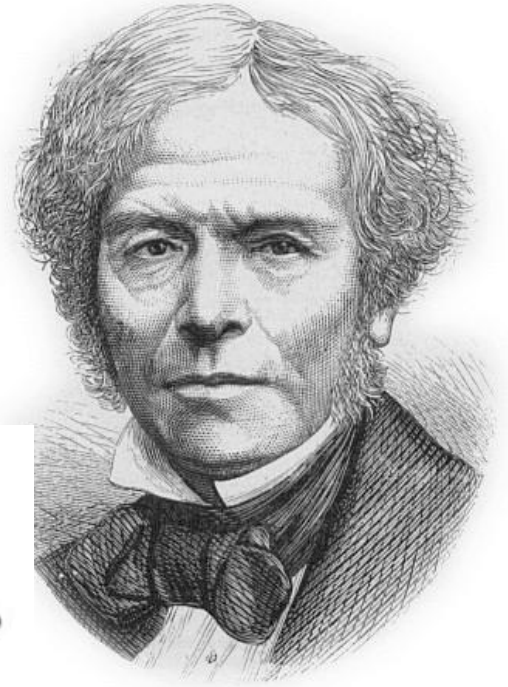
CONCEPT 1 - ENERGY

- Hans Christian Oersted found a compass needle can be affected if passed by a current-carrying wire
 - Indicated a relationship between magnetism and electricity



CONCEPT 1 - ENERGY

- Michael Faraday built a device that used electromagnetic forces
 - Lead to the development of modern motors



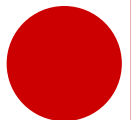
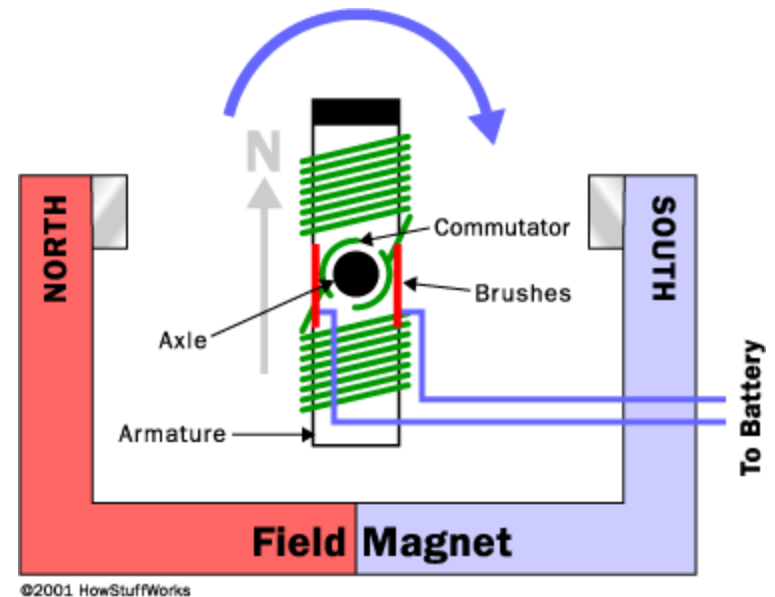
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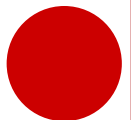
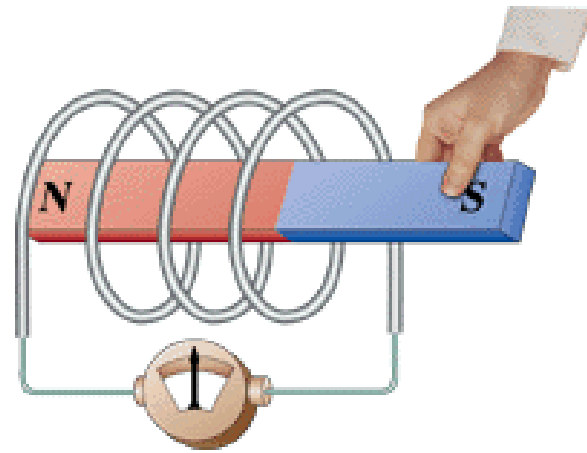
CONCEPT 1 - ENERGY

- Electrical energy → Mechanical energy
 - Most common device for this conversion is the motor
 - Use an electromagnet to cause mechanical rotation, which can do work



CONCEPT 1 - ENERGY

- Faraday made a significant electrical discover
 - Electromagnetic induction
 - Electrical current can be generated by moving a conducting wire back and forth inside a coil of wire
- Mechanical energy → Electrical energy



CONCEPT 1 - ENERGY

Science Log – Lab Challenge

- Using the following materials **only**, build a magnet
 - Nail
 - Wire
 - Battery
 - Paper clips
 - Masking tape

