**Critical Thinking Items**

**20.1 Magnetic Fields, Field Lines, and Force** 10.

True or false—It is not recommended to place credit cards with magnetic strips near permanent magnets.

a. false
b. true

11.

True or false—A square magnet can have sides that alternate between north and south poles.

a. false
b. true

12.

You move a compass in a circular plane around a planar magnet. The compass makes four complete revolutions. How many poles does the magnet have?

a. two poles
b. four poles
c. eight poles
d. 12 poles

**20.2 Motors, Generators, and Transformers** 13.

How can you maximize the peak emf from a generator?

a. The peak emf from a generator can be maximized only by maximizing number of turns.
b. The peak emf from a generator can be maximized only by maximizing area of the wired loop.
c. The peak emf from a generator can be maximized only by maximizing frequency.
d. The peak emf from a generator can be maximized by maximizing number of turns, maximizing area of the wired loop or maximizing frequency.

14.

Explain why power is transmitted over long distances at high voltages.

a. $P_{\text{lost}} = I_{\text{transmitted}}\ V_{\text{transmitted}}$, so to maximize current, the voltage must be maximized
b. $P_{\text{transmitted}} = I_{\text{transmitted}}\ V_{\text{transmitted}}$, so to maximize current, the voltage must be maximized
c. $P_{\text{lost}} = I_{\text{transmitted}}\ V_{\text{transmitted}}$, so to minimize current, the voltage must be maximized

d. $P_{\text{transmitted}} = I_{\text{transmitted}}\ V_{\text{transmitted}}$, so to minimize current, the voltage must be maximized

**20.3 Electromagnetic Induction** 15.

To obtain power from the current in the wire of your vacuum cleaner, you place a loop of wire near it to obtain an induced emf. How do you place and orient the loop?

a. A loop of wire should be placed nearest to the vacuum cleaner wire to maximize the magnetic flux through the loop.
b. A loop of wire should be placed farthest to the vacuum cleaner wire to maximize the magnetic flux through the loop.
c. A loop of wire should be placed perpendicular to the vacuum cleaner wire to maximize the magnetic flux through the loop.
d. A loop of wire should be placed at angle greater than 90° to the vacuum cleaner wire to maximize the magnetic flux through the loop.

16.

A magneto is a device that creates a spark across a gap by creating a large voltage across the gap. To do this, the device spins a magnet very quickly in front of a wire coil, with the ends of the wires forming the gap. Explain how this creates a sufficiently large voltage to produce a spark.

a. The electric field in the coil increases rapidly due to spinning of magnet which creates an emf in the coil that is proportional to the rate of change of the magnetic flux.
b. The magnetic field in the coil changes rapidly due to spinning of magnet which creates an emf in the coil that is proportional to the rate of change of the magnetic flux.

17.

If you drop a copper tube over a bar magnet with its north pole up, is a current induced in the copper tube? If so, in what direction? Consider when the copper tube is approaching the bar magnet.

a. Yes, the induced current will be produced in the clockwise direction when viewed from above.
b. No, the induced current will not be produced.