

## Producing Electric Current (p. 238 – 244)

### I. From Mechanical To Electrical Energy

1. According to Faraday and Henry, electric current can be induced by changing a

magnetic field.

2. Define the term electromagnetic induction.

Electromagnetic Induction – process in which electric current is produced in a wire loop by changing magnetic fields

3. Why is the discovery of electromagnetic induction significant? (Not in the book.)

It opened the way for practical uses of electromagnetism

4. Define the term generator.

Generator – device that uses electromagnetic induction to convert mechanical energy to electrical energy  
(opposite of electric motor)

5. Complete the flowchart showing how generators operate.

A current is produced in a coil as the coil rotates between permanent magnets.

↓

After 1/2 revolution, the coil moves past opposite poles, & current changes direction.

↓

As the coil keeps rotating, the current periodically changes direction.

6. The direction of the current in a generator coil changes direction <sup>twice</sup> once per revolution.

Circle One :

True

False

U.S. Generators

Current = 3,600 rev./min.

7. How does a car alternator maintain electric current for a car.

Maintains a constant charge on the battery  
(Coil is fixed while permanent magnet rotates)

8. How do power plant generators provide electrical energy for houses? (AC Generators)

Huge generators have many coils of wire wrapped around large iron cores as rotating magnets connect to turbines.

9. Define the term turbine.

Turbine – large wheel that rotates when pushed by steam, wind, or water and provides mechanical energy to a generator

- Flashlight  
- Induction Device

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Comparison of Electric Motor + Generator

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- Hydroelectric  
- Hoover Dam  
- Nuclear Energy

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Tip

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**II. Direct & Alternating Current**

1. Define each of the following terms and give two examples of devices using the current.

Direct Current (DC) – electric current that only flows in one direction

1. Flashlight 2. Remote Control

Alternating Current (AC) – electric current that reverses its direction of flow in a regular pattern

1. Home Wall Sockets 2. Businesses

**III. Transmitting Electrical Energy**

↳ (Power plant generators)

1. As electrical energy is transmitted along power lines, how is some energy "lost"?

- Electrical resistance over long distances produces heat

2. To reduce heat produced in power lines, what voltage is electricity typically transmitted?

150,000 Volts (Lowers current)

**IV. Transformers**

1. Define the term transformer.

Transformer – device that uses electromagnetic induction to increase or decrease the voltage of an alternating current

2. Why are transformers necessary for home electrical service? (No overload!)

Lighting

To transmit power at high voltage so power loss can be reduced

3. Complete the flowchart showing how transformers operate.

As alternating current passes through a primary coil, the coils iron core is magnetized

↓

Magnetic field in the primary coil changes direction as current changes direction.

↓

An alternating current with the same frequency is produced in a secondary coil.

4. How is voltage calculated in a transformer?

- Divide # of turns in secondary coil by # of turns in primary coil  
(Gives a ratio of output voltage to input voltage)

$$V = \frac{\text{Turns 2nd Coil}}{\text{Turns 1st Coil}}$$

5. Match each term with the correct definition.

1. B - Step-Up Transformer A. Number of wire turns on primary coil is greater than number of turns on the secondary coil
2. A - Step-Down Transformer B. Number of wire turns on secondary coil is greater than number of turns on the primary coil