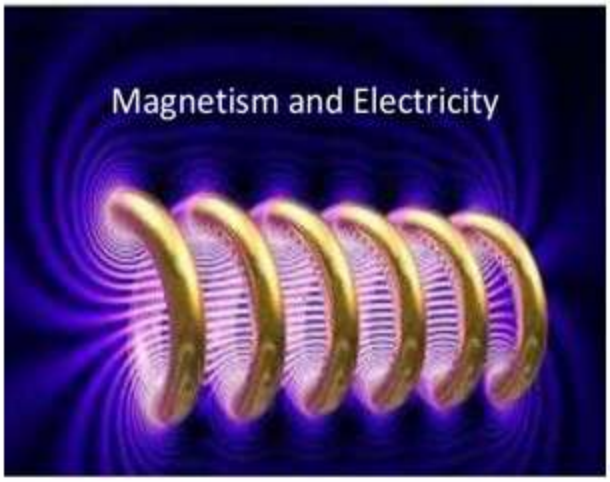
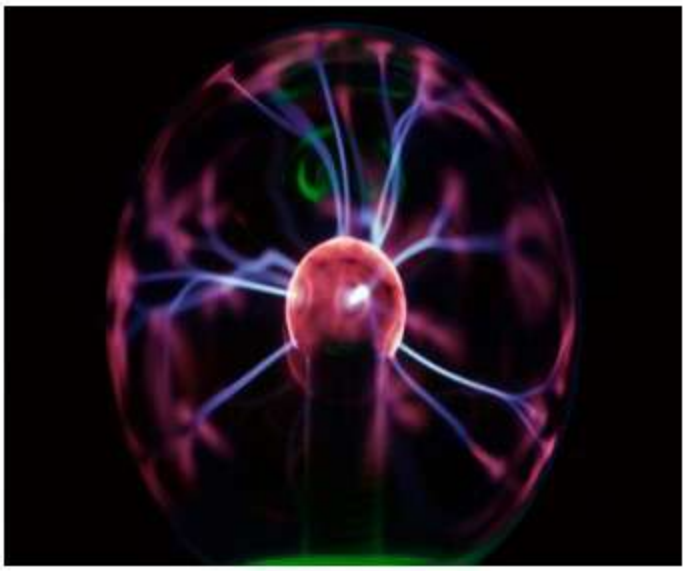
MCQ Question Bank

On
Electricity & Magnetism





Topics to be covered

- Capacitors
- Chemical effect
- Electric Current
- Electromagnetic induction
- Electrometers
- Magnetic properties of materials
- Meters
- Thermoelectricity
- Alternating Current

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MCQ ON ELECTRICITY AND MAGNETISM

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CONTENT

1. CAPACITORS

1. What is a capacitor?

a. Resistor

b. Inductor

c. Energy storage device

d. Conductor

Answer: c. Energy storage device

2. Which unit is used to measure capacitance?

a. Ohm

b. Farad

c. Henry

d. Volt

Answer: b. Farad

3. What does the capacitance of a capacitor depend on?

a. Voltage across the capacitor

b. Distance between the plates

c. Area of the plates

d. All of the above

Answer: d. All of the above

4. In a capacitor, the electric field is strongest:

a. Between the plates

b. Outside the plates

c. Inside the plates

d. In the connecting wires

Answer: a. Between the plates

5. What is the formula for capacitance (C) of a parallel plate capacitor?

a. C = Q/V

b. C = V/Q

c. $C = \varepsilon A/d$

d. $C = Q/\varepsilon A$

Answer: c. $C = \varepsilon A/d$

6. The dielectric material in a capacitor is used to:

a. Increase capacitance

b. Decrease capacitance

c. Short-circuit the capacitor

d. None of the above

Answer: a. Increase capacitance

7. What happens to the capacitance if the distance between the plates of a capacitor is increased?

a. Increases

b. Decreases

c. Remains the same

d. Depends on the dielectric

Answer: b. Decreases

8. A capacitor is fully charged when:

a. Current is maximum

b. Voltage is maximum

c. Energy is maximum

d. Both voltage and current are zero

Answer: b. Voltage is maximum

9. What is the time constant (τ) of an RC circuit?

a. R/C

b. C/R

c. $R \times C$

d. $C \times R$

Answer: d. $C \times R$

10. In an AC circuit, the capacitive reactance (Xc) is given by:

a. $Xc = 1/(2\pi fC)$

b. $Xc = 2\pi fC$

c. $Xc = R/(2\pi f)$

d. $Xc = 1/(2\pi fR)$

Answer: a. $Xc = 1/(2\pi fC)$

11. The time taken for a capacitor to charge to approximately 63.2% of its maximum voltage is equal to:

a. 1 time constant

b. 2 time constants

c. 3 time constants

d. 4 time constants

Answer: a. 1 time constant

12. Which type of capacitor is commonly used in high-frequency applications?

a. Ceramic capacitor

b. Electrolytic capacitor

c. Tantalum capacitor

d. Variable capacitor

Answer: a. Ceramic capacitor

13. The voltage across the capacitor in an RC charging circuit follows which curve during the charging process?

a. Linear

b. Exponential

c. Parabolic

d. Sinusoidal

Answer: b. Exponential

14. What is the primary purpose of a bypass capacitor in electronic circuits?

a. Store energy

b. Smooth voltage fluctuations

c. Block DC signals

d. Increase resistance

Answer: b. Smooth voltage fluctuations

15. Which factor affects the energy stored in a capacitor the most?

a. Voltage

b. Capacitance

c. Dielectric material

d. Plate area

Answer: b. Capacitance

16. The capacitance of a capacitor is doubled. What happens to the energy stored?

a. Doubled

b. Halved

c. Quadrupled

d. Unchanged

Answer: c. Quadrupled

17. A capacitor with a dielectric material has a capacitance of 10 μF. If the dielectric constant is doubled, what is the new capacitance?

a. 5 μF

b. 10 μF

c. 20 μF

d. 40 μF

Answer: c. 20 μF

18. What is the time constant of an RL circuit?

a. R/L

b. L/R

c. R × L

d. L × R

Answer: a. R/L

19. The energy stored in a capacitor can be calculated using the formula:

a. $W = 0.5CV^2$

b. $W = QV$

c. $W = 0.5QV$

d. $W = CV^2$

Answer: a. $W = 0.5CV^2$

20. A capacitor in series with a resistor makes a:

a. Low-pass filter

b. High-pass filter

c. Band-pass filter

d. Notch filter

Answer: a. Low-pass filter

21. Which capacitor type is polarized and should be connected with the correct polarity? a. Ceramic capacitor

b. Electrolytic capacitor

c. Film capacitor

d. Variable capacitor

Answer: b. Electrolytic capacitor

22. What happens to the charge on a capacitor when it discharges through a resistor?

a. Increases

b. Decreases

c. Remains constant

d. Depends on the resistor value

Answer: b. Decreases

23. The time constant of an RC circuit determines:

a. Rate of charging

b. Rate of discharging

c. Both charging and discharging rates

d. Resistance of the circuit

Answer: c. Both charging and discharging rates

24. In an AC circuit, if the frequency is increased, what happens to the capacitive reactance?

a. Increases

b. Decreases

c. Remains constant

d. Depends on the voltage

Answer: b. Decreases

25. Which factor is crucial for the breakdown voltage of a capacitor?

a. Capacitance

b. Dielectric strength

c. Voltage rating

d. Plate area

Answer: b. Dielectric strength

26. The symbol for a capacitor in a circuit diagram is:

a. I

b. R

c. C

d. L

Answer: c. C

27. What is the purpose of a coupling capacitor in an amplifier circuit?

a. Block DC signals

b. Increase gain

c. Decrease resistance

d. Short-circuit the output

Answer: a. Block DC signals

28. The time constant of an RC circuit is equal to the product of:

a. Resistance and inductance

b. Resistance and capacitance

c. Inductance and capacitance

d. Voltage and current

Answer: b. Resistance and capacitance

29. Which type of capacitor is commonly used for smoothing voltage in power supply circuits?

a. Ceramic capacitor
b. Electrolytic capacitor
c. Tantalum capacitor
d. Film capacitor

Answer: b. Electrolytic capacitor

30. What is the purpose of a decoupling capacitor in electronic circuits?

a. Block AC signals
b. Smooth voltage fluctuations
c. Increase capacitance
d. Short-circuit the circuit

Answer: b. Smooth voltage fluctuations

31. The charging current in an RC circuit is highest at:

a. Start of charging
b. Middle of charging
c. End of charging
d. It remains constant

Answer: a. Start of charging

32. The relationship between voltage (V), current (I), and capacitance (C) in a capacitor is given by:

a. V = IR
b. I = VR
c. V = Q/C
d. I = CQ

Answer: c. V = Q/C

33. The leakage current in a capacitor is mainly due to:

a. Dielectric breakdown

b. Plate separation

c. Imperfections in the dielectric

d. Voltage rating

Answer: c. Imperfections in the dielectric

34. What is the effect of temperature on the capacitance of a capacitor with a ceramic dielectric?

a. Increases with temperature

b. Decreases with temperature

c. Remains constant

d. Depends on the voltage

Answer: b. Decreases with temperature

35. Which capacitor type is known for its stability and low tolerance?

a. Ceramic capacitor

b. Electrolytic capacitor

c. Film capacitor

d. Variable capacitor

Answer: c. Film capacitor

36. The voltage rating of a capacitor indicates:

a. The maximum allowable voltage across the capacitor

b. The minimum allowable voltage across the capacitor

c. The rate of voltage change

d. The capacitance value

Answer: a. The maximum allowable voltage across the capacitor

37. What is the formula for the reactance (Xc) of a capacitor in an AC circuit?

a. $Xc = 1/(2\pi fC)$

b. $Xc = 2\pi fC$

c. $Xc = R/(2\pi f)$

d. $Xc = 1/(2\pi fR)$

Answer: a. $Xc = 1/(2\pi fC)$

38. The equivalent capacitance of capacitors in series is calculated using the formula:

a. $C\_eq = C_1 + C_2 + C_3$

b. $1/C\_eq = 1/C_1 + 1/C_2 + 1/C_3$

c. $C\_eq = C_1 \times C_2 \times C_3$

d. $C\_eq = C_1 - C_2 - C_3$

Answer: b. $1/C\_eq = 1/C_1 + 1/C_2 + 1/C_3$

39. The charge on a capacitor is directly proportional to:

a. Voltage

b. Current

c. Capacitance

d. Resistance

Answer: a. Voltage

40. Which type of capacitor is commonly used for coupling and bypass applications in audio circuits?

a. Ceramic capacitor

b. Electrolytic capacitor

c. Tantalum capacitor

d. Film capacitor

Answer: b. Electrolytic capacitor

41. The time constant of an RL circuit determines:

a. Rate of charging

b. Rate of discharging

c. Both charging and discharging rates

d. Resistance of the circuit

Answer: b. Rate of discharging

42. What happens to the charge on a capacitor when it is connected to a battery in a closed circuit?

a. Increases

b. Decreases

c. Remains constant

d. Depends on the battery voltage

Answer: a. Increases

43. Which factor does NOT affect the capacitance of a parallel plate capacitor?

a. Voltage

b. Distance between plates

c. Area of plates

d. Permittivity of the dielectric

Answer: a. Voltage

44. In an AC circuit, if the frequency is decreased, what happens to the capacitive reactance?

a. Increases

b. Decreases

c. Remains constant

d. Depends on the voltage

Answer: a. Increases

45. Which type of capacitor is often used for tuning applications in radio circuits?

a. Ceramic capacitor

b. Electrolytic capacitor

c. Tantalum capacitor

d. Variable capacitor

Answer: d. Variable capacitor

46. The capacitance of a capacitor is inversely proportional to:

a. Voltage

b. Current

c. Distance between plates

d. Permittivity of the dielectric

Answer: c. Distance between plates

47. What is the purpose of a feedback capacitor in an amplifier circuit?

a. Block DC signals

b. Increase gain

c. Decrease resistance

d. Short-circuit the input

Answer: a. Block DC signals

48. Which type of capacitor is known for its small size and high capacitance?

a. Ceramic capacitor

b. Electrolytic capacitor

c. Tantalum capacitor

d. Film capacitor

Answer: c. Tantalum capacitor

49. What is the formula for the energy stored in a capacitor?

a. $W = 0.5CV^2$

b. $W = QV$

c. $W = 0.5QV$

d. $W = CV^2$

Answer: a. $W = 0.5CV^2$

50. The capacitance of a parallel plate capacitor is directly proportional to:

a. Voltage

b. Distance between plates

c. Area of plates

d. Permittivity of the dielectric

Answer: c. Area of plates

2. CHEMICAL EFFECT

1. Which of the following cells is more likely to be damaged due to short circuiting?

a) Daniel cell
b) Dry cell
c) Acid cell
d) Fuel cell

Answer: c

2. Seebeck effect is inverse of :

a) Peltier effect
b) Joule's effect
c) Thomson's effect
d) None of these

Answer: a

3. The current capacity of a cell is measured in :

a) A
b) Ah
c) W
d) Wh

Answer: b

4. Which of the following is one of the active materials of the Edison cell ?

a) Nickel oxide
b) Potassium oxide
c) Iron oxide
d) None of these

Answer: d

5. The electric cell is a device to obtain:

a) Electrons
b) Electric charge

c) Electric energy from chemical energy

d) Electric force

Answer: c

6. The thermocouple cannot act as :

a) refrigerator

b) a.c.generator

c) thermometer

d) voltmeter

Answer: b

7. What carries current in an electrolyte ?

a) Electrons only

b) –ve ions only

c) +ve ions only

d) Both +ve and –ve ions

Answer: d

8. What happens during the discharging of Edison cell ?

a) Relative density of electrolyte decreases

b) The emf does not change

c) The emf decreases

d) Relative density increases

Answer: c

9. The current capacity of the charged secondary cell does not depend on

a) Rate of discharge

b) Temperature

c) Amount of active material

d) Rate of charging

Answer: d

10. Which of the following acts as depolarizes in Leclanche cell?

a) MnO_2
b) NH_4Cl
c) Mn_2O_3
d) $ZnCl_2$

Answer: a

11. The thermocouple cannot act as :

a) Refrigerator
b) A.C.generator
c) Thermometer
d) Voltmeter

Answer: b

12. An external battery is connected to a copper – iron thermocouple having both junctions at same temperature initially. After some time :

a) The temperature of both junctions is still same but more than what it was initially
b) The temperature of both junctions is same but lower than what it was initially
c) The temperature of one junction increase and that of other decreases
d) The temperature of both the junctions increase but unequally

Answer: c

13. Which of the following does not cause sulphation of acid storage cell ?

a) Incomplete charging
b) Overcharging
c) Irregular charging
d) Fast charging

Answer: d

14. Which of the following cells involves similar chemical reactions?

a) Voltaic cell and Daniel cell
b) Daniel cell and dry cell

c) Dry cell and Leclanche cell

d) Leclanche cell and voltaic cell

Answer: c

15. What is the nature of graph between temperature and thermoelectric power ?

a) Parabola

b) Straight line

c) Hyperbola

d) None of these

Answer: c

16. What happens during the charging of acid cell ?

a) Voltage increase

b) Energy is given out

c) Relative density of electrolyte decreases

d) Cathode becomes chocolate brown

Answer: a

17. Which of the following is not reversible?

a) Seebeck effect

b) Peltier effect

c) Joule's effect

d) Thomson's effect

Answer: c

18. For a given thermocouple the temperature of the hot junction at which thermo emf is maximum, is known as :

a) Critical temperature

b) Temperature of inversion

c) Neutral temperature

d) Curie's temperature

Answer: c

19. The value of current required to deposit 0.972 gm of chromium in 3 hours if the e.c.e. of chromium is 0.00018 gm per colomb, is :

a) 1 amp
b) 1.5 amp
c) 0.5 amp
d) 2 amp

Answer: c

20. Which of the following is Not the disadvantage of polarization of voltaic cell ?

a) Increase in internal resistance
b) Wastage of chemical energy
c) Setting up of back emf
d) Decrease in current supply

Answer: b

21. Within the electric cell, the charge is transported by :

a) Free electrons
b) Only positive ions
c) Only negative ions
d) Both positive and negative ions

Answer: d

22. The unit of Peltier coefficient is :

a) JC^{-1}
b) JA^{-1}
c) JV^{-1}
d) None of these

Answer: a

23. Thermoelectric power it is the rate of change of thermo emf with:

a) Temperature
b) Time

c) Distance

d) Thermo electric current

Answer: a

24. The thermocouple should preferably be not used for measuring temperature above :

a) That of cold junction

b) That of hot junction

c) Temperature of inversion

d) Neutral temperature

Answer: d

25. In Seebeck series Sb appears before Bi. In

a) Sb-Bi thermocouple current flows from :

b) Sb to Bi at the hot junction

c) Sb to Bi at the cold junction

d) None of the above

Answer:b

26. If the temperature of the hot junction of a thermocouple changes from 80C to 100C the percentage change in thermoelectric power is

a) 8%

b) 10%

c) 20%

d) 25%

Answer: c

27. The Thomson coefficient for lead is :

a) Less than zero

b) Zero

c) More than zero but less than 1

d) More than 1

Answer: b

28. In which of the following cells polarization is the major defect ?

a) Voltaic cell
b) Leclanche cell
c) Daniel cell
d) None

Answer: a

29. Voltameter cannot be used to measure :

a) Current
b) Electrochemical equivalent
c) Potential difference
d) Charge

Answer: c

30. In which of the following the power dissipation is proportional to the square of the current?

a) Peltier effect
b) Joule's effect
c) Thomson's effect
d) None of these

Answer: b

31. In a thermocouple minimum current flows at :

a) Neutral temperature
b) Temperature of inversion
c) Twice the neutral temperature
d) Twice the temperature of inversion

Answer: b

32. A battery is connected to a thermocouple of copper and iron. The two junctions will be :

a) At the same temperature
b) Heated up

c) Neither heated up nor cooled

d) Undergoing thermoelectric effect leading to the heating of one junction and cooling of the other

Answer: d

33. The electrochemical equivalent of a material in an electrolyte depends on

a) The nature of the material

b) The current through the electrolyte

c) The amount of charge passed through electrolyte

d) The amount of material present in electrolyte

Answer: a

34. On passing 96500 coulomb of charge through a solution CuSO4 the amount of copper liberated is

a) 64 gram

b) 32 gram

c) 32 kilogram

d) 64 kilogram

Answer: a

35. Conversion of heat into electrical energy may be achieved by using :

a) Hydrometer

b) Thermocouple

c) Voltmeter

d) Photoelectric tube

Answer: a

36. Thermocouple is an arrangement of two different metals

a) To convert heat energy into electrical energy

b) To produce more heat

c) To convert heat energy into chemical energy

d) To convert mechanical energy into electrical energy

Answer: a

37. The thermo emf of a thermocouple varies with the temperature θ of the hot junction as $E = a\theta + b\theta^2$ in volts where the ratio a / b is 700℃. If the cold junction is kept at 0℃, then the neutral temperature is

a) 700 °C
b) 350 °C
c) 1400 °C
d) No neutral temperature is possible for this thermocouple

Answer: d

38. Which of the following is secondary cell?

a) Voltaic cell
b) Daniel cell
c) Leclanche cell
d) Edison cell

Answer: d

3. ELECTRIC CONDUCTION

1. Which of the following has negative temperature coefficient of resistance ?
   a) Tungsten
   b) Carbon
   c) Nichrome
   d) Platinum

Answer: c

2. Two resistors R and 2R are connected in series in an electric circuit. The thermal energy developed in R and 2R are in the ratio
   a) 1: 2
   b) 2 : 1
   c) 1: 4
   d) 4 : 1

Answer: a

3. If a wire of resistance R is melted and recasted to half of its length, then the new resistance of the wire will be
   a) R / 4
   b) R / 2
   c) R
   d) 2R

Answer: a

4. A copper wire of wire of length 1 meter and radius 1mm is joined in series with an iron wire of length two meters and radius 3mm and a current is passed through the wires. The ratio of the current density in the copper and iron wires is
   a) 18 / 1
   b) 9 / 1
   c) 6 / 1
   d) 2 / 3

Answer: b

5. Two uniform wires A and B are of same metal and have equal masses. The radius of wire A is twice that of wire B. The total resistance of A and B when connect in parallel is

a) 4 Ω when the resistance of wire A is 4 . 25 Ω
b) 5 Ω when the resistance of wire A is 4 Ω
c) 4 Ω when the resistance of wire B is 4 . 25 Ω
d) 5 Ω when the resistance of wire B is 4 Ω

Answer: a

6. Ohms law is not applicable for

a) Insulators
b) Semiconductors
c) Arc lamp
d) All of these

Answer: a

7. The temperature – coefficient of resistance of conductors is

a) Positive
b) Negative
c) Neutral
d) First 'A' and 'C'

Answer: a

8. Two resistances R_1 and R_2 when connected across a 120V line consume power at the rate of 25W and 100W respectively when connected in series and parallel across the same 120V line. Then the ratio of power consumed by R_1 will be :

a) 1 : 1
b) 1 : 2
c) 2 : 1
d) 1 : 4

Answer: a

9. An electric bulb is rated 220 volts and 100 watts Power consumed by it when operated on 110 volts is :

a) 50 watts
b) 75 watts
c) 90 watts
d) 25 watts

Answer: d

10. A heater coil is cut into two parts of equal length and only one of them is used in the heater. The ratio of the heat produced by this half –coil to that by the original coil is :

a) 2 : 1
b) 1 : 2
c) 1 : 4
d) 4 : 1

Answer: a

11. Two bulbs of equal wattage, one having carbon filament and the other having a tungsten filament, are connected in parallel to the mains :

a) Both bulbs glow equally
b) Carbon filament bulb glows more
c) Tungsten filament bulb glows more
d) None of these

Answer: b

13. An electron charge (e) is revolving in a circular orbit of radius r round a nucleus of charge Ze with speed υ. The equivalent current is :

a) Zero
b) e υ / 2πr
c) Z e υ / 2πr
d) e .2πr / υ

Answer: b

14. In the figure below, a fuse in one of the bulbs causes all the other to go out. Which bulb has fused ?

a) 1

b) 2

c) 3

d) 4

Answer: a

15. In a circuit containing two unequal resistors connected in parallel:

a) The current is same in both the resistors

b) The current is large in larger the resistance

c) The voltage drop is same across both the resistances

d) The voltage drop is larger across larger the resistances

Answer: c

16. The equivalent resistance in series combination is :

a) Smaller than the largest resistance

b) larger than the largest resistance

c) Smaller than the smallest resistance

d) larger than the largest resistance

Answer: b

17. Two identical cells are first connected in series and then in parallel. The ratio of power consumed by them is :

a) 1 : 1

b) 2 : 1

c) 1 : 4

d) 4 : 1

Answer: a

18. Two electric bulb have tungsten filament of same length. if one of them gives 60 watts and other 100 watts, then :

a) 100 watts bulb has thicker filament

b) 60 watts bulb has thicker filament

c) Both filaments are of same thickness

d) The thickness of filament cannot be compared

Answer: a

19. pick out the wrong statement :

a) In a simple battery circuit, the point of lowest potential is the negative terminal of the battery
b) The resistance of an incandescent lamp is greater when the lamp is switched off
c) An ordinary 100W lamp has less resistance than a 60 W lamp
d) At constant voltage, the heat developed in a uniform wire varies inversely as the length of the wire used.

Answer: b

20. Three equal resistors are connected as shown in the adjoining figure. The maximum power consumed by each resistor is 18 watt. Then maximum power consumed by the combination is :

a) 54
b) 27
c) 36
d) 18

Answer: a

21. Two electric lamps of 40 watt each are connected in parallel. The power consumed by the combination will be:

a) 20 watt
b) 60 watt
c) 80 watt
d) 100 watt

Answer: c

22. A metal wire of specific Resistance 62 x 10^{-6} ohm cm and length 198 cm has a resistance of 7 ohms, the radius of the wire will be:

a) 2.4 cm
b) 0.24 cm
c) 0.024 cm
d) 24 cm

Answer: c

23. The resistance of an incandescent lamp is:

a) Greater when switched off
b) The same whether it is switched off or switched on
c) Greater when switched off
d) Greater when switched on

Answer: d

24. A 200watt and 100watt bulbs, both meant for operation at 220 volt, are connected in series. When connected to a 220 volt supply, the power consumed by them will be :

a) 33 watt
b) 66 watt
c) 100 watt
d) 300 watt

Answer: b

25. The material of the heating element of an electric heater should have

a) High resistivity and high melting point
b) High resistivity and low melting point
c) low resistivity and low melting point
d) low resistivity and high melting point

Answer: a

26. When a wire is stretched and its radius becomes r /2 then its resistance will be:

a) 16 R
b) 4 R
c) 2 R
d) 0

Answer: a

4. ELECTROMAGNETIC INDUCTION

1. A straight conductor of length 4 metres moves at a speed of 10 metre per second when the conductor makes an angle of 30° with the direction of magnetic field of induction 0.1 Weber/ per meter^2. Then the induced EMF is

a) 1 volt
b) 2 volt
c) 4 volt
d) 8 volt

Answer: b

2. When a magnet is moved with it's N- pole towards a closed coil, the nearer end of the coil acts as

a) N – pole
b) S – pole
c) Positive charge
d) Negative Charge

Answer: a

3. A square coil of 0.01 metre square area is placed perpendicular to the uniform magnetic field of intensity 10^3 Weber metres. The magnetic flux linked with the coil is

a) 10 Weber
b) 5 Weber
c) Zero
d) 100 Weber

Answer: a

4. The current passing through a choke coil of 5 Henry is decreasing at the rate of 2 amp/sec. The e.m.f developed across the coil is:

a) 10 volts
b) -10 volts
c) 2.5 volts

d) -2.5 volts

Answer: a

5. If 2.2 kilowatt power is transmitted through a 10 ohm line at 22000 volt, the power loss in the form of heat will be:

a) 0.1 watt

b) 1 watt

c) 10 watt

d) 100 watt

Answer: a

6. Quantity that remains unchanged in a transformer is:

a) Voltage

b) Current

c) Frequency

d) None of these

Answer: c

7. The laws of electromagnetic induction have been used in the construction of a:

a) Galvanometer

b) Voltmeter

c) Electric motor

d) Generator

Answer: d

8. A coil having 50 turns has a self-inductance of 10 mH. On increasing the number of turns to 150, the self-inductance is:

a) 30 mH

b) 3.33 mH

c) 90 mH

d) 60 mH

Answer: c

9. Lenz's law is a consequence of the law of conservation of:

a) Charge

b) Mass

c) Momentum

d) Energy

Answer: d

10. The back emf in a DC motor is maximum when:

a) The Motor has picked up maximum speed

b) The motor has just started moving

c) The speed of motor is still on the increase

d) The motor has just been switched off

Answer: a

11. The core used in transformers and other electromagnetic devices is laminated to:

a) Increase the magnetic field

b) Increase the level of the magnetic saturation of the core

c) Reduce the residual magnetism in the core

d) Reduce eddy current losses in the core

Answer: d

12. The number of turns in the primary coil of a transformer is 200 and the number of turns in the secondary coil is 10. If 240 volts a.c. are applied to the primary the output from the secondary will be:

a) 48 V

b) 24 V

c) 12 V

d) 6 V

Answer: c

13. The armature current in a DC motor is maximum when the motor has:

a) Picked up maximum speed

b) Just started

c) Intermediate speed

d) Just been switched off

Answer: b

14. Faraday's laws are consequence of the conservation of

a) Charge

b) Energy

c) Magnetic field

d) Both 'b' and 'c'

Answer: b

15. The current of LR circuit is reduced to half ? What will be energy in it:

a) Four times

b) Two times

c) 1/2

d) One-fourth

Answer: d

16. A coil of metal wire is kept stationary in a non-uniform magnetic field:

a) An e.m.f. is induced in the coil

b) A current is induced in the coil

c) Neither e.m.f. nor current is induced

d) Both 'a' and 'b'

Answer: c

17. A small transformer does not:

a) consist of primary winding

b) consist of secondary winding

c) consist of laminated core

d) Has it's winding and core submerged in oil

Answer: d

18. An inductor may store energy in:

a) It's electric field

b) It's coils

c) It's magnetic field

d) Both in electric on magnetic field

Answer: c

19. A transformer has 100 windings in the primary and 200 windings in the secondary. The primary is connected to a.c. supply of 120 Volts at 10 amp. Check the correct situation for this transformer out of the following:

a) The secondary voltage is 240 volts and current is 10 ampere

b) The secondary voltage is 240 volts and current is 5 amp

c) The secondary voltage is 60 volts and current is 10 amp

d) The secondary voltage is 240 volts and current is 20 amp

Answer: b

20. Electric energy can be achieved by

a) Only chemical reactions
b) Only magnetic flux changes
c) Only by thermal energy
d) By all the above three

Answer: d

21. The self inductance of a coil is measure of

a) Electrical inertia
b) Electric friction
c) Induced emf
d) Induced current

Answer: a

22. Henry is the unit for

a) Resistance
b) Magnetic flux
c) Magnetic field
d) Inductance

Answer: d

23. Eddy currents do not cause

a) Damping
b) Heating
c) Sparking
d) Loss of energy

Answer: c

24. Lenz 's law gives

a) Direction of magnetic field
b) Direction of motion of conductor
c) Direction of induced current
d) Direction of current in any electrical circuit

Answer: c

25. Mutual inductance of two coils can be increased by

a) Decreasing the number of turns in the coils
b) Increase the number of turns in the coils

c) Winding the coils on wooden core

d) None of these

Answer: b

26. A step down transformer is used to reduce the voltage from 110V to 11 V. The current in primary and secondary is 2 A and 18 A respectively. The efficiency of the transformer is

a) 100 %

b) 90%

c) 80%

d) 60%

Answer: b

27. In a step up transformer, 220 V is converted into 220V. The number of turns in primary coil is 600. What is the number of turns in the secondary coil?

a) 60

b) 600

c) 6000

d) 100

Answer: c

28. A rectangular coil of 20 turns and area of cross section 25 sq.cm has a resistance of 100 ohm. If a magnetic field which is perpendicular to the plane of coil changes at a rate of 1000 tesla per second, the current in the coil is

a) 1 A

b) 50 A

c) 0.5 A

d) 5 A

Answer: c

29. Large Transformers, when used for some time, become hot and are cold by circulating oil. the heating of transformer is due to

a) heating effect of current alone

b) hysteresis loss alone

c) both the hysteresis loss and heating effect of current

d) none of these

Answer: c

30. A transformer is an appliance for converting

a) Small current at low voltage to high current at high voltage

b) large current at low voltage to low current at high voltage

c) small current at high voltage to small current at low voltage

d) large current at high voltage to low current at low voltage

Answer: b

31. Electro motive force is most closely related to

a) Electric field

b) Potential difference

c) Mechanical force

d) Magnetic field

Answer: b

32. A transformer works with

a) Any signal

b) Alternating current

c) Direct current

d) Both AC and DC

Answer: b

33. Faraday's law of electromagnetic induction is related to the

a) none

b) Law of conservation of energy

c) Law of conservation of charge

d) Third law of motion

Answer: b

34. An example for diamagnetic substance is

a) Nickel

b) Copper

c) Aluminium

d) Iron

Answer: b

35. The force that appears at a result of the interaction between two moving charges is called

a) Magnetic Force

b) Induced Force

c) Gravitational Force

d) Electrostatic Force

Answer: a

36. The magnetic field lasts only as long as ____ flowing through the conductor

a) Current

b) Voltage

c) emf

d) None

Answer: a

37. The direction of magnetic field due to current carrying conductor can be determined by

a) left Hand Rule

b) Fleming's Right Hand Rule

c) Palm Right Hand Rule

d) Right Hand Rule

Answer: d

38. The SI unit of magnetic field strength

a) Ampere

b) Weber

c) Tesla

d) Henry

Answer: c

39. The direction of induced current is always so as to oppose the change which causes the current is called:

a) Faraday's law

b) Ohm's law

c) Kirchhoff's 1st rule

d) Lenz's law

Answer: d

40. The SI units of induced emf is

a) Tesla

b) Henry

c) Volt

d) Ohm

Answer: c

41. The mean value of A.C. over a complete cycle in

a) Zero

b) Minimum

c) Maximum

d) None

Answer: a

42. At high frequency, the current through a capacitor of AC circuit will be:

a) infinity

b) Large

c) Small

d) Zero

Answer: b

43. The highest value reached by the voltage or current in one cycle is called

a) Peak to peak value

b) Root mean square value

c) Instantaneous value

d) Peak value

Answer: a

44. Power dissipation in pure inductive or in a pure capacitive circuit is:

a) infinity

b) Minimum

c) Maximum

d) Zero

Answer: d

45. The r.m.s. value of A.C current in

a) 0.707 Io

b) 0.707 Vo

c) 0.707 Ro

d) None

Answer: a

46. A device that allows permits flow of DC through the circuit easily, is called:

a) AC generator

b) Inductor

c) Capacitor

d) Transformer

Answer: b

47. The unit used for capacitive reactance is

a) Ampere

b) Joule

c) ohm

d) Volt

Answer: c

48. In case of capacitor, the voltage lag behind the current by

a) 60

b) 30

c) 180

d) 90

Answer: d

49. If the frequency of A.C. is doubled, the reactance of inductor will be

a) Same

b) Triple

c) half

d) Double

Answer: d

50. At resonance frequency the power factor is

a) Three

b) One

c) Zero

d) Two

Answer: b

51. The condition of resonance reached when

a) XC > XL

b) XL < XC

c) none

d) XL = XC

Answer: d

52. In RLC series AC circuit, when XL = XC then impedance is

a) Z=XL

b) Z=XC

c) Z=infinity

d) Z=R

Answer: d

53. The combine opposition of resistor, capacitor and inductor is called

a) Resistor

b) Reactance

c) None

d) Impedance

Answer: d

54. The Phenomenon by which an induced emf is produced in the conductor due to change of magnetic flux in it is called:

a) Electromagnetic induction

b) Electro magnetism

c) Electric polarization

d) All of above

Answer: a

55. The unit of induced emf is:

a) Henary

b) Ampere

c) Joule/coulomb

d) V/m

Answer: c

56. The rate of change of magnetic flux is directly proportional to the induced emf is called:

a) Faraday's law

b) Lenz law

c) Oersted law

d) None of them

Answer: a

57. Energy stored per unit volume inside a long solenoid is known as:

a) Surface charge density

b) Energy density

c) Energy

d) Power density

Answer: b

58. The SI unit of mutual inductance is:

a) Coulomb

b) Ampere

c) Henry

d) Farad

Answer: c

59. Which of the following is scalar:

a) Magnetic field

b) Pointing vector

c) Flux density

d) Electric fields

Answer: c

60. A 50 mH coil carries a current of 2A. The energy stored in its magnetic field is:

a) E = 50 J

b) E = 0.1 J

c) E = 005 J

d) E = 10J

Answer: b

61. A.C is converted into D.C by:

a) Transformer

b) Rectifier

c) Dynamo

d) Motor

Answer: b

62. The direction of the induced emf during electromagnetic induction can be determined by the use of:

a) Amperes law

b) Coulomb's law

c) Faraday's law

d) Lenz's law

Answer: d

63. The basic circuit element in a D.C circuit is:

a) An inductor

b) A capacitor

c) None of these

d) A resistor

Answer: b

64. In a resistive A.C circuit, instantaneous values of voltage and current are:

a) Lead each other

b) Out of phase

c) None of these

d) In phase

Answer: d

65. When voltage V and current I are in phase the power is expressed as:

a) P = VR

b) P = VI cos θ

c) P = I2R

d) P = VI sin θ

Answer: c

66. With high frequencies, capacitive reactance:

a) Increases

b) None

c) Decreases

d) Remain unchanged

Answer: c

67. **For parallel resonant circuit, the resonance current is:**

a) maximum

b) zero

c) infinity

d) Minimum

Answer: d

68. The impedance of pure anti-resonant which at resonance is:

a) infinity

b) 1

c) 0

d) 50 ohm

Answer: a

69. The peak value of alternating voltage is 423 volts, its rms value is:

a) 300 volts

b) 150 volts

c) 423 volts

d) 211.5 volts

Answer: a

70. A capacitor of capacitance 30 mF is charged by a constant current of 10 mA. If initially capacitor is uncharged, what is time taken for potential difference across capacitor to reach 300 V?

a) 180sec

b) 0.9 sec

c) 15sec

d) 30min

Answer: b

71. Who proved that light waves are electromagnetic?

a) Enderson

b) Faraday

c) Maxwell

d) Einstein

Answer: c

72. The waveform of alternating voltage is a:

a) Rectangular

b) None of these

c) Sinusoidal

d) Square

Answer: c

73. Alternating current can be produced by:

a) Electric motor

b) Generator

c) Turbine

d) Transformer

Answer: b

74. Power factor is defined by:

a) sin q

b) sec q

c) tan q

d) cos q

Answer: d

75. The reciprocal of impedance is called:

a) Capacitance

b) Resistance

c) Admittance

d) Inductance

Answer: b

76. A 100 mF capacitor will offer a reactance of:

a) 90 W

b) 32 W

c) 60 W

d) 42 W

Answer: b

77. The electromagnetic spectrum contains:

a) Radio waves

b) Microwaves

c) X-rays

d) All of these

Answer: d

78. For q – t graph, slope shows:

a) none

b) current

c) voltage

d) Emf

Answer: b

5. ELECTROMETERS

1. What is an electrometer used for?

a) Measuring electric current
b) Measuring voltage
c) Measuring resistance
d) Measuring charge

Answer: d. Measuring charge

2. Who is credited with the invention of the first electrometer?

a) Alessandro Volta
b) André-Marie Ampère
c) William Gilbert
d) Lord Kelvin

Answer: a. Alessandro Volta

3. Which type of electrometer is based on the attraction or repulsion of charged objects?

a) Gold-leaf electrometer
b) Peltier electrometer
c) Quadrant electrometer
d) Torsion balance electrometer

Answer: a. Gold-leaf electrometer

4. In a quadrant electrometer, how many quadrants are typically used?

a) One
b) Two
c) Three
d) Four

Answer: b. Two

5. What is the principle behind a Peltier electrometer?

a) Piezoelectric effect
b) Seebeck effect
c) Photoelectric effect
d) Hall effect

Answer: b. Seebeck effect

6. Which electrometer is suitable for measuring very small electric charges?

a) Gold-leaf electrometer
b) Torsion balance electrometer
c) Peltier electrometer
d) Quadrant electrometer

Answer: b. Torsion balance electrometer

7. What is the unit of charge in the International System of Units (SI)?

a) Ampere
b) Coulomb
c) Ohm
d) Volt

Answer: b. Coulomb

8. The sensitivity of an electrometer is often expressed in which unit?

a) Volts
b) Coulombs
c) Radians
d) Degrees

Answer: a. Volts

9. Which material is commonly used in the construction of the torsion strip in a gold-leaf electrometer?

a) Aluminum
b) Copper
c) Gold
d) Silver

Answer: c. Gold

10. What is the purpose of the guard ring in some electrometers?

a) To protect the electrometer from electrical interference
b) To increase the sensitivity of the electrometer
c) To shield the electrometer from magnetic fields
d) To provide mechanical stability to the electrometer

Answer: a. To protect the electrometer from electrical interference

11. Which of the following electrometers is based on the thermal effect of a current?

a) Quadrant electrometer
b) Peltier electrometer
c) Torsion balance electrometer
d) Gold-leaf electrometer

Answer: b. Peltier electrometer

12. The quadrant electrometer is primarily used for measuring:

a) Voltage
b) Current
c) Charge
d) Resistance

Answer: c. Charge

13. What is the function of the damping system in an electrometer?

a) To reduce the effects of temperature variations
b) To minimize the impact of air resistance
c) To prevent oscillations and provide quick readings
d) To shield the instrument from electromagnetic interference

Answer: c. To prevent oscillations and provide quick readings

14. The electroscope is a simple form of which type of electrometer?

a) Gold-leaf electrometer
b) Quadrant electrometer

c) Peltier electrometer
d) Torsion balance electrometer

Answer: a. Gold-leaf electrometer

15. In a gold-leaf electrometer, what happens when a charged object is brought near the gold leaf?

a) The gold leaf attracts the charged object
b) The gold leaf repels the charged object
c) The gold leaf remains unaffected
d) The gold leaf oscillates

Answer: b. The gold leaf repels the charged object

16. Which principle is fundamental to the operation of a quadrant electrometer?

a) Magnetic induction
b) Coulomb's law
c) Conservation of energy
d) Newton's third law

Answer: b. Coulomb's law

17. The sensitivity of an electrometer is inversely proportional to:

a) The charge
b) The voltage
c) The capacitance
d) The resistance

Answer: c. The capacitance

18. What is the primary advantage of a torsion balance electrometer over other types?

a) High sensitivity
b) Simple construction
c) Low cost
d) Large measurement range

Answer: a. High sensitivity

19. Which electrometer type is suitable for measuring both positive and negative charges?

a) Gold-leaf electrometer
b) Quadrant electrometer
c) Peltier electrometer
d) Torsion balance electrometer

Answer: b. Quadrant electrometer

20. What property of a gold-leaf electrometer allows it to measure small electric charges?

a) High inertia
b) Low capacitance
c) High resistance
d) Low sensitivity

Answer: b. Low capacitance

21. The sensitivity of a gold-leaf electrometer can be increased by:

a) Increasing the length of the gold leaf
b) Decreasing the width of the gold leaf
c) Decreasing the distance between the leaves
d) Increasing the thickness of the gold leaf

Answer: c. Decreasing the distance between the leaves

22. Which of the following materials is commonly used for the needle in a quadrant electrometer?

a) Copper
b) Aluminum
c) Steel
d) Gold

Answer: c. Steel

23. The Coulomb's law states that the force between two charges is:

a) Directly proportional to the product of the charges and inversely proportional to the square of the distance between them
b) Inversely proportional to the product of the charges and directly proportional to the square of the distance between them
c) Inversely proportional to the product of the charges and inversely proportional to the distance between them
d) Directly proportional to the product of the charges and directly proportional to the distance between them

Answer: a. Directly proportional to the product of the charges and inversely proportional to the square of the distance between them

24. What is the role of a Faraday cup in electrometry?

a) To measure electric potential
b) To measure electric current
c) To collect and measure charged particles
d) To measure electric resistance

Answer: c. To collect and measure charged particles

25. The quadrant electrometer is based on the principle of:

a) Magnetic induction
b) Coulomb's law
c) Ohm's law
d) Newton's second law

Answer: b. Coulomb's law

26. What is the primary advantage of a Peltier electrometer in comparison to other types?

a) High sensitivity
b) Low cost
c) No need for external power
d) High temperature stability

Answer: d. High temperature stability

27. What is the purpose of the guard ring in a Peltier electrometer?

a) To protect the instrument from mechanical shock
b) To shield the instrument from electric fields
c) To enhance the sensitivity of the instrument
d) To maintain a constant temperature

Answer: b. To shield the instrument from electric fields

28. What is the SI unit of electric potential difference?

a) Ampere
b) Volt
c) Coulomb
d) Ohm

Answer: b. Volt

29. In a gold-leaf electrometer, the deflection of the gold leaves is directly proportional to:

a) The charge on the leaves
b) The potential difference between the leaves
c) The square of the potential difference between the leaves
d) The square root of the charge on the leaves

Answer: b. The potential difference between the leaves

30. Which type of electrometer uses a balanced force system for measurement?

a) Quadrant electrometer
b) Gold-leaf electrometer
c) Torsion balance electrometer
d) Peltier electrometer

Answer: c. Torsion balance electrometer

31. The operation of a quadrant electrometer is based on:

a) Electrostatic repulsion and attraction
b) Magnetic induction
c) Magnetic repulsion and attraction

d) Electrostatic induction

Answer: a. Electrostatic repulsion and attraction

32. Which electrometer type is suitable for measuring the charge on individual particles in a beam?

a) Gold-leaf electrometer
b) Quadrant electrometer
c) Peltier electrometer
d) Faraday cup electrometer

Answer: d. Faraday cup electrometer

33. What is the primary limitation of a gold-leaf electrometer?

a) Limited sensitivity
b) Susceptibility to temperature changes
c) Limited range of measurement
d) Sensitivity to mechanical vibrations

Answer: c. Limited range of measurement

34. What is the primary function of the damping mechanism in a Peltier electrometer?

a) To minimize air resistance
b) To reduce temperature fluctuations
c) To prevent oscillations and provide quick readings
d) To shield the instrument from electromagnetic interference

Answer: b. To reduce temperature fluctuations

35. The sensitivity of an electrometer is influenced by:

a) The length of the needle
b) The width of the needle
c) The distance between the leaves
d) All of the above

Answer: d. All of the above

36. The operation of a Peltier electrometer is based on:

a) Electrostatic induction
b) Piezoelectric effect
c) Seebeck effect
d) Magnetic induction

Answer: c. Seebeck effect

37. Which type of electrometer is most suitable for measuring extremely low currents?

a) Gold-leaf electrometer
b) Torsion balance electrometer
c) Faraday cup electrometer
d) Quadrant electrometer

Answer: c. Faraday cup electrometer

38. What is the purpose of the guard ring in a gold-leaf electrometer?

a) To protect the instrument from electrical interference
b) To enhance the sensitivity of the instrument
c) To shield the instrument from magnetic fields
d) To provide mechanical stability to the instrument

Answer: c. To shield the instrument from magnetic fields

39. The sensitivity of an electrometer is defined as:

a) The ability to measure high currents
b) The ability to measure low currents
c) The ability to measure high voltages
d) The ability to measure low voltages

Answer: b. The ability to measure low currents

40. The Coulomb's law equation is given by:

a) F = q/d
b) F = k(q1*q2)/d^2

c) V = IR

d) P = VI

Answer: b. F = k(q1*q2)/d^2

41. In a Peltier electrometer, what happens when there is a temperature difference across the thermocouple junction?

a) An electric potential is generated

b) An electric current flows

c) The thermocouple contracts

d) The thermocouple expands

Answer: a. An electric potential is generated

42. What is the primary disadvantage of a quadrant electrometer?

a) Limited sensitivity

b) Susceptibility to temperature changes

c) Limited range of measurement

d) Sensitivity to mechanical vibrations

Answer: a. Limited sensitivity

43. The force between two charges is maximum when:

a) The charges are of opposite sign

b) The charges are of the same sign

c) The distance between the charges is maximum

d) The distance between the charges is minimum

Answer: a. The charges are of opposite sign

44. What is the primary advantage of a Faraday cup electrometer?

a) High sensitivity

b) Simple construction

c) No need for external power

d) Large measurement range

Answer: d. Large measurement range

45. In a quadrant electrometer, what is the role of the graduated scale?

a) To measure the potential difference
b) To measure the charge
c) To measure the distance between the leaves
d) To measure the angle of deflection

Answer: d. To measure the angle of deflection

46. The torque in a torsion balance electrometer is proportional to:

a) The charge on the leaves
b) The potential difference between the leaves
c) The square of the potential difference between the leaves
d) The square root of the charge on the leaves

Answer: b. The potential difference between the leaves

47. Which type of electrometer is commonly used in nuclear physics experiments?

a) Gold-leaf electrometer
b) Torsion balance electrometer
c) Peltier electrometer
d) Faraday cup electrometer

Answer: d. Faraday cup electrometer

48. The damping in a gold-leaf electrometer is usually achieved by:

a) Air damping
b) Viscous damping
c) Magnetic damping
d) Thermal damping

Answer: c. Magnetic damping

6. MAGNETIC PROPERTIES OF MATERIALS

1. What is the basic unit of magnetic dipole moment?

a) Tesla
b) Ampere
c) Ampere-meter
d) Weber

Answer: c. Ampere-meter

2. Which of the following materials is typically ferromagnetic?

a) Aluminum
b) Copper
c) Iron
d) Silver

Answer: c. Iron

3. What is the SI unit of magnetic flux density?

a) Weber
b) Tesla
c) Gauss
d) Ampere-turn

Answer: b. Tesla

4. The phenomenon of a material retaining its magnetization after the removal of an applied magnetic field is known as:

a) Diamagnetism
b) Paramagnetism
c) Ferromagnetism
d) Antiferromagnetism

Answer: c. Ferromagnetism

5. Which of the following is an example of a diamagnetic material?

a) Iron
b) Copper
c) Bismuth
d) Nickel

Answer: c. Bismuth

6. The Curie temperature is the temperature at which:

a) A material becomes superconducting
b) A material loses its ferromagnetic properties
c) A material becomes paramagnetic
d) A material becomes diamagnetic

Answer: b. A material loses its ferromagnetic properties

7. What is the magnetic susceptibility of a paramagnetic material at its Curie temperature?

a) 0
b) 1
c) Infinite
d) Negative infinity

Answer: a. 0

8. Which of the following materials has a negative magnetic susceptibility?

a) Paramagnetic material
b) Diamagnetic material
c) Ferromagnetic material
d) Antiferromagnetic material

Answer: b. Diamagnetic material

9. What is the magnetic moment of a nonmagnetic material?

a) Zero
b) Positive
c) Negative

d) Infinite

Answer: a. Zero

10. The hysteresis loop of a ferromagnetic material is useful in understanding its:

a) Magnetic permeability
b) Magnetic susceptibility
c) Magnetic anisotropy
d) Magnetic memory

Answer: c. Magnetic anisotropy

11. What is the unit of magnetic field strength (H)?

a) Tesla
b) Ampere/meter
c) Weber
d) Gauss

Answer: b. Ampere/meter

12. The magnetic field inside a superconductor is:

a) Zero
b) Infinite
c) Constant
d) Varies

Answer: a. Zero

13. Which of the following is an antiferromagnetic material?

a) Iron
b) Cobalt
c) Nickel
d) Manganese oxide (MnO)

Answer: d. Manganese oxide (MnO)

14. What is the magnetic permeability of free space?

a) 1

b) $4\pi \times 10^{(-7)}$ T·m/A

c) 0

d) ∞

Answer: b. $4\pi \times 10^{(-7)}$ T·m/A

15. The magnetic field lines around a current-carrying wire form:

a) Circles

b) Parabolas

c) Ellipses

d) Straight lines

Answer: a. Circles

16. What happens to the magnetic susceptibility of a paramagnetic material as the temperature decreases?

a) Increases

b) Decreases

c) Remains constant

d) Becomes zero

Answer: a. Increases

17. Which of the following is not a magnetic material?

a) Cobalt

b) Silicon

c) Nickel

d) Gadolinium

Answer: b. Silicon

18. In a ferromagnetic material, the alignment of magnetic moments results in:

a) Low magnetization

b) High magnetization

c) No magnetization

d) Random magnetization

Answer: b. High magnetization

19. What is the relationship between magnetic field strength (H) and magnetic flux density (B) in a vacuum?

a) $H = B$
b) $H = B/\mu_0$
c) $B = \mu_0 H$
d) $B = H/\mu_0$

Answer: c. $B = \mu_0 H$

20. Which law states that the magnetization of a material is directly proportional to the applied magnetic field?

a) Ampere's Law
b) Faraday's Law
c) Hooke's Law
d) Curie's Law

Answer: d. Curie's Law

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c) Ampere-meter
d) Weber

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33. Which of the following is an antiferromagnetic material?

a) Iron
b) Cobalt
c) Nickel
d) Manganese oxide (MnO)

Answer: d. Manganese oxide (MnO)

34. What is the magnetic permeability of free space?

a) 1
b) $4\pi \times 10^{(-7)}$ T·m/A
c) 0
d) ∞

Answer: b. $4\pi \times 10^{(-7)}$ T·m/A

35. The magnetic field lines around a current-carrying wire form:

a. Circles
b. Parabolas
c. Ellipses
d. Straight lines

Answer: a. Circles

36. What happens to the magnetic susceptibility of a paramagnetic material as the temperature decreases?

a) Increases
b) Decreases
c) Remains constant
d) Becomes zero

Answer: a. Increases

37. Which of the following is not a magnetic material?

a) Cobalt
b) Silicon
c) Nickel
d) Gadolinium

Answer: b. Silicon

38. In a ferromagnetic material, the alignment of magnetic moments results in:

a) Low magnetization
b) High magnetization
c) No magnetization
d) Random magnetization

Answer: b. High magnetization

39. What is the relationship between magnetic field strength (H) and magnetic flux density (B) in a vacuum?

a) $H = B$
b) $H = B/\mu_0$
c) $B = \mu_0 H$
d) $B = H/\mu_0$

Answer: c. $B = \mu_0 H$

40. Which law states that the magnetization of a material is directly proportional to the applied magnetic field?

a) Ampere's Law
b) Faraday's Law
c) Hooke's Law
d) Curie's Law

Answer: d. Curie's Law

41. What type of magnetic material is attracted to a magnet and can be magnetized?

a) Diamagnetic
b) Paramagnetic
c) Ferromagnetic
d) Antiferromagnetic

Answer: c. Ferromagnetic

42. Which type of magnetic material has a magnetic moment that aligns in the direction of an applied magnetic field and retains some magnetization after the field is removed?

a) Diamagnetic
b) Paramagnetic
c) Ferromagnetic
d) Antiferromagnetic

Answer: c. Ferromagnetic

43. What is the primary characteristic of a diamagnetic material?

a) Attracted to a magnet
b) Repelled by a magnet
c) Strongly magnetized
d) Retains magnetization

Answer: b. Repelled by a magnet

44. Which of the following materials has all its magnetic moments aligned parallel to each other, resulting in a strong magnetic behavior?

a) Copper
b) Aluminum
c) Iron

d) Silver

Answer: c. Iron

45. In which type of magnetic material do adjacent magnetic moments align antiparallel to each other, leading to a cancellation effect?

a) Diamagnetic
b) Paramagnetic
c) Ferromagnetic
d) Antiferromagnetic

Answer: d. Antiferromagnetic

46. What is the magnetic behavior of a paramagnetic material at absolute zero temperature?

a) No magnetization
b) Maximum magnetization
c) Random magnetization
d) Infinite magnetization

Answer: a. No magnetization

47. Which type of magnetic material is characterized by having a Curie temperature above which it loses its ferromagnetic properties?

a) Diamagnetic
b) Paramagnetic
c) Ferromagnetic
d) Antiferromagnetic

Answer: c. Ferromagnetic

48. What is the primary characteristic of a paramagnetic material?

a) Attracted to a magnet
b) Repelled by a magnet
c) Strongly magnetized
d) Retains magnetization

Answer: a. Attracted to a magnet

49. Which type of magnetic material is characterized by having a negative magnetic susceptibility?

a) Diamagnetic
b) Paramagnetic
c) Ferromagnetic
d) Antiferromagnetic

Answer: a. Diamagnetic

50. The magnetic susceptibility of a ferromagnetic material is _____ its Curie temperature.

a) Maximum at
b) Minimum at
c) Unaffected by
d) Equal to

Answer: b. Minimum at

51. Which of the following materials is a typical example of a paramagnetic substance?

a) Copper
b) Aluminum
c) Nickel
d) Bismuth

Answer: c. Nickel

52. What is the primary characteristic of an antiferromagnetic material?

a) Attracted to a magnet
b) Repelled by a magnet
c) Strongly magnetized
d) Retains magnetization

Answer: b. Repelled by a magnet

13. What happens to the magnetic susceptibility of a paramagnetic material as the temperature increases?

a) Increases
b) Decreases
c) Remains constant
d) Becomes zero

Answer: b. Decreases

54. Which of the following materials is typically an antiferromagnetic substance?

a) Iron
b) Cobalt
c) Nickel
d) Manganese oxide (MnO)

Answer: d. Manganese oxide (MnO)

55. The Curie temperature is a critical temperature for which type of magnetic material?

a) Diamagnetic
b) Paramagnetic
c) Ferromagnetic
d) Antiferromagnetic

Answer: c. Ferromagnetic

56. Which law describes the magnetic susceptibility of a paramagnetic material as inversely proportional to the absolute temperature?

a) Ampere's Law
b) Faraday's Law
c) Hooke's Law
d) Curie's Law

Answer: d. Curie's Law

57. What is the primary characteristic of an antiferromagnetic material at absolute zero temperature?

a) No magnetization

b) Maximum magnetization
c) Random magnetization
d) Infinite magnetization

Answer: a. No magnetization

58. Which of the following is not a magnetic material?

a) Cobalt
b) Silicon
c) Nickel
d) Gadolinium

Answer: b. Silicon

59. In which type of magnetic material do adjacent magnetic moments align parallel to each other, reinforcing the overall magnetization?

a) Diamagnetic
b) Paramagnetic
c) Ferromagnetic
d) Antiferromagnetic

Answer: c. Ferromagnetic

60. The magnetic behavior of a superconductor is best described as:

a) Diamagnetic
b) Paramagnetic
c) Ferromagnetic
d) Antiferromagnetic

Answer: a. Diamagnetic

7. METERS

1. To measure the resistance of a device using ohm's law, which of the following mode of connection is used?

a) ammeter in series, voltmeter in parallel
b) Voltmeter in series, ammeter in parallel
c) both ammeter and voltmeter in series
d) both ammeter and voltmeter in parallel

Answer: a

2. which of the following is true?

a) Ammeter has low resistance and is connected in series in the circuit
b) Ammeter has low resistance and is connected in parallel in the circuit
c) voltmeter has low resistance and is connected in parallel in the circuit
d) none of these

Answer : a

3. The tangent galvanometer, when connected in series with a standard resistance can be used as

a) An ammeter
b) A voltameter
c) A wattmeter
d) both as ammeter and a voltmeter

Answer : d

4. The sensitivity of a tangent galvanometer will increase if

a) number of turns in the coil is decreased
b) number of turns in the coil is increased
c) radius of the coil is increased
d) it is independent of the radius of the coil

Answer : b

5. To increase the range of a voltmeter we need to connect a suitable

a) High resistance in series
b) high resistance in parallel
c) low resistance in series
d) low resistance in parallel

Answer: a

6. An ammeter can be converted into voltmeter by connecting

a) A low resistance in series
b) A low resistance in parallel
c) A high resistance in Series
d) A high resistance in parallel

Answer: c

7. The net resistance of the voltmeter should be large to ensure that

a) It does not get overheated
b) it does not draw excessive current
c) it can measure large potential difference
d) it does not appreciably change the potential difference to be measured

Answer: d

8. If an ammeter is connected parallel to a circuit, it is likely to be damaged due to excess

a) current
b) Voltage
c) resistance
d) none of these

Answer: a

9. an ammeter can be converted into voltmeter by connecting

a) A low resistance in Series
b) A high resistance in series
c) A low resistance in parallel
d) A high resistance in parallel

Answer : b

10. The pole pieces used in moving coil galvanometer should produce a magnetic field
a) equal to earth's magnetic field
b) much stronger than earth's magnetic field
c) much weaker than earth's magnetic field
d) any arbitrary magnetic field

Answer : b

11. ohmmeter is a device for directly measuring the resistance of a conductor. it is a modification of
a) moving coil galvanometer
b) a voltmeter
c) A Rheostat
d) All are true

Answer: c

12. Potentiometer is an ideal instrument to measure potential difference because
a) At null point no current flows in the potentiometer wire
b) at null point no current flows in the main circuit
c) at null point no current flows in the secondary circuit
d) none of these

Answer: c

13. The sensitivity of a moving coil galvanometer depends on
a) the angle of deflection
b) earth's magnetic field
c) Torsional constant of the spring
d) the moment of inertia of the coil

Answer : c

14. The sensitivity of a moving coil galvanometer increases with the decrease in
a) number of turns
b) area of coil
c) magnetic field

d) none of these

Answer: d

15. The pointer of a dead- beat galvanometer gives a steady deflection because

a) Eddy currents or produced in the conducting frame over which the coil is wound

b) its magnet is very strong

c) it's pointer is very light

d) its frame is made of ebonite

Answer: a

16. To make the field radial in a moving coil galvanometer

a) the number of turns in the coil is increased

b) magnet is taken in the form of horseshoe

c) poles or cylindrically cut

d) coil is wound on aluminium frame

Answer: c

17. watt- hour meter measures

a) electric energy

b) Current

c) voltage

d) Power

Answer: a

18. which of the following devices will have the least resistance?

a) Ammeter of range 1A

b) ammeter of range 10 A

c) Voltmeter of range 10 V

d) Voltmeter of range 1 V

Answer: b

19. A voltmeter always gives lower value of potential difference because

a) some energy is lost in moving the needle

b) it takes some current for its own deflection

c) it observes some energy

d) both A and B are true

Answer: b

20. In a ballistic galvanometer the deflection is proportional to

a) Charge

b) current

c) potential difference

d) none of these

Answer: a

21. The resistance of an ideal voltmeter is

a) low

b) High

c) infinite

d) Zero

Answer : c

22. A galvanometer can be measured used as a voltameter

a) by connecting a high resistance in series

b) by connecting a low resistance in series

c) by connecting a high resistance in parallel

d) by connecting a low resistance in parallel

Answer : a

23. a galvanometer can be converted to an ammeter by

a) connecting a high resistance in series with it

b) connecting a low resistance in series with it

c) connecting a low resistance in parallel with it

d) connecting a high resistance in parallel with it

Answer: c

24. when an ammeter is connected in parallel, the resistance of the circuit is

a) increased

b) decreased

c) Un changed

d) none

Answer: b

25. tangent galvanometer is used to measure

a) steady current

b) current impulses

c) magnetic moment of bar magnets

d) earth's magnetic field

Answer: a

26. Unit of reduction factor is

a) Ampere

b) Ohms

c) Tesla

d) Weber

Answer: a

27. If two meters X and Y requires 40mA and 50mA respectively, to give full scale deflection, then:

a) X is more sensitive

b) Y is more sensitive

c) Both X and Y are equally sensitive

d) It would not be possible to access the sensitivity on the basis of the given data

Answer: a

28. The reliability of the instrument refer to:

a) Measurement of changes due to temperature variations

b) Degree to which repeatability continues to remain within specified limits

c) The life of the instrument

d) The extent to which the characteristics remain linear

Answer : b

29. The damping torque must operate only when the moving system of the indicating instrument is:

a) Actually moving

b) Stationary

c) Just starting to move

d) Near its full deflection

Answer : a

30. If a voltmeter is connected, like an ammeter in series to the load:

a) The measurement reading will be too high

b) Almost no current will flow in the circuit

c) The meter will burn

d) An instantaneously high current will flow

Answer : b

31. Preferred material for permanent magnet is:

a) Stainless steel

b) Alnico

c) Tungsten steel

d) Soft iron

Answer: b

32. Air friction damping is used in the instruments which is:

a) Moving iron

b) Moving coil

c) Induction

d) Hot wire

Answer: a

33. PMMC instrument gives uniform scale because:

a) It uses spring control

b) It uses eddy current damping

c) The deflection torque is proportional to the instrument current

d) Both (a) and ©

Answer: d

34. An instrument that is capable of measuring only dc is:

a) Moving coil

b) Moving iron

c) Thermo couple

d) None of the above

Answer : a

35. Maxwell-Wien bridge is used to measure:

a) Inductance

b) Capacitance

c) Dielectric loss

d) Frequency

Answer : a

36. A ballistic galvanometer is used to measure:

a) Charge

b) Current

c) Voltage

d) Frequency

Answer : a

37. ____ factor is the ratio of total flux to the useful flux in a magnetic circuit:

a) Form factor

b) Leakage

c) Utility

d) Dispersion

Answer : b

38. For eliminating the effect of earth capacitance from the bridge network we use:

a) Wagner's earthing device

b) High voltage at low frequency

c)) Low voltage at high frequency

d)) Campbell-maxwell device

Answer : a

39. The most commonly used null deflector in a power frequency ac bridge is a:

a) Vibration galvanometer

b) D'Arsanval galvanometer

c) Ballistic galvanometer

d) Tachometer

Answer : a

40. For measuring emf of a standard cell we use:

a) Galvanometer

b) Potentiometer

c) Zener reference

d) Electro-dynamic voltmeter

Answer : b

41. .Loss of charge method is used to measure:

a) Low R

b) High R

c) Low L

d) High L

Answer : b

42. Megger is an instrument used for the measurement of:

a) High resistance and insulation resistance

b) Medium resistance

c) Low resistance

d) Leakage current

Answer : a

43. Vibration reeds are employed in:

a) Frequency meter

b) Power factor meter

c) Synchroscope

d) Megger

Answer : a

44. Kelvin double bridge is best suited for the measurement of:

a) Inductance

b) Capacitance

c))Low resistance

d) High resistance

Answer : c

45. Introduction of dielectric:

a) Increases the capacitance

b) Reduces the breakdown voltage

c) Reduces the mechanical voltage

d) Increases the size of the capacitor

Answer : a

46. The material used to make standard resistance is:

a) Manganin

b) Aluminium

c) Nichrome

d) Platinum

Answer : a

47. A moving iron ammeter coil has few turns of thick wire in order to have:

a) High sensitivity

b)) Effective damping

c) Low resistance and large current carrying capacity

d) Large scale

Answer : a

48. Which of the set of torques is provided in deflection galvanometer:

a) Deflection and controlling

b) Controlling and damping

c) Deflecting and damping

d) Deflecting, controlling and damping

Answer : d

49. Which of the following is not an absolute instrument:

a) Tangent galvanometer

b) Rayleigh current balance

c) D'Arsonval galvanometer

d) Absolute electrometer

Answer : c

50. Voltmeter should be of very high resistance so that:

a) Its range is high

b) Its accuracy is high

c) It may draw current minimum possible

d) Its sensitivity is high

Answer : c

51. The internal resistance for milli ammeter must be very low for:

a) High sensitivity

b) High accuracy

c) Maximum voltage drop across the meter

d) Minimum voltage drop across the meter

Answer : d

52. Which of the following instrument can be used for both ac and dc

a) PMMC type

b) Induction type

c) Moving-iron type

d) None of the above

Answer : c

53. Electrostatic instruments are mainly employed to measure:

a) Heavy currents

b) Low currents

c) Low voltages

d) High voltages

Answer : d

54. Uniformity in the scale of an ammeter indicates that it is:

a) Rectifier type

b) PMMC type

c) Moving iron type

d) Dynamo-meter type

Answer : a

55. A Dynamo-meter type wattmeter responds to the:

a) Average value of the active power

b) Average value of the reactive power

c) Peak value of the active power

d) Peak value of the reactive power

Answer : a

56. Anderson bridge is used to measure of:

a) Inductance

b) Capacitance

c) Time period

d) Resistance and capacitance

Answer : a

57. Campbell's bridge method is used to measure:

a) Copper loss

b) Iron loss

c) Both iron and copper loss

d) None of the above

Answer : b

58. Hysteresis of an instrument means:

a) The change in the same reading when input is first increased and then decreased

b) The reliability of the instrument

c))The repeatability of the insrument

d) The inaccuracy due to change in temperature

Answer : a

59. In which part of the scale does the pointer indicate more accurately

a) In the first third of the cycle

b) In the first half of the cycle

c) In about middle of the scale

d) In the last third of the cycle

Answer : c

60. For measuring an unknown electrical quantity, select the meter with

a) Highest range and work down

b) Lowest range and work up

c) Middle range and can be work up or down depending

d) Any of the above

Answer : a

61. The ratio of maximum displacement deviation to the full scale deviation of the instrument is called:

a) Static sensitivity

b) Accuracy

c) Linearity

d) Precision

Answer : c

62. A 150 V moving iron voltmeter of accuracy class 1.0 reads 75 V when used in a circuit under a standard conditions.The maximum possible percentage error in the reading is:

a) 0.5

b) 1.0

c) 2.0

d) 4.0

Answer : c

63. The relative error is the:

a) Difference of the measured value and the true value

b) Ratio of absolute error to the measured value of the quantity under measurement

c) Ratio of the absolute error to the true value of the quantity under measurement

d) Ratio of the probable error to the true value of the quantity under measurment

Answer : c

64. The moving iron voltmeters are likely:

a) To indicate the same value of the ac as on dc

b) To indicate higher value of ac than on dc

c) To indicate lower value of ac than on dc

d) The moving iron instruments should not be used for dc measurment

Answer : c

65. The power measurement in a balanced 3-phase circuit can be done by:

a) One wattmeter method

b) Two wattmeter method

c) Three wattmeter method

d) Any of the above method

Answer : d

66. Anderson's bridge is a modification of:

a) Maxwell's wien bridge

b) Hay's bridge

c) Schering bridge

d) Owen bridge

Answer : a

8. THERMOELECTRICITY

1. What is thermoelectricity?

a) Generation of electricity from heat

b) Generation of heat from electricity

c) Both a and b

d) Neither a nor b

Answer: a

2. Which effect is responsible for thermoelectricity?

a) Joule heating

b) Peltier effect

c) Seebeck effect

d) Faraday effect

Answer: c

3. Who discovered the Seebeck effect?

a) Thomas Edison

b) Alessandro Volta

c) Thomas Seebeck

d) James Clerk Maxwell

Answer: c

4. In the Seebeck effect, a potential difference is generated across a conductor when there is a difference in:

a) Temperature

b) Pressure

c) Density

d) Length

Answer: a

5. The Peltier effect is the reverse of which thermoelectric effect?

a) Seebeck effect

b) Joule heating

c) Faraday effect

d) Carnot effect

Answer: a

6. Which material is commonly used in thermoelectric devices due to its high Seebeck coefficient?

a) Copper

b) Aluminum

c) Bismuth telluride

d) Silicon

Answer: c

7. The efficiency of a thermoelectric device is determined by:

a) Seebeck coefficient

b) Peltier coefficient

c) Both a and b

d) Neither a nor b

Answer: c

8. What is the unit of the Seebeck coefficient?

a) V/K

b) A/m

c) J/C

d) W/m^2

Answer: a

9. Which law relates the Seebeck coefficient to the electrical conductivity and thermal conductivity of a material?

a) Ohm's Law

b) Fourier's Law

c) Faraday's Law

d) Thomson's Law

Answer: d

10. The Seebeck coefficient is a measure of:

a) Electrical conductivity

b) Thermoelectric power

c) Thermal conductivity

d) Heat capacity

Answer: b

11. Which of the following materials is a common n-type thermoelectric material?

a) Bismuth telluride

b) Lead telluride

c) Copper

d) Silicon

Answer: b

12. The term "ZT" in thermoelectricity refers to:

a) Zero temperature

b) Zonal thermodynamics

c) Zonal transport

d) Figure of merit

Answer: d

13. Which temperature difference is crucial for efficient thermoelectric power generation?

a) Low temperature difference

b) Moderate temperature difference

c) High temperature difference

d) No temperature difference

Answer: c

14. The material with a higher ZT value is considered more suitable for thermoelectric applications because:

a) It has lower thermal conductivity

b) It has higher electrical conductivity

c) It has a higher Seebeck coefficient

d) It has higher power factor

Answer: d

15. What is the main disadvantage of thermoelectric power generation compared to traditional methods?

a) Low efficiency

b) High cost

c) Environmental pollution

d) Limited temperature range

Answer: a

16. In a thermoelectric cooler, the direction of heat transfer is from:

a) Hot side to cold side

b) Cold side to hot side

c) Both ways simultaneously

d) No heat transfer

Answer: b

17. Which of the following is a common application of thermoelectric devices?

a) Solar panels

b) Refrigerators

c) Wind turbines

d) Nuclear reactors

Answer: b

18. The thermoelectric generator in space probes utilizes the heat generated by:

a) Solar radiation

b) Nuclear decay

c) Radioactive decay

d) Atmospheric friction

Answer: c

19. The efficiency of a thermoelectric device can be improved by:

a) Increasing thermal conductivity

b) Decreasing electrical conductivity

c) Increasing Seebeck coefficient

d) Increasing heat capacity

Answer: c

20. Which of the following is a key factor in selecting materials for thermoelectric applications?

a) Color

b) Hardness

c) Band gap

d) Viscosity

Answer: c

21. The Seebeck coefficient is highest in materials with:

a) Metallic bonding

b) Ionic bonding

c) Covalent bonding

d) Van der Waals forces

Answer: c

22. The thermoelectric power generated by a device is directly proportional to:

a) Temperature difference

b) Electrical resistance

c) Thermal conductivity

d) Mass of the device

Answer: a

23. The concept of thermoelectricity is based on the conversion of:

a) Mechanical energy to electrical energy

b) Thermal energy to electrical energy

c) Electrical energy to thermal energy

d) Nuclear energy to electrical energy

Answer: b

24. Which of the following factors contributes to the degradation of thermoelectric device performance?

a) High thermal conductivity

b) Low electrical conductivity

c) Aging of materials

d) Low temperature difference

Answer: c

25. What is the primary function of a thermoelectric module in a thermoelectric device?

a) To generate heat

b) To store electrical energy

c) To convert heat to electricity

d) To measure temperature

Answer: c

26. The thermoelectric effect is based on the principles of:

a) Quantum mechanics

b) Newtonian mechanics

c) Thermodynamics

d) Relativity

Answer: c

27. The Seebeck coefficient is temperature-dependent, meaning it:

a) Increases with temperature

b) Decreases with temperature

c) Remains constant with temperature

d) Is not affected by temperature

Answer: a

28. Which material property is crucial for minimizing heat loss in a thermoelectric device?

a) Electrical resistivity

b) Thermal conductivity

c) Seebeck coefficient

d) Young's modulus

Answer: b

29. The thermoelectric effect is utilized in the measurement of:

a) Pressure

b) Temperature

c) Humidity

d) Velocity

Answer: b

30. Which of the following is a common characteristic of thermoelectric materials for power generation applications?

a) Low thermal conductivity

b) Low electrical conductivity

c) Low Seebeck coefficient

d) Low melting point

Answer: a

31. The efficiency of a thermoelectric device can be improved by optimizing:

a) Only the Seebeck coefficient

b) Only the electrical conductivity

c) Both Seebeck coefficient and electrical conductivity

d) Neither Seebeck coefficient nor electrical conductivity

Answer: c

32. The Peltier coefficient is a measure of:

a) Heat capacity

b) Heat transfer rate

c) Heat generated or absorbed per unit charge

d) Temperature difference

Answer: c

33. The Seebeck effect is often used in the design of:

a) Solar cells

b) Thermocouples

c) Batteries

d) Transformers

Answer: b

34. In a thermoelectric power generator, the term "hot junction" refers to the part of the device:

a) Exposed to sunlight

b) At a higher temperature

c) At a lower temperature

d) Insulated from the surroundings

Answer: b

35. The efficiency of a thermoelectric device is limited by:

a) Carnot efficiency

b) Faraday efficiency

c) Ohmic losses

d) Magnetic losses

Answer: a

36. What is the role of a heat sink in a thermoelectric device?

a) To generate heat

b) To absorb heat

c) To store heat

d) To convert heat to electricity

Answer: b

37. The Seebeck coefficient is a measure of the voltage produced per unit:

a) Time

b) Charge

c) Mass

d) Volume

Answer: b

38. Which of the following factors contributes to the self-heating of a thermoelectric device?

a) High Seebeck coefficient

b) High Peltier coefficient

c) Low electrical resistance

d) Low thermal conductivity

Answer: b

39. The efficiency of a thermoelectric device is improved by minimizing:

a) Temperature difference

b) Electrical resistance

c) Thermal conductivity

d) Seebeck coefficient

Answer: c

40. The Carnot efficiency of a thermoelectric device depends on:

a) Seebeck coefficient

b) Peltier coefficient

c) Temperature difference

d) All of the above

Answer: c

41. The application of a voltage to a thermoelectric material can induce:

a) Heat absorption

b) Heat generation

c) Cooling effect

d) No change in temperature

Answer: c

42. What is the primary limitation of thermoelectric power generation for widespread use?

a) Low efficiency

b) High cost

c) Limited materials availability

d) Environmental impact

Answer: a

43. Which type of thermoelectric material is used for power generation at high temperatures?

a) Semiconductors

b) Metals

c) Superconductors

d) Insulators

Answer: b

44. The term "thermocouple" refers to:

a) A device for measuring temperature

b) A device for generating electricity

c) A device for cooling

d) A device for storing heat

Answer: a

45. The efficiency of a thermoelectric device decreases with an increase in:

a) Seebeck coefficient

b) Electrical conductivity

c) Thermal conductivity

d) Temperature difference

Answer: d

46. The voltage produced by a thermoelectric device is directly proportional to:

a) Temperature difference

b) Seebeck coefficient

c) Electrical resistance

d) Thermal conductivity

Answer: b

47. Which of the following factors is crucial for the stability of thermoelectric materials at high temperatures?

a) High melting point

b) Low melting point

c) High thermal conductivity

d) High electrical resistivity

Answer: a

48. The term "thermopile" refers to:

a) A group of thermoelectric devices

b) A type of thermocouple

c) A device for power generation

d) A device for temperature measurement

Answer: a

49. The efficiency of a thermoelectric device is affected by:

a) Magnetic fields

b) Chemical reactions

c) Mechanical vibrations

d) All of the above

Answer: d

50. Which of the following materials is often used as a p-type thermoelectric material?

a) Bismuth telluride

b) Lead telluride

c) Silicon

d) Copper

Answer: c

9. ALTERNATING CURRENT

1. What does AC stand for in electrical circuits?

a) Alternating Current

b) Amplified Current

c) Applied Current

d) Alternating Charge

Answer: **a) Alternating Current**

2. In an AC circuit, the current continuously changes direction. How many times does it change direction in one complete cycle for a sinusoidal waveform?

a) Once

b) Twice

c) Three times

d) Four times

Answer: b) Twice

3. What is the frequency of an AC signal that completes 50 cycles in one second?

a) 25 Hz

b) 50 Hz

c) 100 Hz

d) 150 Hz

Answer: b) 50 Hz

4. Which component of an AC circuit opposes the change in current flow?

a) Resistance

b) Inductance

c) Capacitance

d) Impedance

Answer: b) Inductance

5. What is the unit of frequency?

a) Hertz (Hz)

b) Ohm (Ω)

c) Farad (F)

d) Ampere (A)

Answer: a) Hertz (Hz)

6. Which of the following devices is used to measure AC voltage?

a) Ammeter

b) Voltmeter

c) Ohmmeter

d) Wattmeter

Answer: b) Voltmeter

7. In an AC circuit, the phase difference between voltage and current is measured in:

a) Volts

b) Amperes

c) Degrees

d) Watts

Answer: c) Degrees

8. What is the relationship between the root mean square (RMS) value and the peak value of an AC voltage or current?

a) RMS = 2 × Peak

b) RMS = 0.707 × Peak

c) RMS = Peak × 1.414

d) RMS = Peak ÷ 2

Answer: c) RMS = Peak × 1.414

9. What type of circuit element stores electrical energy in an electric field?

a) Resistor

b) Inductor

c) Capacitor

d) Transformer

Answer: c) Capacitor

10. What is the power factor of a purely resistive AC circuit?

a) 0

b) 1

c) 0.5

d) -1

Answer: b) 1

11. The measure of opposition that a circuit presents to the flow of alternating current is known as:

a) Resistance

b) Impedance

c) Reactance

d) Conductance

Answer: b) Impedance

12. Which of the following is a property of an inductor in an AC circuit?

a) It stores energy in a magnetic field

b) It stores energy in an electric field

c) It does not affect the flow of AC

d) It decreases current in an AC circuit

Answer: a) It stores energy in a magnetic field

13. What is the unit of inductance?

a) Farad (F)

b) Henry (H)

c) Ohm (Ω)

d) Volt (V)

Answer: b) Henry (H)

14. Which law states that the voltage across the total impedance in an AC circuit is equal to the current multiplied by the total impedance?

a) Ohm's Law

b) Kirchhoff's Voltage Law

c) Faraday's Law

d) Lenz's Law

Answer: b) Kirchhoff's Voltage Law

15. What is the phase relationship between voltage and current in a purely capacitive AC circuit?

a) In-phase

b) 90 degrees leading

c) 90 degrees lagging

d) Out of phase

Answer: c) 90 degrees lagging

16. What is the power factor of an ideal capacitor in an AC circuit?

a) 0

b) 1

c) 0.5

d) -1

Answer: a) 0

17. Which component of an AC circuit is responsible for dissipating electrical energy in the form of heat?

a) Capacitance

b) Resistance

c) Inductance

d) Reactance

Answer: b) Resistance

18. What is the purpose of a transformer in an AC power distribution system?

a) To convert AC to DC

b) To increase voltage

c) To decrease voltage

d) To store electrical energy

Answer: b) To increase voltage

19. The time taken for one complete cycle of an AC waveform is known as:

a) Frequency

b) Period

c) Wavelength

d) Amplitude

Answer: b) Period

20. What is the formula for calculating power in an AC circuit?

a) P = VI

b) P = V^2/R

c) P = I^2R

d) P = VI cos(θ)

Answer: d) P = VI cos(θ)

21. Which of the following materials is commonly used as a core in transformers?

a) Copper

b) Aluminum

c) Iron

d) Silver

Answer: c) Iron

22. What is the function of a rectifier in an AC-DC power supply?

a) To increase voltage

b) To decrease voltage

c) To convert AC to DC

d) To store electrical energy

Answer: c) To convert AC to DC

23. What is the effect of increasing the frequency of an AC signal on the inductive reactance in a circuit?

a) Increases

b) Decreases

c) Remains the same

d) Becomes zero

Answer: b) Decreases

24. Which of the following is a measure of the opposition to the flow of alternating current due to capacitance in a circuit?

a) Inductance

b) Resistance

c) Reactance

d) Conductance

Answer: c) Reactance

25. In a series RLC circuit, the impedance is minimum when:

a) The resistance is minimum

b) The inductive reactance is minimum

c) The capacitive reactance is minimum

d) The frequency is maximum

Answer: a) The resistance is minimum

26. Which type of AC waveform is characterized by a continuous, smooth oscillation between positive and negative values?

a) Square wave

b) Sine wave

c) Triangle wave

d) Sawtooth wave

Answer: b) Sine wave

27. The phase angle between voltage and current in a purely resistive circuit is:

a) 0 degrees

b) 90 degrees leading

c) 90 degrees lagging

d) 180 degrees

Answer: a) 0 degrees

28. Which of the following statements is true regarding power in an AC circuit with both resistive and reactive components?

a) Real power is the product of voltage and current.

b) Reactive power is the product of voltage and current.

c) Apparent power is the product of voltage and current.

d) Real power is the same as apparent power.

Answer: c) Apparent power is the product of voltage and current.

29. What is the relationship between the frequency and the period of an AC waveform?

a) Frequency = 1/Period

b) Frequency = Period

c) Frequency = 2 × Period

d) Frequency = 0.5 × Period

Answer: a) Frequency = 1/Period

30. What is the function of a choke coil in an AC circuit?

a) To store electrical energy

b) To provide resistance

c) To increase inductance

d) To decrease capacitance

Answer: c) To increase inductance

31. What is the unit of capacitance?

a) Farad (F)

) Henry (H)

c) Ohm (Ω)

d) Volt (V)

Answer: a) Farad (F)

32. In an AC circuit, if the voltage and current are in phase, the power factor is:

a) 0

b) 1

c) 0.5

d) -1

Answer: b) 1

33. What is the purpose of a capacitor in an AC circuit?

a) To increase resistance

b) To decrease capacitance

c) To store electrical energy

d) To provide inductance

Answer: c) To store electrical energy

34. What is the formula for calculating inductive reactance (XL) in an AC circuit?

a) $XL = R / (2\pi f)$

b) $XL = 2\pi fR$

c) $XL = 1 / (2\pi fR)$

d) $XL = 2\pi fL$

Answer: d) $XL = 2\pi fL$

35. Which type of circuit is characterized by a phase angle between voltage and current that is neither 0 nor 180 degrees?

a) Purely resistive

b) Purely inductive

c) Purely capacitive

d) RLC circuit

Answer: d) RLC circuit

36. What is the function of a diode in an AC circuit?

a) To increase resistance

b) To decrease capacitance

c) To convert AC to DC

d) To store electrical energy

Answer: c) To convert AC to DC

37. In an AC circuit, the angle by which the current waveform lags behind the voltage waveform is known as:

a) Resistance angle

b) Capacitance angle

c) Phase angle

d) Impedance angle

Answer: c) Phase angle

38. What is the unit of power in an AC circuit?

a) Volt (V)

b) Ampere (A)

c) Watt (W)

d) Ohm (Ω)

Answer: c) Watt (W)

39. Which of the following statements is true regarding capacitive reactance in an AC circuit?

a) It increases with increasing frequency.

b) It decreases with increasing frequency.

c) It is independent of frequency.

d) It is zero at all frequencies.

Answer: b) It decreases with increasing frequency.

40. What is the purpose of an oscillator in an AC circuit?

a) To increase resistance

b) To decrease capacitance

c) To generate AC signals

d) To store electrical energy

Answer: c) To generate AC signals

41. Which law states that the algebraic sum of the currents entering and leaving a node in an AC circuit is zero?

a) Ohm's Law

b) Kirchhoff's Voltage Law

c) Kirchhoff's Current Law

d) Faraday's Law

Answer: c) Kirchhoff's Current Law

42. What is the effect of adding capacitance to an AC circuit on the capacitive reactance?

a) Increases

b) Decreases

c) Remains the same

d) Becomes zero

Answer: b) Decreases

43. Which of the following materials is commonly used as a dielectric in capacitors?

a) Copper

b) Aluminum

c) Iron

d) Air

Answer: d) Air

44. What is the formula for calculating capacitive reactance (XC) in an AC circuit?

a) $XC = R / (2\pi f)$

b) $XC = 2\pi fR$

c) $XC = 1 / (2\pi fR)$

d) $X_C = 1 / (2\pi fC)$

Answer: d) $X_C = 1 / (2\pi fC)$

45. In a parallel RLC circuit, the impedance is maximum when:

a) The resistance is maximum

b) The inductive reactance is maximum

c) The capacitive reactance is maximum

d) The frequency is maximum

Answer: c) The capacitive reactance is maximum

46. Which of the following devices is used to step-up or step-down AC voltage in a power distribution system?

a) Capacitor

b) Resistor

c) Inductor

d) Transformer

Answer: d) Transformer

47. What is the relationship between the power factor and the cosine of the phase angle in an AC circuit?

a) Power Factor = $\cos(\theta)$

b) Power Factor = $\sin(\theta)$

c) Power Factor = $\tan(\theta)$

d) Power Factor = $1/\theta$

Answer: a) Power Factor = $\cos(\theta)$

48. In a capacitive circuit, the phase angle between voltage and current is:

a) In-phase

b) 90 degrees leading

c) 90 degrees lagging

d) Out of phase

Answer: b) 90 degrees leading

49. What is the relationship between the voltage and current in a purely resistive AC circuit?

a) In-phase

b) 90 degrees leading

c) 90 degrees lagging

d) Out of phase

Answer: a) In-phase

ABOUT THE AUTHOR

Dr. V. Mowlika was born in 1992 in Hosur, Krishnagiri, Tamilnadu and she is currently working as an Assistant Professor in the Department of Physics, St. Joseph's College of Arts and Science for Women, Hosur. She has completed her M.Sc degree in Sacred Heart College, Tirupattur and received Doctor of Philosophy in Periyar University, Salem. She has experience of one year in Auxilium College, Vellore. She has published 12 papers in International scopus indexed Journals and 6 in National and International conference proceedings. Her areas of interest include Nanotechnology, Material Science and Shock waves.

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