

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. $\text{T}/(\text{m}^2\text{s})$
 - 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 direction 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. $\frac{1}{2}$ H

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

- a. $\frac{1}{2}$ 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 been 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, a, d, d, omit, omit, omit, omit,

Solutions to extra two problems: a, c