Pretest for Magnetic Induction (and Transformers)

1. A magnet mounted on a pendulum swings back and forth. The induced current at the nearby wire loop is at its maximum when placed
a. at the top of the magnet's swing on the right.
b. at the top of the magnet's swing on the left.
c. at the bottom of the magnet's swing.
d. where the magnet is in between the top of its swing and the bottom.

2. A loop is placed next to a circuit containing a solenoid and a switch. The circuit is attached to an AC source and then the switch is closed. Several moments later, the switch is opened. Current is induced in the loop by the solenoid:
a. only when the switch is first closed.
b. only when the switch is opened.
c. only when the switch is closed and opened.
d. during the time the switch is closed.

3. A loop of wire of area 1.0 m^2 is perpendicular to a magnetic field of 0.010 T. The radius of the loop doubles in 1.5 s. What is the magnitude of the emf induced in the loop?
a. 0.010 V
b. 0.020 V
c. 0.030 V
d. 0.027 V

4. Which of the following combination of units equals a volt?
a. T/s
b. $T/(m^2s)$
c. Tm^2
d. Tm^2/s

5. The flux of the magnetic field caused by an induced current in a loop:
a. is in the same direction as the flux causing the induced current.
b. is in the opposite direction to the flux causing the induced current.
c. is in the same direction as the change in flux causing the induced current.
d. is in the opposite direction to the change in flux causing the induced current.

6. A plane is flying horizontally in a region where the Earth's magnetic field is in a direction 45° below the horizontal. In which direct or directions should the plane fly so that the emf between the wingtips is the greatest? Choose the answer with the most correct directions.
a. north
b. northeast or northwest
c. east, west or north
d. north, northeast, northwest, east, west

7. A loop of wire lies on the table. The south end of a magnet is moved toward the loop from above. In which directions are the induced current as viewed from above and the induced magnetic field?
a. counter-clockwise, up
b. counter-clockwise, down
c. clockwise, up
d. clockwise, down

8. A generator uses a 100-turn coil of area 10^{-2} m^2. The coil rotates at a frequency of 15.9 Hz (100 rad/s) in a magnetic field of 10^{-2} T. What is the maximum induced emf?
a. 1 V
b. 10 V
c. 0.159 V
d. 15.9V

9. In which of the following cases is the emf of a motor the greatest?
a. when turned off
b. when just starting up
c. when running under a large mechanical load
d. when running under no mechanical load

10. A circuit with current increasing at a rate of 4 A/s contains an inductor, L. If the induced emf is -2 V, what is the inductance of the inductor?
a. 8 H
b. 4 H
c. 2 H
d. ½ H

11. (omit) An inductor with 100 turns has a magnetic flux of 0.5 $T \cdot m^2$ passing through it when the current is 25 A. What is the inductance, L?

a. ½ H
b. 1.25 H
c. 2 H
d. 50 H

12. At t=0, the switch in an RL circuit is closed. At that moment
a.
b.

c.

d.

13. An RL circuit has reached equilibrium, i.e. the current is no longer changing. At that point,
a.
b.

c.

d.

14. A 12-V battery is connected in series with a 6- resistor and a 3-H inductor. What are the time constant of this circuit and the eventual value of the current in this circuit after the switch has been closed for a long time?
a. 0.5 s, 0 A
b. 2 s, 0 A
c. 0.5 s, 2 A
d. 2 s, 2A

15. (omit) A 12-V battery is connected in series with a 6- resistor and a 3-H inductor. What is the energy stored by the inductor after the switch has be closed for a long time?
a. 0 J
b. 24 J
c. 6 J
d. 36 j

#10. (from next chapter) The primary coil in an ideal transformer has N turns. To output half the input potential difference, the secondary coil should have:
a. N/2 turns.
b. N turns.
c. 2N turns.
d. a number impossible to determine with the given information.

Impromptu (from next chapter) The primary coil in an ideal transformer has N turns. To output half the input current, the secondary coil should have:
a. N/2 turns.
b. N turns.
c. 2N turns.
d. a number impossible to determine with the given information.

Solutions: c, d, b, d, d, d, d, a, d, d, omit, omit, omit, omit, omit,

Solutions to extra two problems: a, c