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CLASS 12 PHYSICS · NCERT CHAPTER 3 · IMU CET PRACTICE

Current Electricity

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Questions: 45 MCQs

Each question has exactly one correct option. Attempt all questions first, then check the Answer Key and Solutions at the end.

- 1 Electric current is a
 - (A) tensor of rank 2
 - (B) vector quantity
 - (C) dimensionless quantity
 - (D) scalar quantity
- 2 A current of 2 A flows for 5 minutes. The charge that flows is
 - (A) 600 C
 - (B) 10 C
 - (C) 300 C
 - (D) 120 C
- 3 The drift velocity of electrons in a conductor is related to current I as
 - (A) $I = neAv_d$
 - (B) $I = ne/Av_d$
 - (C) $I = nAv_d/e$
 - (D) $I = neA/v_d$
- 4 The order of drift velocity of electrons in a metallic conductor is about
 - (A) 10^8 m/s
 - (B) 1 m/s
 - (C) 10^3 m/s
 - (D) 10^{-4} m/s
- 5 Mobility of a charge carrier is defined as
 - (A) drift velocity per unit electric field
 - (B) current per unit area
 - (C) charge per unit time
 - (D) electric field per unit drift velocity
- 6 Ohm's law states that, at constant temperature,
 - (A) $V \propto I^2$
 - (B) $V = \text{constant}$
 - (C) $V \propto 1/I$
 - (D) $V \propto I$
- 7 The resistance of a wire of length l , area A and resistivity ρ is
 - (A) lA/ρ
 - (B) $\rho l/A$
 - (C) $\rho A/l$
 - (D) ρ/lA
- 8 A wire of resistance R is stretched to double its length. Its new resistance is
 - (A) $2R$
 - (B) $R/2$
 - (C) $4R$
 - (D) $R/4$



- 9 A wire of resistance $10\ \Omega$ is cut into two equal parts which are joined in parallel. The equivalent resistance is
(A) $5\ \Omega$ (B) $20\ \Omega$
(C) $10\ \Omega$ (D) $2.5\ \Omega$
- 10 Resistivity of a conductor depends on
(A) cross-sectional area (B) length of the conductor
(C) material and temperature (D) shape of the conductor
- 11 The resistivity of metals ___ with increase in temperature.
(A) increases (B) decreases
(C) remains constant (D) first decreases then increases
- 12 The resistivity of semiconductors ___ with increase in temperature.
(A) becomes infinite (B) remains constant
(C) increases (D) decreases
- 13 Three resistors of $2\ \Omega$, $3\ \Omega$ and $6\ \Omega$ are connected in parallel. The equivalent resistance is
(A) $0.5\ \Omega$ (B) $1\ \Omega$
(C) $2\ \Omega$ (D) $11\ \Omega$
- 14 Three resistors of $2\ \Omega$, $3\ \Omega$ and $6\ \Omega$ are connected in series. The equivalent resistance is
(A) $6\ \Omega$ (B) $11\ \Omega$
(C) $36\ \Omega$ (D) $1\ \Omega$
- 15 A cell of emf E and internal resistance r is connected to an external resistance R . The current is
(A) $E/(R + r)$ (B) E/R
(C) $E(R + r)$ (D) E/r
- 16 The terminal voltage of a cell of emf E and internal resistance r delivering current I is
(A) E (B) $E - Ir$
(C) Ir (D) $E + Ir$
- 17 A cell of emf $2\ \text{V}$ and internal resistance $0.5\ \Omega$ is connected to a $3.5\ \Omega$ resistor. The terminal voltage is
(A) $0.25\ \text{V}$ (B) $1.75\ \text{V}$
(C) $1.5\ \text{V}$ (D) $2\ \text{V}$
- 18 When a cell is short-circuited, the current is
(A) E/r (B) infinite
(C) zero (D) E/R
- 19 Kirchhoff's junction rule is based on conservation of
(A) momentum (B) mass
(C) charge (D) energy
- 20 Kirchhoff's loop rule is based on conservation of
(A) angular momentum (B) charge
(C) energy (D) momentum

- 21** A Wheatstone bridge is balanced when
(A) $P/R = S/Q$
(B) $P/Q = R/S$
(C) $P + Q = R + S$
(D) $PQ = R + S$
- 22** In a balanced Wheatstone bridge, the current through the galvanometer is
(A) zero
(B) equal to battery current
(C) maximum
(D) half of battery current
- 23** In a metre bridge, the balance point is at 40 cm with an unknown resistance X in the left gap and $6\ \Omega$ in the right gap. X is
(A) $15\ \Omega$
(B) $4\ \Omega$
(C) $9\ \Omega$
(D) $2.4\ \Omega$
- 24** A potentiometer is preferred over a voltmeter to measure emf because
(A) it has very low resistance
(B) it reads directly
(C) it is portable
(D) it draws no current from the cell at balance
- 25** The power dissipated in a resistor R carrying current I is
(A) I^2R
(B) IR
(C) I/R
(D) IR^2
- 26** A bulb rated 100 W, 220 V has a resistance of
(A) $22000\ \Omega$
(B) $2.2\ \Omega$
(C) $484\ \Omega$
(D) $48.4\ \Omega$
- 27** A 100 W, 220 V bulb is connected to a 110 V supply. The power consumed is
(A) 200 W
(B) 50 W
(C) 25 W
(D) 100 W
- 28** Two bulbs of 25 W and 100 W (both rated 220 V) are connected in series across 220 V. Which glows brighter?
(A) 100 W bulb
(B) 25 W bulb
(C) neither glows
(D) both equally
- 29** The colour code of a resistor is brown, black, red. Its resistance is
(A) $10\ \Omega$
(B) $1\ \text{k}\Omega$
(C) $100\ \Omega$
(D) $12\ \Omega$
- 30** n identical cells each of emf E and internal resistance r are connected in series. The total emf and internal resistance are
(A) nE and nr
(B) nE and r/n
(C) E and nr
(D) E and r/n
- 31** n identical cells (E, r) are connected in parallel. The equivalent emf and internal resistance are
(A) E and nr
(B) nE and r/n
(C) E and r/n
(D) nE and nr



- 32** The maximum power is transferred from a cell to an external resistance R when
(A) $R = 0$ (B) $R \gg r$
(C) $R = 2r$ (D) $R = r$
- 33** The current density J is related to the electric field E by
(A) $J = \sigma E$ (B) $J = \rho E$
(C) $J = \sigma/E$ (D) $J = E/\sigma$
- 34** A copper wire has 8.5×10^{28} free electrons per m^3 , area 10^{-6} m^2 , and carries 1.36 A. The drift velocity is
(A) 10^{-2} m/s (B) 10^{-5} m/s
(C) 10^{-3} m/s (D) 10^{-4} m/s
- 35** The I - V graph of an ohmic conductor is
(A) a curve with decreasing slope (B) a parabola
(C) a horizontal line (D) a straight line through the origin
- 36** The resistance of a wire at 0°C is 10Ω and the temperature coefficient is $0.004 / ^\circ\text{C}$. Its resistance at 50°C is
(A) 12Ω (B) 11Ω
(C) 10.2Ω (D) 14Ω
- 37** Electrical energy consumed by a 1000 W heater in 2 hours is
(A) 0.5 kWh (B) 1 kWh
(C) 2 kWh (D) 2000 kWh
- 38** The relaxation time of electrons in a conductor increases. The resistivity
(A) increases (B) remains same
(C) becomes zero (D) decreases
- 39** Four resistors of 4Ω each form the four sides of a square. The resistance between two diagonally opposite corners is
(A) 16Ω (B) 8Ω
(C) 4Ω (D) 2Ω
- 40** Four resistors of 4Ω each form a square. The resistance between two adjacent corners is
(A) 3Ω (B) 4Ω
(C) 16Ω (D) 12Ω
- 41** The emf of a cell is the
(A) force on unit charge
(B) work done per unit charge in moving charge around the complete circuit
(C) potential difference across external resistance only
(D) current per unit resistance
- 42** A battery of emf 12 V and internal resistance 1Ω is charged by a current of 2 A. The terminal voltage during charging is
(A) 2 V (B) 12 V
(C) 10 V (D) 14 V

- 43** In a potentiometer, the potential gradient is 0.02 V/cm . A cell balances at 75 cm . Its emf is
- (A) 15 V (B) 0.15 V
(C) 1.5 V (D) 3.75 V
-
- 44** Conductance is the reciprocal of
- (A) voltage (B) current
(C) resistance (D) resistivity
-
- 45** A uniform wire of resistance 9Ω is bent into an equilateral triangle. The resistance between any two vertices is
- (A) 3Ω (B) 2Ω
(C) 6Ω (D) 4.5Ω
-

Answer Key

1	2	3	4	5	6	7	8	9	10
D	A	A	D	A	D	B	C	D	C
11	12	13	14	15	16	17	18	19	20
A	D	B	B	A	B	B	A	C	C
21	22	23	24	25	26	27	28	29	30
B	A	B	D	A	C	C	B	B	A
31	32	33	34	35	36	37	38	39	40
C	D	A	D	D	A	C	D	C	A
41	42	43	44	45					
B	D	C	C	B					

Hints & Solutions

1. (D) Although current has direction, it does not obey vector addition (Kirchhoff's junction law adds algebraically), so it is a scalar.
2. (A) $Q = It = 2 \times 300 = 600 \text{ C}$.
3. (A) $I = neAv_d$.
4. (D) Drift speeds are tiny, typically $\sim 10^{-4} \text{ m/s}$ (mm/s).
5. (A) $\mu = v_d/E$, unit $\text{m}^2 \text{ V}^{-1} \text{ s}^{-1}$.
6. (D) $V = IR$.
7. (B) $R = \rho l/A$.
8. (C) Volume constant $\rightarrow A$ halves when l doubles. $R \propto l/A \rightarrow 2 \times 2 = 4R$.
9. (D) Each part 5Ω ; parallel $\rightarrow 5/2 = 2.5 \Omega$.
10. (C) ρ is a material property that varies with temperature.
11. (A) More lattice vibrations increase collisions, so ρ increases (positive temperature coefficient).
12. (D) More charge carriers are thermally generated, lowering resistivity.
13. (B) $1/R = 1/2 + 1/3 + 1/6 = 1 \rightarrow R = 1 \Omega$.
14. (B) $R = 2 + 3 + 6 = 11 \Omega$.
15. (A) $I = E/(R + r)$.
16. (B) $V = E - Ir$ during discharge.
17. (B) $I = 2/4 = 0.5 \text{ A} \rightarrow V = E - Ir = 2 - 0.25 = 1.75 \text{ V}$.
18. (A) External $R = 0 \rightarrow I = E/r$.
19. (C) Charge cannot accumulate at a junction: $\Sigma I = 0$.
20. (C) The net change in potential around a closed loop is zero.
21. (B) No current through the galvanometer when $P/Q = R/S$.
22. (A) Balanced bridge means the galvanometer's two ends are at equal potential.



23. (B) $X/6 = 40/60 \rightarrow X = 4 \Omega$.
24. (D) At null point no current flows from the cell, so the true emf is measured.
25. (A) $P = I^2 R = V^2/R = VI$.
26. (C) $R = V^2/P = 48400/100 = 484 \Omega$.
27. (C) $P \propto V^2$ (R fixed) $\rightarrow 100 \times (1/2)^2 = 25 \text{ W}$.
28. (B) In series, same current; $P = I^2 R$. The 25 W bulb has larger R (V^2/P), so it dissipates more power.
29. (B) Brown = 1, black = 0, red = $\times 10^2 \rightarrow 10 \times 100 = 1000 \Omega$.
30. (A) Series: emfs add and internal resistances add.
31. (C) Parallel identical cells: emf unchanged, internal resistance divided by n.
32. (D) Maximum power transfer theorem.
33. (A) Microscopic Ohm's law: $J = \sigma E$.
34. (D) $v_d = I/(neA) = 1.36/(8.5 \times 10^{28} \times 1.6 \times 10^{-19} \times 10^{-6}) = 1.36/13.6 = 10^{-4} \text{ m/s}$.
35. (D) $V \propto I$ gives a straight line with slope $1/R$ on an I-V graph.
36. (A) $R = R_0(1 + \alpha \Delta T) = 10(1 + 0.2) = 12 \Omega$.
37. (C) $E = Pt = 1 \text{ kW} \times 2 \text{ h} = 2 \text{ kWh}$.
38. (D) $\rho = m/(ne^2 \tau)$; larger τ means smaller ρ .
39. (C) Two paths of 8Ω each in parallel $\rightarrow 4 \Omega$.
40. (A) 4Ω in parallel with $12 \Omega \rightarrow 48/16 = 3 \Omega$.
41. (B) emf = energy supplied by the cell per unit charge.
42. (D) While charging, $V = E + Ir = 12 + 2 = 14 \text{ V}$.
43. (C) $E = kI = 0.02 \times 75 = 1.5 \text{ V}$.
44. (C) $G = 1/R$, unit siemens (S).
45. (B) Each side 3Ω . Between two vertices: $3 \parallel 6 = 18/9 = 2 \Omega$.

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