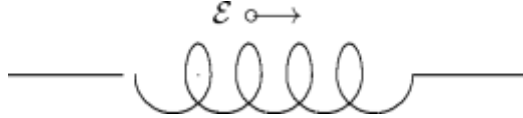Name: _____   Date: _____

___ **1.** The diagram shows an inductor that is part of a circuit. The direction of the emf induced in the inductor is indicated. Which of the following is possible?

$\mathcal{E}$ o⟶

   A) The current is constant and rightward
   B) The current is constant and leftward
   C) The current is increasing and rightward
   D) The current is increasing and leftward
   E) None of the above

___ **2.** An electron traveling with speed v around a circle of radius r is equivalent to a current of:
   A) $evr/2$ **B)** ev/r **C)** $ev/2\pi r$ **D)** $2\pi er/v$ **E)** $2\pi ev/r$

___ **3.** An inductor with inductance L and an inductor with inductance $2L$ are connected in parallel. When the rate of change of the current in the larger inductor is 1200 A/s the rate of change of the current in the smaller inductor is:
   A) 400 A/s   **B)** 1200 A/s   **C)** 1600 A/s   **D)** 2000 A/s   **E)** 2400 A/s

___ **4.** A 3.5-mH inductor and a 4.5-mH inductor are connected in series. The equivalent inductance is:
   A) 2.0 mH   **B)** 0.51 mH   **C)** 0.13 mH   **D)** 1.0 mH   **E)** 8.0 mH

___ **5.** The diagram shows two small paramagnetic spheres, one near each end of a bar magnet. Which of the following statements is true?
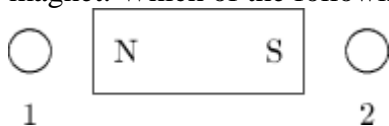

   A) The force on 1 is toward the magnet and the force on 2 is away from the magnet
   B) The force on 1 is away from the magnet and the force on 2 is away from the magnet
   C) The forces on 1 and 2 are both toward the magnet
   D) The forces on 1 and 2 are both away from the magnet
   E) The magnet does not exert a force on either sphere

___ **6.** A magnetic field $\vec{B}^{\text{ext}}$ is applied to a diamagnetic substance. In the interior the magnetic field produced by the magnetic dipoles of the substance is:
  A) greater in magnitude than $\vec{B}^{\text{ext}}$ and in the opposite direction
  B) less in magnitude than $\vec{B}^{\text{ext}}$ and in the opposite direction
  C) greater in magnitude than $\vec{B}^{\text{ext}}$ and in the same direction
  D) less in magnitude than $\vec{B}^{\text{ext}}$ and in the same direction
  E) the same as $\vec{B}^{\text{ext}}$

___ **7.** Paramagnetism is closely associated with:
  A) the tendency of electron dipole moments to align with an applied magnetic field
  B) the tendency of electron dipole moments to align opposite to an applied magnetic field
  C) the exchange force between electrons
  D) the force exerted by electron dipole moments on each other
  E) the torque exerted by electron dipole moments on each other

___ **8.** A 10-turn ideal solenoid has an inductance of 4.0 mH. To generate an emf of 2.0 V the current should change at a rate of:
  A) zero   **B)** 5.0 A/s   **C)** 50 A/s   **D)** 250 A/s   **E)** 500 A/s

___ **9.** The core of a transformer is made in a laminated form to:
  A) facilitate easy assembly   **D)** save weight
  B) reduce i^2R losses in the coils   **E)** prevent eddy currents
  C) increase the magnetic flux

___ **10.** A paramagnetic substance, in an external magnetic field, is thermally isolated. The field is then removed. As a result:
  A) the magnetic energy of the magnetic dipoles decreases
  B) the temperature of the substance increases
  C) the magnetization decreases, but only slightly
  D) the magnetization reverses direction
  E) none of the above

___ **11.** An inductance L, resistance R, and ideal battery of emf ε are wired in series. A switch in the circuit is closed at time 0, at which time the current is zero. At any later time t the emf of the inductor is given by:
  A) $\varepsilon(1 - e^{-Lt/R})$ **B)** $\varepsilon e^{-Lt/R}$ **C)** $\varepsilon(1 + e^{-Rt/L})$ **D)** $\varepsilon e^{-Rt/L}$ **E)** $\varepsilon(1 - e^{-Rt/L})$

___ **12.** A paramagnetic substance is placed in a weak magnetic field and its absolute
temperature T is increased. As a result, its magnetization:

A) increases in proportion to T **D)** decreases in proportion to $1/T$
B) increases in proportion to T^2 **E)** decreases in proportion to $1/T^2$
C) remains the same

___ **13.** A 3.5-mH inductor and a 4.5-mH inductor are connected in series and a time varying
current is established in them. When the total emf of the combination is 16 V, the emf
of the larger inductor is:

A) 7.0 V   **B)** 9.0 V   **C)** 2.3 V   **D)** 28 V   **E)** 36 V

___ **14.** The primary of a 3:1 step-up transformer is connected to a source and the secondary
is connected to a resistor R. The power dissipated by R in this situation is P. If R is
connected directly to the source it will dissipate a power of:

A) $P/9$ **B)** $P/3$ **C)** P **D)** $3P$ **E)** $9P$

___ **15.** A positively charged ion, due to a cosmic ray, is headed through Earth's atmosphere
toward the center of Earth. Due to Earth's magnetic field, the ion will be deflected:

A) south
B) north
C) west
D) east
E) not at all since it is a charge and not a pole

___ **16.** Because ferromagnets have ferromagnetic domains, the net magnetization:

A) can never be in the same direction as an applied field
B) may not vanish when an applied field is reduced to zero
C) can never vanish
D) is proportional to any applied magnetic field
E) is always opposite to the direction of any applied magnetic field

___ **17.** Of the three chief kinds of magnetic materials (diamagnetic, paramagnetic, and
ferromagnetic), which are used to make permanent magnets?

A) Only diamagnetic   **D)** Only paramagnetic and ferromagnetic
B) Only ferromagnetic   **E)** All three
C) Only paramagnetic

___ **18.** A generator supplies 100 V to the primary coil of a transformer. The primary has 50
turns and the secondary has 500 turns. The secondary voltage is:

A) 1000 V   **B)** 500 V   **C)** 250 V   **D)** 100 V   **E)** 10 V

___ **19.** Immediately after switch S in the circuit shown is closed, the current through the battery is:
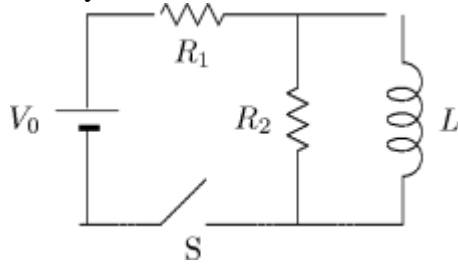
A) 0   **B)** V_0/R_1 **C)** V_0/R_2 **D)** $V_0/(R_1 + R_2)$ **E)** $V_0(R_1 + R_2)/(R_1R_2)$

___ **20.** Lenz' law can explain:
A) paramagnetism only
B) diamagnetism only
C) ferromagnetism only
D) only two of the three types of magnetism
E) all three of the types of magnetism

Answer Key

1. D
Origin: Chapter 32- Inductors and Magnetic Materials, 2
2. C
Origin: Chapter 32- Inductors and Magnetic Materials, 39
3. E
Origin: Chapter 32- Inductors and Magnetic Materials, 22
4. E
Origin: Chapter 32- Inductors and Magnetic Materials, 18
5. C
Origin: Chapter 32- Inductors and Magnetic Materials, 57
6. B
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7. A
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8. E
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9. E
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10. E
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11. D
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12. D
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13. B
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14. A
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16. B
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17. B
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18. A
Origin: Chapter 32- Inductors and Magnetic Materials, 26
19. D
Origin: Chapter 32- Inductors and Magnetic Materials, 17
20. B
Origin: Chapter 32- Inductors and Magnetic Materials, 54