Multiple Choice

Identify the choice that best completes the statement or answers the question.

1. A sensitive ammeter is connected to a wire loop and placed within the magnetic field of a strong horseshoe magnet. The ammeter shows a deflection when:
   a. the wire is moved parallel to the field. b. the wire is moved perpendicularly to the field. c. neither wire nor magnet is moving. d. the wire's axis is parallel to the field.

2. A flat coil of wire consisting of 20 turns, each with an area of 50 cm\(^2\), is positioned perpendicularly to a uniform magnetic field that increases its magnitude at a constant rate from 2.0 T to 6.0 T in 2.0 s. If the coil has a total resistance of 0.40 \(\text{\Omega}\), what is the magnitude of the induced current?
   a. 70 mA   b. 140 mA   c. 500 mA   d. 800 mA

3. The magnet moving past an object will produce eddy currents in the object if the object:
   a. is magnetic material only.   b. is a conductor.   c. is an insulator.   d. is a liquid.

4. A bar magnet is falling through a loop of wire with constant velocity. The north pole enters first. As the south pole leaves the loop of wire, the induced current (as viewed from above) will be:
   a. clockwise.   b. counterclockwise.   c. zero.   d. along the length of the magnet.

5. The back emf in an electric motor is its maximum value under which condition?
   a. motor speed is zero   b. current is a maximum   c. voltage is a maximum   d. motor speed is a maximum

6. A 12-V battery is connected in series with a switch, resistor and coil. If the circuit’s time constant is 2.0 \(\times\) 10\(^{-4}\) s and the final steady current after the switch is closed becomes 1.0 A, what is the value of the inductance?
   a. 1.2 mH   b. 2.4 mH   c. 9.6 mH   d. 48 mH

7. An AC voltage source, with a peak output of 200 V, is connected to a 50-\(\Omega\) resistor. What is the effective (or rms) current in the circuit?
   a. 2.8 A   b. 4.0 A   c. 5.6 A   d. 2.0 A

8. The frequency in an AC series circuit is doubled. By what factor does this change the capacitive reactance?
   a. 1/2   b. 1/4   c. 2   d. 4

9. What is the phase angle of an AC series circuit that is constructed of a 10.0-\(\Omega\) resistor along with 12.00 \(\Omega\) inductive reactance and 7.00 \(\Omega\) capacitive reactance?
   a. 26.6° b. 18.4° c. 87.0° d. 63.4°

10. Resonance occurs in an AC series circuit when which of the following conditions is met?
     a. resistance equals capacitive reactance
     b. resistance equals inductive reactance
     c. capacitive reactance equals inductive reactance
     d. capacitive reactance equals zero

11. A transformer consists of a 500-turn primary coil and a 2 000-turn secondary coil. If the current in the secondary is 3.00 A, what is the primary current?
    a. 0.750 A   b. 1.33 A   c. 12.0 A   d. 48.0 A

12. An electromagnetic wave is made up of which of the following oscillating quantities?
    a. electrons only   b. electric fields only   c. magnetic fields only   d. electric and magnetic fields

13. In order of increasing frequency, which of the following is correct?
    a. visible, radio, ultraviolet and x-ray   b. infrared, visible, ultraviolet and gamma   c. visible, gamma, ultraviolet and x-ray   d. infrared, x-ray, visible and gamma
14. An RLC circuit has resistance $R_0$, inductance $L_0$, and capacitance $C_0$. If the resistance value is now doubled, which values of inductance and capacitance will result in the same resonant frequency as before.
   a. $2L_0$, $2C_0$  b. $L_0/2$, $C_0/2$  c. $2L_0$, $C_0/2$  d. $2L_0$, $C_0$

15. What is the energy of a photon of frequency $5.00 \times 10^{14}$ Hz? ($h = 6.626 \times 10^{-34}$ J⋅s)
   a. $3.31 \times 10^{-19}$ J  b. $3.31 \times 10^{-47}$ J  c. $1.33 \times 10^{-48}$ J  d. $1.33 \times 10^{-24}$ J

16. As the angle of incidence is increased for a ray incident on a reflecting surface, the angle between the incident and reflected rays ultimately approaches what value?
   a. zero  b. $45^\circ$  c. $90^\circ$  d. $180^\circ$

17. A ray of light strikes a thick sheet of glass ($n = 1.5$) at an angle of $25^\circ$ with the normal. Find the angle of the refracted ray within the glass with respect to the normal.
   a. $56^\circ$  b. $46^\circ$  c. $25^\circ$  d. $16^\circ$

18. When light passing through a prism undergoes dispersion, the effect is a result of:
   a. different wavelengths traveling at different speeds  b. different wavelengths having different indices of refraction  c. different wavelengths refracting differently  d. All of the above.

19. In Huygens’s construction, all points on a wave front:
   a. act as point sources for the production of secondary spherical waves  b. act as particles  c. demonstrate the dual nature of light  d. must be sources of plane waves.

20. Which of the following describes what will happen to a light ray incident on an air-to-glass boundary at less than the critical angle?
   a. total reflection  b. total transmission  c. partial reflection, partial transmission  d. partial reflection, total transmission
phy105s12-sample questions for class exam 3-goderya
Answer Section

MULTIPLE CHOICE

1. ANS: B DIF: 1 TOP: 20.2 Faraday’s Law of Induction
2. ANS: C DIF: 2 TOP: 20.2 Faraday’s Law of Induction
3. ANS: B DIF: 1 TOP: 20.3. Motional emf
5. ANS: D DIF: 1 TOP: 20.5 Generators
6. ANS: B DIF: 2 TOP: 20.7 RL Circuits
7. ANS: A DIF: 2 TOP: 21.1 Resistors in an AC Circuit
8. ANS: A DIF: 1 TOP: 21.2 Capacitors in an AC Circuit
9. ANS: A DIF: 2 TOP: 21.4 The RLC Series Circuit
10. ANS: C DIF: 1 TOP: 21.6 Resonance in a Series RLC Circuit
11. ANS: C DIF: 2 TOP: 21.7 The Transformer
14. ANS: C DIF: 1 TOP: Conceptual Questions
15. ANS: A DIF: 2 TOP: 22.1 The Nature of Light
16. ANS: D DIF: 1 TOP: 22.2 Reflection and Refraction
17. ANS: D DIF: 2 TOP: 22.3 The Law of Refraction
18. ANS: D DIF: 1 TOP: 22.4 Dispersion and Prisms
19. ANS: A DIF: 1 TOP: 22.6 Huygens’s Principle
20. ANS: C DIF: 1 TOP: 22.7 Total Internal Reflection