Name: _____ **Class:** _____ **Date:** _____ **ID: A**

Phys.G12-Q4W3-Electromagnetism- H.W.

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

____ 1. The rms current in an ac current is 3.6 A. Find the maximum current.
a. 4.7 A
b. 1.8 A
c. 2.8 A
d. 5.1 A

____ 2. A potential difference of 115 V across the primary of a step-down transformer provides a potential difference of 2.3 V across the secondary. What is the ratio of the number of turns of wire on the primary to the number of turns on the secondary?
a. 50:1
b. 7:1
c. 1:7
d. 1:50

____ 3. The maximum current supplied by a generator to a 25 Ω circuit is 6.2 A. What is the rms potential difference?
a. 120 V
b. 110 V
c. 150 V
d. 62 V

____ 4. A transformer has 15 turns in its primary and 6750 turns in its secondary. If the potential difference across the primary is 1.2 V, what is the potential difference across the secondary?
a. 125 V
b. 270 V
c. 380 V
d. 540 V

____ 5. What is rms (root-mean-square) current?
a. the value of alternating current that gives the same heating effect that the corresponding value of direct current does
b. an important measure of the current in an ac circuit
c. the amount of direct current that would dissipate the same energy in a resistor as is dissipated by the instantaneous alternating current over a complete cycle
d. all of the above

Use the following equations to find maximum emf.
maximum emf $= NAB\omega$
$\omega = 2\pi f$, where f = frequency in Hz.

____ 6. A generator consists of 10.0 turns of wire, and each turn has an area of $0.095\ \text{m}^2$. If a maximum emf of 1.2×10^2 V is induced when the coil rotates with a frequency of 60.0 Hz, what is the strength of the magnetic field?
a. 0.85 T
b. 1.5 T
c. 0.15 T
d. 0.34 T

____ 7. A generator consists of eight turns of wire, and each turn has an area of $0.15\ \text{m}^2$. The loop rotates in a magnetic field of 0.55 T at constant frequency of 9.0 Hz. What is the maximum induced emf in the loop?
a. 4.1 V
b. 37 V
c. 5.9 V
d. 19 V

____ 8. A loop of wire is held in a vertical position at the equator with the face of the loop facing in the east-west direction. What change will induce the greatest current in the loop?
   a. rotating the loop so its face is north-south
   b. rotating the loop so its face is vertical
   c. moving the loop north
   d. raising the loop to a higher elevation

____ 9. A circular coil with an area of 5.0×10^{-2} m^2 and with 500 turns of wire is placed in a uniform magnetic field perpendicular to the plane of the coil. If the field changes in value from –0.100 T to +0.150 T in an interval of 0.500 s, what is the induced emf in the coil?
   a. 252 V
   b. 188 V
   c. 125 V
   d. –12.5 V

____ 10. All of the following statements about the electromagnetic force are true *except* which one?
   a. It is one of the four fundamental forces in the universe.
   b. It exerts a force on either charged or uncharged particles.
   c. It obeys the inverse-square law.
   d. It is produced by—and produces—electric and magnetic fields.

____ 11. An ac generator has a maximum output emf of 120 V. The generator is connected to a 125 Ω resistor. What is the rms current through the resistor?
   a. 2.43 A
   b. 1.47 A
   c. 1.73 A
   d. 0.68 A

____ 12. How does an electromagnetic wave propagate itself?
   a. A changing electric field induces a magnetic field perpendicular to the electric field.
   b. Changing electric and magnetic fields produce a transverse wave that is perpendicular to both of the oscillating fields.
   c. A changing magnetic field induces an electric field perpendicular to the magnetic field.
   d. all of the above

____ 13. Which of the following determines the maximum generated emf in an ac generator?
   a. the coil rotation rate or angular frequency
   b. the magnetic field strength, *B*
   c. the loop area, *A*
   d. all of the above

____ 14. A step-down transformer has 2500 turns on its primary and 5.0×10^{1} turns on its secondary. If the potential difference across the primary is 4850 V, what is the potential difference across the secondary?
   a. 1.0 V
   b. 97 V
   c. 240 V
   d. 110 V

____ 15. Which of the following statements about electromagnetic radiation is true?
   a. It transports the energy of electromagnetic waves.
   b. It transfers energy to objects in the path of the electromagnetic waves.
   c. It can be converted to other energy forms.
   d. all of the above

____ 16. How is a motor's mechanical energy able to perform mechanical work?
   a. A shaft connected to the rotating coil is attached to some external device.
   b. Electrical energy is converted into a magnetic force.
   c. Mechanical energy is converted into electrical energy.
   d. A current is generated by a rotating loop in a magnetic field.

____ 17. In a two-coil system, the mutual inductance depends on
a. only the geometrical properties of the coils.
b. neither the geometrical properties of the coils nor their orientation to each other.
c. both the geometrical properties of the coils and their orientation to each other.
d. only the orientation of the coils to each other.

____ 18. According to Lenz's law, the magnetic field of an induced current in a conductor will
a. enhance the applied field.
b. heat the conductor.
c. oppose a change in the applied magnetic field.
d. increase the potential difference.

____ 19. Two loops of wire are arranged so that a changing current in the primary will induce a current in the secondary. The secondary loop has twice as many turns as the primary loop. As long as the current in the primary is steady at 3.0 A, the current in the secondary will be
a. 3.0 A.
b. 1.5 A.
c. zero.
d. 6.0 A.

____ 20. Which conversion process is the basic function of the electric generator?
a. electrical energy to mechanical energy
b. low emf to high emf, or vice versa
c. mechanical energy to electrical energy
d. alternating current to direct current

____ 21. A step-up transformer used on a 120 V line has 95 turns on the primary and 2850 turns on the secondary. What is the emf across the secondary?
a. 1800 V
b. 30 V
c. 3600 V
d. 2400 V

____ 22. A generator's maximum output is 220 V. What is the rms potential difference?
a. 110 V
b. 150 V
c. 310 V
d. 160 V

____ 23. Electricity may be generated by rotating a loop of wire between the poles of a magnet. The induced current is greatest when
a. the plane of the loop is perpendicular to the magnetic field.
b. the plane of the loop is parallel to the magnetic field.
c. the magnetic flux through the loop is a minimum.
d. the plane of the loop makes an angle of 45° with the magnetic field.

____ 24. A coil with a wire that is wound around a 2.0 m^2 hollow tube 35 times. A uniform magnetic field is applied perpendicular to the plane of the coil. If the field changes uniformly from 0.00 T to 0.55 T in 0.85 s, what is the induced emf in the coil?
a. 33 V
b. 45 V
c. –33 V
d. –45 V

____ 25. Electromagnetic waves are ____ electric and magnetic fields.
a. transverse
b. parallel
c. constant
d. oscillating

____ 26. An ac generator has a maximum emf output of 150 V. What is the rms current in the circuit when the generator is connected to a 35 Ω resistor?
a. 2.6 A
b. 1.5 A
c. 3.1 A
d. 1.2 A

____ 27. An ac generator has a maximum output emf of 215 V. What is the rms potential difference?
a. 145 V
b. 304 V
c. 152 V
d. 216 V

____ 28. A current can be induced in a closed circuit without the use of a battery or an electrical power supply by moving the circuit through a
a. magnetic field.
b. high temperature field.
c. gravitational field.
d. nuclear field.

____ 29. A bar magnet falls through a loop of wire with constant velocity, and the north pole enters the loop first. The induced current will be greatest when the magnet is located so that the loop is
a. With no acceleration, the induced current is zero.
b. near the middle of the magnet.
c. near either the north or the south pole.
d. near the north pole only.

____ 30. A generator supplies an rms current of 1.66 A. If the resistance of the circuit is 66.0 Ω, what is the maximum emf?
a. 156 V
b. 77.5 V
c. 38.7 V
d. 125 V

____ 31. A generator with a single loop produces the greatest magnetic force on the charges and the greatest induced emf when
a. half of the loop segments are moving perpendicular to the magnetic field.
b. the plane of the loop is parallel to the magnetic field.
c. the plane of the loop is perpendicular to the magnetic field.
d. none of the above

____ 32. According to Lenz's law, if the applied magnetic field changes,
a. the induced field attempts to keep the total field strength constant.
b. the induced field attempts to decrease the total field strength.
c. the induced field attempts to increase the total field strength.
d. the induced field attempts to oscillate about an equilibrium value.

____ 33. In a primary-secondary coil combination, which of the following conditions is met in the primary coil when the current in the secondary coil is at its maximum?
a. The rate of current change is maximum.
b. The voltage is maximum in a positive direction.
c. The current is maximum in a negative direction.
d. The current is maximum in a positive direction.

____ 34. Where is energy stored in electromagnetic waves?
a. in the oscillating electric and magnetic fields
b. in the wave's moving atoms
c. in the wave's directional vector
d. in the electromagnetic force

____ 35. Under which condition is the back emf in an electric motor at its maximum value?
a. Current is at maximum.
b. Motor speed is at maximum.
c. Motor speed is zero.
d. Voltage is at maximum.

____ 36. Which conversion process is the basic function of the electric motor?
a. mechanical energy to electrical energy
b. electrical energy to mechanical energy
c. alternating current to direct current
d. low emf to high emf, or vice versa

____ 37. A coil with 150 turns and a cross-sectional area of 1.00 m^2 experiences a magnetic field whose strength increases by +0.65T in 1.80 s. The plane of the coil is perpendicular to the plane of the applied magnetic field. What is the induced emf in the coil?
a. 54 V
b. –54 V
c. –27 V
d. 0.36 V

____ 38. In most electric generators, either the armature or the magnetic field is ____, generating a(n) ____.
a. turned off; temporary dipole
b. interrupted; impulse change
c. nonconducting; flux line
d. rotated; induced current

____ 39. Which of the following options can be used to generate electricity?
a. Change the orientation of the circuit loop with respect to the magnetic field.
b. Change the magnetic field strength around the circuit loop.
c. Move the circuit loop into and out of a magnetic field.
d. all of the above

____ 40. In a two-coil system, the induced potential difference in the secondary coil depends on
a. the switch being kept open.
b. the number of turns of wire.
c. the iron ring around which the coils are wrapped.
d. the orientation of the coils being kept constant.

____ 41. An electric current that changes directions at regular intervals is called
a. directional current.
b. reversible current.
c. fluctuating current.
d. alternating current.

____ 42. All of the following statements about ac rms values and maximum values are true *except* which one?
a. Rms values are approximately 70 percent of the maximum values.
b. Rms values are always less than maximum values.
c. Rms values may equal maximum values.
d. Rms values are different from maximum values because the alternating current is at its maximum only for an instant.

____ 43. All of the following are ways to induce an emf in a loop of wire *except* which one?
a. Move the loop parallel to a magnetic field.
b. Move the loop into or out of a magnetic field.
c. Insert the loop into a changing magnetic field.
d. Rotate the loop in a magnetic field.

____ 44. What do radio waves, microwaves, X rays, and gamma rays all have in common?
a. They are detected in the same way.
b. They are produced in the same way.
c. They are electromagnetic waves.
d. They store the same amount of energy.

____ 45. A loop of wire is rotated 360° across an external magnetic field. During one period of revolution, the induced current changes in
a. amplitude.
b. magnitude only.
c. direction only.
d. both magnitude and direction.

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