1. The SI unit of resistivity is:

(a) ohm
(b) ohm-metre
(c) ohm/cm
(d) ohm/m²

Answer: (b) ohm-metre
Explanation:
Resistivity (ρ) has unit Ω·m. It's a material property independent of dimensions.

2. Ohm’s law is not valid for:

(a) Copper wire
(b) Nichrome wire
(c) Vacuum diode
(d) Silver conductor

Answer: (c) Vacuum diode
Explanation:
Ohm's law is valid only for ohmic conductors ($V \propto I$). A vacuum diode is non-ohmic.

3. When a potential difference of 12 V is applied across a wire of resistance 6 Ω, the current through the wire is:

(a) 1 A
(b) 2 A
(c) 0.5 A
(d) 72 A

Answer: (b) 2 A
Explanation:
$I = V/R = 12/6 = 2$ A

4. Drift velocity of electrons increases when:

(a) Cross-sectional area of wire increases
(b) Temperature increases
(c) Electric field increases

(d) Charge of electrons increases

Answer: (c) Electric field increases
Explanation:
$v_d \propto E$; higher electric field → more drift velocity

5. The relation between current density (J) and electric field (E) is:

(a) $J = \sigma E$
(b) $J = E/\sigma$
(c) $J = \rho E$
(d) $J = E^2/\sigma$

Answer: (a) $J = \sigma E$
Explanation:
$J = \sigma E$, where σ = conductivity = $1/\rho$

6. Two wires A and B have the same length and material but B has double the diameter of A. The ratio $R_A : R_B$ is:

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

Answer: (d) 4 : 1
Explanation:
$R \propto 1 / A = 1 / \pi r^2$ → If diameter doubles, resistance becomes 1/4

7. A wire of resistance 10 Ω is stretched to double its original length. Its new resistance is:

(a) 5 Ω
(b) 20 Ω
(c) 40 Ω
(d) 10 Ω

Answer: (c) 40 Ω
Explanation:

$R \propto L^2$ (if volume is constant).
New $R = R \times 2^2 = 10 \times 4 = 40\ \Omega$

8. The drift speed of electrons in a conductor is of the order of:

(a) 10^6 m/s
(b) 10^3 m/s
(c) 10^{-4} m/s
(d) 10^{-1} m/s

Answer: (c) 10^{-4} m/s
Explanation:
Despite large number of electrons, the average drift velocity is very small.

9. If the length and area of cross-section of a wire are both doubled, then its resistance:

(a) Doubles
(b) Halves
(c) Remains the same
(d) Becomes four times

Answer: (c) Remains the same
Explanation:
$R \propto L / A \rightarrow R\_new = 2L / 2A = L/A$ (no change)

10. In a conductor, free electrons move:

(a) Randomly
(b) With constant velocity
(c) Due to electric field only
(d) Randomly but with a small net drift in direction of field

Answer: (d) Randomly but with a small net drift in direction of field
Explanation:
Electrons undergo random collisions but drift due to the applied electric field.

11. The specific resistance of a wire depends on:

(a) Length
(b) Cross-sectional area
(c) Temperature
(d) Shape

Answer: (c) Temperature
Explanation:
Resistivity is a material property, mainly affected by temperature.

12. When 1 A of current flows for 1 second, the total charge transferred is:

(a) 1 C
(b) 10 C
(c) 0.5 C
(d) 100 C

Answer: (a) 1 C
Explanation:
$Q = I \times t = 1 \times 1 = 1$ C

13. A copper wire and an iron wire of the same length and cross-sectional area are connected in series. Which has more resistance?

(a) Copper
(b) Iron
(c) Same
(d) Depends on temperature

Answer: (b) Iron
Explanation:
Iron has higher resistivity than copper → more resistance

14. A fuse wire should have:

(a) Low resistance and high melting point
(b) High resistance and high melting point
(c) High resistance and low melting point

(d) Low resistance and low melting point

Answer: (c) High resistance and low melting point
Explanation:
High resistance → heats quickly; low melting point → melts easily to break the circuit.

15. The quantity of charge flowing through a conductor in 2 minutes if current is 3 A is:

(a) 3 C
(b) 180 C
(c) 360 C
(d) 120 C

Answer: (c) 360 C
Explanation:
$Q = I \times t = 3 \times 120 = 360$ C

16. Kirchhoff's junction rule is based on:

(a) Conservation of energy
(b) Conservation of momentum
(c) Conservation of charge
(d) Ohm's law

Answer: (c) Conservation of charge
Explanation:
The total current entering a junction equals the total current leaving it, since charge is conserved.

17. In a series combination of resistors, the equivalent resistance is:

(a) Smaller than the smallest resistor
(b) Greater than the largest resistor
(c) Equal to the smallest resistor
(d) Product of all resistors

Answer: (b) Greater than the largest resistor
Explanation:
$R_{eq(series)} = R_1 + R_2 + ...$ so it's always greater than any individual resistance.

18. Two resistors of 2 Ω and 3 Ω are connected in parallel. The equivalent resistance is:

(a) 6 Ω
(b) 1.2 Ω
(c) 5 Ω
(d) 0.5 Ω

Answer: (b) 1.2 Ω
Explanation:
$1/R = 1/2 + 1/3 = 5/6 \rightarrow R = 6/5 = 1.2\ \Omega$

19. A 3 V battery is connected to a 6 Ω resistor. The power consumed is:

(a) 1.5 W
(b) 3 W
(c) 0.5 W
(d) 1 W

Answer: (a) 1.5 W
Explanation:
$P = V^2/R = 9/6 = 1.5$ W

20. The potential difference across a 10 Ω resistor carrying 2 A current is:

(a) 5 V
(b) 10 V
(c) 20 V
(d) 2 V

Answer: (c) 20 V
Explanation:
$V = IR = 2 \times 10 = 20$ V

21. A battery of EMF 6 V and internal resistance 1 Ω is connected to a 5 Ω resistor. The current is:

(a) 1 A

(b) 5 A
(c) 6 A
(d) 3 A

Answer: (a) 1 A
Explanation:
Total resistance = 5 + 1 = 6 Ω
I = EMF / R = 6 / 6 = 1 A

22. In the Wheatstone bridge, when the bridge is balanced:

(a) Current flows through the galvanometer
(b) No current flows through the galvanometer
(c) Current flows only through one arm
(d) Resistance becomes infinite

Answer: (b) No current flows through the galvanometer
Explanation:
In a balanced bridge, potential difference across galvanometer is zero.

23. In a balanced Wheatstone bridge, if all resistors are 10 Ω, the resistance between opposite corners is:

(a) 10 Ω
(b) 20 Ω
(c) 5 Ω
(d) 15 Ω

Answer: (c) 5 Ω
Explanation:
Use symmetry and equivalent resistance calculation across diagonals.

24. A battery of EMF E and internal resistance r gives maximum power to the external resistor when:

(a) R = r
(b) R > r
(c) R < r
(d) R = 0

Answer: (a) R = r
Explanation:
According to the maximum power transfer theorem, power is maximum when external resistance equals internal resistance.

25. A wire of resistance R is stretched to double its length. The new resistance becomes:

(a) 2R
(b) 4R
(c) R/2
(d) R/4

Answer: (b) 4R
Explanation:
$R \propto L^2$ (when volume remains constant), so new R = 4R.

26. The net resistance of three resistors 3 Ω, 6 Ω, and 9 Ω connected in series is:

(a) 2 Ω
(b) 18 Ω
(c) 6 Ω
(d) 3 Ω

Answer: (b) 18 Ω
Explanation:
R_total(series) = 3 + 6 + 9 = 18 Ω

27. In a meter bridge, the balancing point is found at 40 cm. If the resistance in the known arm is 12 Ω, the unknown resistance is:

(a) 12 Ω
(b) 8 Ω
(c) 18 Ω
(d) 24 Ω

Answer: (b) 8 Ω
Explanation:
$R_1/R_2 = L_1/L_2 \rightarrow X/12 = 40/60 \rightarrow X = 8\ \Omega$

28. Current density is given by:

(a) $J = I \times A$
(b) $J = A/I$
(c) $J = I / A$
(d) $J = I \times t$

Answer: (c) $J = I / A$
Explanation:
Current density is current per unit area.

29. If current I flows through a resistor R for time t, the heat produced is:

(a) $H = IR$
(b) $H = I^2Rt$
(c) $H = VIt$
(d) $H = V^2/R$

Answer: (b) $H = I^2Rt$
Explanation:
This is the Joule's law of heating.

30. Which of the following factors does NOT affect the resistance of a conductor?

(a) Length
(b) Cross-sectional area
(c) Temperature
(d) EMF of battery

Answer: (d) EMF of battery
Explanation:
Resistance is a material property. EMF only affects current, not resistance.

31. Three resistors of 3 Ω, 6 Ω, and 9 Ω are connected in parallel. What is the equivalent resistance?

(a) 18 Ω

(b) 2 Ω
(c) 6 Ω
(d) 1 Ω

Answer: (b) 2 Ω
Explanation:
1/R = 1/3 + 1/6 + 1/9 = (6 + 3 + 2)/18 = 11/18
R = 18/11 ≈ 1.64 Ω (closest to 2 Ω)

32. Two resistors R_1 = 6 Ω and R_2 = 3 Ω are connected in series across a 9 V battery. The voltage drop across R_2 is:

(a) 3 V
(b) 6 V
(c) 4.5 V
(d) 2 V

Answer: (a) 3 V
Explanation:
V_total = 9 V, R_total = 9 Ω
I = V/R = 9/9 = 1 A
$V_2 = I \times R_2 = 1 \times 3 = 3$ V

33. Two resistors of 5 Ω each are connected in parallel and then in series with a 10 Ω resistor. Find the total resistance.

(a) 5 Ω
(b) 15 Ω
(c) 12.5 Ω
(d) 7.5 Ω

Answer: (c) 12.5 Ω
Explanation:
Parallel: 1/R = 1/5 + 1/5 = 2/5 → R = 2.5 Ω
Total = 2.5 + 10 = 12.5 Ω

34. In a circuit, two resistors of 10 Ω each are connected in parallel. What is the power dissipated if 5 V is applied across them?

(a) 2.5 W
(b) 5 W
(c) 10 W
(d) 1.25 W

Answer: (b) 5 W
Explanation:
$R_{eq} = 5\ \Omega$.
$P = V^2 / R = 25 / 5 = 5$ W

35. A cell of emf 1.5 V and internal resistance 0.5 Ω is connected to a 2.5 Ω resistor. What is the current in the circuit?

(a) 1 A
(b) 0.5 A
(c) 0.75 A
(d) 1.5 A

Answer: (c) 0.75 A
Explanation:
$R_{total} = 2.5 + 0.5 = 3\ \Omega$
$I = 1.5 / 3 = 0.5$ A

(Corrected: Answer is (b) 0.5 A, not (c))

36. A potentiometer wire has length 1 m and resistance 10 Ω. A 5 V battery is connected across it. What is the potential gradient?

(a) 0.5 V/m
(b) 5 V/m
(c) 50 V/m
(d) 0.05 V/m

Answer: (a) 0.5 V/m
Explanation:
Potential gradient = $V / L = 5 / 10 = 0.5$ V/m

37. The potentiometer is preferred over voltmeter for measuring emf because:

(a) It is cheaper
(b) It does not draw current
(c) It is faster
(d) It is larger

Answer: (b) It does not draw current
Explanation:
This avoids loading the circuit, giving accurate emf readings.

38. A battery of emf 12 V is connected to a potentiometer wire of 4 m. The potential gradient is 3 V/m. The length needed to balance a cell of emf 1.5 V is:

(a) 2 m
(b) 0.5 m
(c) 1.5 m
(d) 3 m

Answer: (b) 0.5 m
Explanation:
L = emf / gradient = 1.5 / 3 = 0.5 m

39. A 20 Ω and 30 Ω resistors are connected in parallel. Find the current through the 30 Ω resistor when total current is 2 A.

(a) 0.8 A
(b) 1.2 A
(c) 0.5 A
(d) 1.5 A

Answer: (a) 0.8 A
Explanation:
Use current division rule:
$I_{30} = I \times (R\_total / R_{30})$
First find R_eq = 1/(1/20 + 1/30) = 12 Ω
V = I × R = 2 × 12 = 24 V
I_{30} = 24 / 30 = 0.8 A

40. If 3 resistors of 2 Ω, 4 Ω, and 6 Ω are connected in series, what fraction of total power is dissipated in the 4 Ω resistor?

(a) 1/2
(b) 1/3
(c) 1/6
(d) 1/4

Answer: (b) 1/3
Explanation:
Power in series: $P \propto R$
Total R = 12 Ω → Power in 4 Ω = 4/12 = 1/3

41. In a meter bridge, null point is found at 40 cm. The resistance in one gap is 6 Ω. What is the unknown resistance?

(a) 9 Ω
(b) 4 Ω
(c) 5 Ω
(d) 8 Ω

Answer: (b) 4 Ω
Explanation:
$R_1/R_2 = L_1/L_2 \rightarrow X/6 = 40/60 \rightarrow X = 4\ \Omega$

42. A wire is cut in two equal parts. If the original resistance is R, the resistance of each part is:

(a) R
(b) 2R
(c) R/2
(d) R/4

Answer: (c) R/2
Explanation:
$R \propto L$. Halving the length halves the resistance.

43. A wire has resistance R. It is stretched to triple its length. New resistance is:

(a) 3R
(b) 9R
(c) R/3
(d) R/9

Answer: (b) 9R
Explanation:
$R \propto L^2$ when volume is constant → $(3L)^2 = 9L^2$ → 9R

44. Internal resistance of a cell is determined using:

(a) Ammeter
(b) Voltmeter
(c) Potentiometer
(d) Galvanometer

Answer: (c) Potentiometer
Explanation:
Potentiometer measures emf and terminal voltage without drawing current.

45. Two resistors of 6 Ω and 12 Ω are connected in parallel. What is the percentage of total current through 6 Ω resistor?

(a) 33.3%
(b) 66.7%
(c) 25%
(d) 75%

Answer: (b) 66.7%
Explanation:
In parallel, current $\propto 1/R$.
So, $I_1/I\_total = 12 / (6 + 12) = 12 / 18 = 2/3 = 66.7\%$