Electromagnetism Advanced Concepts

Physics · Answer Key · 25 Questions

1. Which law states that the induced electromotive force in any closed circuit is equal to the negative of the time rate of change of the magnetic flux through the circuit?

A) Ohm's Law
B) Faraday's Law of Induction
C) Coulomb's Law
D) Ampere's Law

2. In a simple DC electric motor, what component is used to reverse the direction of the current in the coil to ensure continuous rotation?

A) Stator
B) Commutator
C) Transformer
D) Resistor

3. What is the primary function of a step-up transformer?

A) To increase voltage and decrease current
B) To decrease voltage and increase current
C) To increase both voltage and current
D) To convert AC to DC

4. According to the right-hand grip rule, if your thumb points in the direction of the conventional current, what do your curled fingers represent?

A) The direction of the magnetic force
B) The direction of the magnetic field lines
C) The direction of the electron flow
D) The direction of the voltage drop

5. Which material is classified as ferromagnetic?

A) Copper
B) Aluminum
C) Iron
D) Gold

6. What happens to the magnetic field strength inside a solenoid if the number of turns of wire per unit length is increased while keeping the current constant?

A) It decreases
B) It remains the same
C) It increases
D) It reverses polarity

7. What is the unit of magnetic flux density?

A) Weber
B) Tesla
C) Henry
D) Volt

8. Which of the following describes the effect of an electromagnetic relay?

A) Converting mechanical energy to electrical energy
B) Using a small current to control a larger current in a separate circuit
C) Changing the frequency of an AC signal
D) Storing electrical charge for later use

9. What is the phenomenon where a changing magnetic field induces an electric current in a nearby conductor?

A) Electromagnetic induction
B) Electrostatic discharge
C) Magnetic resonance
D) Superconductivity

10. Which component of an electromagnet directly determines the polarity of the magnetic poles created?

A) The diameter of the wire
B) The direction of the electric current
C) The color of the wire insulation
D) The weight of the core

11. What is the main purpose of adding an iron core to a solenoid?

A) To reduce electrical resistance
B) To increase the concentration of magnetic flux
C) To prevent the wire from overheating
D) To change the current from AC to DC

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12. In a generator, what energy conversion takes place?

A) Electrical to mechanical
B) Chemical to electrical
C) Mechanical to electrical
D) Thermal to mechanical

13. Which factor does NOT affect the strength of an electromagnet?

A) The number of coils
B) The magnitude of the current
C) The material of the core
D) The speed of the current flow

14. What is the primary reason transformers do not work with direct current (DC)?

A) DC current has no magnetic field
B) DC does not create a changing magnetic flux
C) DC creates too much resistance
D) DC is incompatible with iron cores

15. What is a permanent magnet's field configuration between unlike poles?

A) Parallel lines
B) Circular loops
C) Lines radiating outwards
D) Lines pointing from North to South

16. Which force acts on a current-carrying wire placed in an external magnetic field?

A) Lorentz force
B) Gravitational force
C) Centripetal force
D) Frictional force

17. What determines the direction of the force on a current-carrying wire in a magnetic field (Fleming's Left-Hand Rule)?

A) Direction of the magnetic field and the direction of the current
B) Voltage and resistance
C) Temperature and pressure
D) Mass and velocity

18. What is an electromagnet that is only magnetic when current flows called?

A) Permanent magnet
B) Temporary magnet
C) Superconductor
D) Natural magnet

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19. How are the magnetic field lines directed outside a bar magnet?

A) From South to North
B) From North to South
C) In circles around the poles
D) They do not exist outside the magnet

20. What does Lenz's Law state about the direction of an induced current?

A) It flows in the same direction as the change in flux
B) It creates a magnetic field that opposes the change that produced it
C) It always flows clockwise
D) It is independent of the speed of the magnet

21. Which device is used to measure very small electric currents by detecting the magnetic field they produce?

A) Galvanometer
B) Voltmeter
C) Thermometer
D) Barometer

22. In a transformer, if the secondary coil has more turns than the primary coil, what will happen to the voltage?

A) It will step down
B) It will step up
C) It will remain equal
D) It will become zero

23. What is the term for a material that is slightly repelled by a magnetic field?

A) Ferromagnetic
B) Paramagnetic
C) Diamagnetic
D) Conductor

24. Which of the following is an example of an electromagnetic device used in households?

A) A glass mirror
B) An electric doorbell
C) A wooden spoon
D) A lead pencil

25. What effect does increasing the resistance of a circuit have on an electromagnet's field strength?

A) It increases the strength

B) It decreases the strength

C) It has no effect

D) It changes the polarity

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