PHYS-1800 **Homework 11** **Due: 16 April 2010**

Name:_____

1. Two parallel wires each carrying a current in the same direction will _____ one another. (1 point)

2. Magnetic fields affect: (1 point)
A. only charges at rest
B. only charges in motion
C. both charges in motion and charges at rest
D. neither charges in motion nor charges at rest.

3. A student brings the north pole of a bar magnet close to one end of another presumed bar magnet with unmarked polarity. She observes that the second magnet is repelled. She concludes that: (1 point)
A. the end of the second magnet is a north pole
B. the end of the second magnet is a south pole
C. the second bar magnet must have lost its magnetism.

4. The direction of the induced current in an electric circuit when there is a changing magnetic flux through the circuit is determined by _____ Law. (1 point)

5. The north pole of a bar magnet is moved toward a single closed loop of wire along the axis of the loop. The changing magnetic flux through the loop as the magnetic approach induces an electric current in a direction that produces an effective _____ pole toward the bar magnet. (1 point)

6. A horizontal straight wire carries a current from south to north. A student moves a compass needle around to observe the magnetic field lines. He observes the field lines from the current-carrying wire are: (1 point)
A. parallel to the wire from south to north
B. parallel to the wire from north to south
C. closed circles perpendicular to the wire directed clockwise as viewed from south to north
D. closed circles perpendicular to the wire directed counterclockwise as viewed from S to N
E. straight lines perpendicular to the wire

7. A transformer has 200 turns on the primary and 20 turns on the secondary. The primary is connected to a direct current source of 120 volts. The voltage in the secondary coil will be:
A. 12 v (2 points)
B. 4000 v
C. 10 v
D. 1200 v
E. zero

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8. Explain why a compass needle points slightly west of true north on the east coast of the USA while on the west coast it points several degrees to the east of true north? (2 points)

9. In your own words state Faraday's Law: (3 points)

10. A coil of wire with 50 turns has a cross-sectional area of 0.04 m^2. A magnetic field of 0.6 T passes through the coil. What is the total magnetic flux passing through the coil? (2 points)

11. Two long parallel wires, each carrying a current of 8 A, lie a distance of 10 cm from each other. What is the magnetic force per unit length exerted by one wire on the other? (2 points)

12. In the lab demonstration experiment of Lenz's Law that used a ball magnet and a hollow aluminum tube. Describe what happened and why: (3 points)

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Two additional (optional) questions worth up to 5 points each:

A. A hydrogen atom consists of an electron of mass 9.1094×10^{-31} kg, orbiting a proton of mass 1.6726×10^{-27} kg at an average distance of 0.53×10^{-10} m. Determine the ratio of the electric to the gravitational force acting between these two atomic particles. (Use charge on the electron = -1.6×10^{-19} C, Gravitational constant G = 6.67×10^{-11} Nm^2/kg^2, and k (in vacuum) = 8.99×10^9 Nm^2/C^2.)

Compare your results:

B. (i) Make a clear drawing of the Earth's dipole magnetic field showing the tilted axis and explain the origin of the term "north seeking pole"

(ii) A coil of wire with 100 turns and a cross-sectional area of $0.03m^2$ lies with its plane perpendicular to a magnetic of magnitude 1.4 T. The coil is rapidly removed from the magnetic field in 0.25 s. Determine:

a. What is the initial magnetic flux through the coil?

b. What is the average voltage induced in the coil?