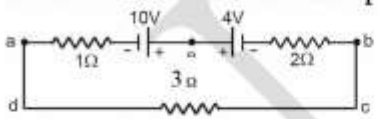
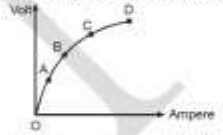
QAD Series

Electricity and Magnetism

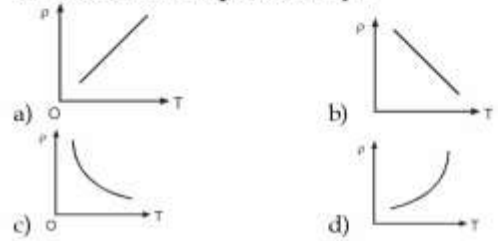
1. **An electric cell is:**
   a) a source of charge
   b) a source of energy
   c) an energy convertor
   d) both a source of charge & energy
2. **A cell converts :**
   a) heat energy into mechanical energy
   b) electrical energy into mechanical energy
   c) electrical energy into sound energy
   d) chemical energy into electric energy
3. **The specific resistance of a wire:**
   a) varies with its length
   b) varies with its cross-section
   c) varies with its mass
   d) does not depend upon its length, cross-section and mass
4. **Two resistances are joined in parallel whose resultant is 6/5 Ω. One of the resistance wire is broken and the effective resistance becomes 2 ohm. Then the resistance in ohm of the wire that got broken was:**
   a) 3/5Ω b) 2 Ω c) 6/5 Ω d) 3 Ω
5. **Two cells of e.m.f. E_1 and E_2 and internal resistances r_1 and r_2 are connected in parallel. Then the e.m.f. and internal resistance of the equivalent source is :**
   a) $E_1 + E_2$ and $\frac{r_1 r_2}{r_1 + r_2}$ b) $E_1 - E_2$ and $r_1 + r_2$
   c) $\frac{E_1 r_2 + E_2 r_1}{r_1 + r_2}$ and $\frac{r_1 r_2}{r_1 + r_2}$ d) $\frac{E_1 r_2 + E_2 r_1}{r_1 + r_2}$ and $r_1 + r_2$
6. **A galvanometer has a resistance of 3663 ohm. A shunt S is connected across it such that (1/34) of the total current passes through the galvanometer. Then the value of shunt is :**
   a) 3663 Ω b) 111 Ω c) 107.7 Ω d) 3555.3 Ω
7. **In the circuit diagram shown below, the magnitude and direction of the flow of current respectively would be:**



   a) 7/3 amp from a to b via e b) 7/3 amp from b to a via e
   c) 1.0 amp from b to a via e d) 1.0 amp from a to b via e
8. **Variation of current passing through a conductor at the voltage applied across its ends is varied as shown in the adjoining diagram. If the resistance is determined at the points A, B, C and D, we will find that resistances at:**



   a) C and D are equal b) B is higher than at A
   c) C is higher than at B d) None of the above
9. **A cell supplies a current I_1 through a resistor of resistance R_1 and a current I_2 through a resistor of resistance R_2, then internal resistance of the cell is:**
   a) $R_1 - R_2$ b) $R_1 + R_2$ c) $\frac{I_1 R_2 + I_2 R_1}{I_1 + I_2}$ d) $\frac{I_1 R_2 - I_2 R_1}{I_1 - I_2}$
10. **Two identical cells of the same e.m.f. and same internal resistance give the same current through an external resistance of 2 Ω, regardless of whether they are connected in series or parallel. The internal resistance of each cell is:**
    a) 0.5 Ω b) 1 Ω c) 2 Ω d) 3 Ω
11. **In a potentiometer experiment, the balancing length with a cell is 560 cm. When an external resistance of 10 Ω is connected in parallel to the cell, the balancing length becomes by 412 cm. The internal resistance of the cell in ohms is:**
    a) 3.6 b) 2.4 c) 1.2 d) 0.6
12. **The potential difference between the terminals of a cell in open circuit is 2.2 volts. With resistance of 5 ohm across the terminals of a cell, the terminal potential difference is 1.8 volt. The internal resistance of the cell is :**
    a) $\frac{10}{9}\Omega$ b) $\frac{9}{10}\Omega$ c) $\frac{12}{7}\Omega$ d) $\frac{7}{12}\Omega$
13. **Two wires of resistance R_1 and R_2 have temperature coefficient of resistance α_1 and α_2, respectively. These are joined in series. The effective temperature coefficient of resistance is :**
    a) $\frac{\alpha_1 + \alpha_2}{2}$ b) $\sqrt{\alpha_1 \alpha_2}$ c) $\frac{\alpha_1 R_1 + \alpha_2 R_2}{R_1 + R_2}$ d) $\frac{\sqrt{R_1 R_2 \alpha_1 \alpha_2}}{\sqrt{R_1^2 + R_2^2}}$
14. **Drift velocity v_d varies with the intensity of electric field as per the relation:**
    a) v_d = constant b) $v_d \propto E^2$ c) $v_d \propto \frac{1}{E}$ d) $v_d \propto E$
15. **For a metallic wire, the ratio V/I (V=applied potential difference, I = current flowing)**
    a) increases or decreases as the temperature rises, depending upon metal.
    b) decreases as the temperature rises
    c) independent of temperature
    d) increases as the temperature rises
16. **Three unequal resistors in parallel are equivalent to a resistance 1 ohm. If two of them are in the ratio 1 : 2 and if no resistance value is fractional, the largest of the three resistances in ohms is :**
    a) 4 b) 6 c) 5 d) 12
17. **The electric field E, current density J and conductivity s of a conductor are related as :**
    a) s = E/J b) s = J/E c) s = JE d) s = 1/JE
18. **Two sources of equal emf are connected to an external resistance R. The internal resistances of the two sources are R_1 and R_2 ($R_2 > R_1$). If the potential difference across the source having internal resistance R_2 is zero, then :**
    a) $R = \frac{R_1 R_2}{R_1 + R_2}$ b) $\frac{R_2 R_2}{R_2 - R_1}$ c) $R = R_2 \frac{R_1 + R_2}{R_2 - R_1}$ d) $R = R_2 - R_1$
19. **If R_1 and R_2 are respectively the filament resistances of a 200 watt bulb and a 100 watt bulb designed to operate on the same voltage:**
    a) R_1 is two times R_2 b) R_2 is two times R_1
    c) R_2 is four times R_1 d) R_1 is four times R_2
20. **A cell of e.m.f. E is connected across a resistance r. The potential difference between the terminals of the cell is found to be V. The internal resistance of the cell must be :**
    a) $\frac{2(E-V)V}{r}$ b) $\frac{2(E-V)r}{E}$ c) $\frac{(E-V)r}{V}$ d) (E – V) r
21. **The temperature (T) dependence of resistivity (ρ) of a semiconductor is represented by :**



22. Twelve equal resistors, each of resistance R, are connected to form a skeleton cube. Then the equivalent resistance taken between two diagonally opposite corners is :
a) R b) 12R c) 5R/6 d) 7R/12

23. The resistance of a metallic wire becomes 8 times when :
a) length is doubled b) length is tripled
c) length is doubled and radius is halved
d) length is halved and radius is doubled

24. The drift velocity does not depend upon:
a) cross-section of the wire b) length of the wire
c) number of free electrons d) magnitude of current

25. The specific resistance of a conductor increases with:
a) increase in temperature
b) increase in cross-sectional area
c) decrease in length
d) decrease in cross-sectional area

26. A fuse wire is a wire of:
a) low resistance and low melting point
b) high resistance and low melting point
c) low resistance and high melting point
d) high resistance and high melting point

27. To draw maximum current from a combination of cells how should the cells be grouped?
a) Series b) Parallel c) Mixed
d) Depends upon relative values of external & internal resistance

28. A circular coil of radius R carries an electric current. The magnetic field due to the coil at a point on the axis of the coil located at a distance r from the centre of the coil, such that r >> R, varies as
a) $\frac{1}{r}$ b) $\frac{1}{r^{3/2}}$ c) $\frac{1}{r^2}$ d) $\frac{1}{r^3}$

29. A long solenoid carrying a current produces a magnetic field B along its axis. If the current is doubled and the number of turns per cm is halved, the new value of the magnetic field is
a) B b) 2B c) 4B d) B/2

30. Two similar coils are kept mutually perpendicular such that their centres coincide. At the centre, find the ratio of the magnetic field due to one coil and the resultant magnetic field by both coils, if the same current is flown
a) $1:\sqrt{2}$ b) 1 : 2 c) 2 : 1 d) $\sqrt{3}:1$

31. An electron is revolving round a proton, producing a magnetic field of 16 weber/m² in a circular orbit of radius 1Å. It's angular velocity will be
a) 10^{17} rad/sec b) $1/2p \times 10^{12}$ rad/sec
c) $2\,p \times 10^{12}$ rad/sec d) $4p \times 10^{12}$ rad/sec

32. A wire carrying current I and other carrying 2I in the same direction produces a magnetic field B at the midpoint. What will be the field when 2I wire is switched off?
a) B/2 b) 2B c) B d) 4B

33. The electric charge in uniform motion produces
a) electric field only
b) magnetic field only
c) both electric and magnetic fields
d) neither electric nor magnetic field

34. A uniform resistance wire of length *L* and diameter d has a resistance *R*. Another wire of same material has length 4*L* and diameter 2*d*, the resistance will be
a) 2*R* b) *R* c) *R*/2 d) *R*/4

35. The drift velocity of free electrons in a conductor is 'V_d' when the current '*i*' is flowing in it. If both the radius and current are doubled, the drift velocity will be
a) $V_d/4$ b) $V_d/8$ c) $V_d/2$ d) V_d

36. A straight wire carrying current *I* is turned into a circular loop. If the magnitude of magnetic moment associated with it in MKS unit is *M*, the length of the wire will be
a) $4\pi/M$ b) $\sqrt{\frac{4\pi M}{I}}$ c) $\sqrt{\frac{4\pi I}{M}}$ d) $\frac{M\pi}{4I}$

37. If the coils of self inductances 4H and 16 H are wound on the same iron core, then the coefficient of mutual inductance will be
a) 8H b) 10H c) 20H d) 64H

38. In a coil of area 10 cm² and 10 turns with magnetic field directed perpendicular to the plane and changing at the rate of 10^8 gauss/sec. The resistance of coil is 20 ohms. The current in the coil will be
a) 5 amp b) 0.5 amp c) 0.05 amp d) 5×10^8 amp

39. In an AC circuit, the instantaneous values of emf and current are e = 200 sin 314 t volts and i = sin (314 t + π/3) ampere. The average power consumed in watt is
a) 200 b) 100 c) 50 d) 25

40. An A.C circuit contains resistance, inductance and capacitance. The electrical energy is consumed in
a) resistance b) inductance
c) capacitance d) both in inductance and capacitance

41. A current of 3A is flowing in a coil. The power dissipated by it is 108 watts. If 120V, 50 Hz AC voltage is applied to combination R and this coil in series, value of R will be
a) 6Ω b) 12Ω c) 24Ω d) 36Ω

42. Two straight parallel wires, both carrying 10 amp in the same direction attract each other with a force of 1×10^{-3} N. If both currents are doubled, the force of attraction will be
a) 1×10^{-3} N b) 2×10^{-3} N c) 4×10^{-3} N d) 0.25×10^{-3} N

43. A circular current carrying coil has a radius R. The distance from the centre of coil on the axis where the magnetic induction will be (1/8) of its value at the centre of coil is
a) $R/\sqrt{3}$ b) $R\sqrt{3}$ c) $2\sqrt{3}\,R$ d) $2/\sqrt{3}\,R$

44. There are two electric bulbs of 40 W and 100 W. Which one will be brighter when first connected in series and then in parallel
a) 40 W in series and 100 W in parallel
b) 100 W in series and 40 W in parallel
c) 40 W in series and 40 W in parallel
d) 100 W both in series & parallel will be uniform

45. Force between two identical bar magnets whose centers are *x* meter apart is 4.8 N when their axes are in the same line. If separation is increased to 2*x*, the force between them is:
a) 2.4 N b) 1.2 N c) 0.3 N d) 0.6 N

46. A cell of internal resistance r is connected to an external resistance R. The current will be maximum in R, if
a) R = r b) R < r c) R > r d) R = r/2

47. A coil is wound on a core of rectangular cross-section. If all the linear dimensions of core are increased by a factor 2 and number of turns per unit length of coil remains same, the self-inductance increases by a factor of
a) 16 b) 8 c) 4 d) 2

48. The time taken by AC of 50 Hz in reaching from zero to the maximum value is:
a) 10^{-2} s b) 2×10^{-2} s c) 50×10^{-3} s d) 5×10^{-3} s

49. During the current growth in L - R circuit, the time constant is the time during which the magnitude of current becomes
a) I_o b) $I_o/2$ c) $0.63I_o$ d) $0.37\,I_o$

50. If the power factor changes from (1/2) to (1/4) then what is the increase in impedance in A.C?
a) 20 % b) 50 % c) 25 % d) 100 %

51. Earth's magnetic field always has a horizontal component except at
a) equator b) magnetic pole
c) a latitude of 60° d) a latitude of 50°

52. A copper wire is stretched so as to make it 0.1% longer. The percentage increase in the resistance of wire will be
a) 1.0 b) 0.1 c) 2.0 d) 0.2

53. Masses of three wires of same material are in the ratio of 1:2:3 and their lengths are the ratio of 3:2:1. Electrical resistance of these wires will be in the ratio of:
a) 1:1:1 b) 1:2:3 c) 9:4:1 d) 27:6:1