13. Since 20 ohm and 30 ohm are in parallel, current in 10 ohm is $i_1 + i_2 = 5$ A.

14. Effective resistance of R_2, R_3, R_4 and the conductor is zero.

15. $R = \frac{Sl}{A}$

The resistors are in parallel. So, current devides in the inverse ratio.

16. $i = \frac{E}{R + r}$

17. $0.8 = \frac{nE}{R + nr}$ and $\frac{(n-2)E}{R + nr} = 0.7$

18. $i = \frac{net\ EMF}{net\ Resistance}$

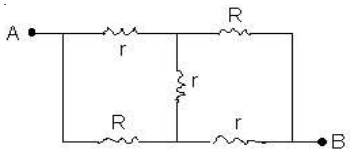
19. Apply Kirchhoff's voltage law.

20. Apply Kirchhoff's voltage law.

21. Apply $\frac{R}{X} = \frac{l_1}{l_2}$

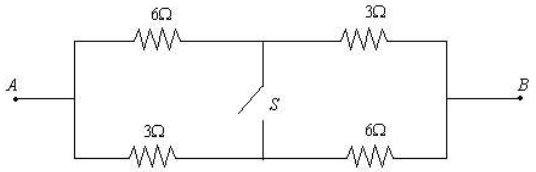
LEVEL - III

1. Equivalent resistance across A and B in the given circuit if $r = 10\,\Omega$, $R = 20\,\Omega$ is



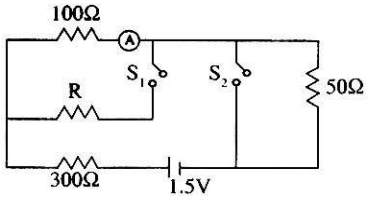
1) $7\,\Omega$ 2) $14\,\Omega$ 3) $35\,\Omega$ 4) $20/3\,\Omega$

2. The ratio of resistances between A and B before and after the switch 'S' is closed.



1) 9 : 8 2) 7 : 8 3) 2 : 3 4) 1 : 2

3. In the given circuit Ammeter reading is same when both switches S_1, S_2 are closed or opened. The value of resistance R is

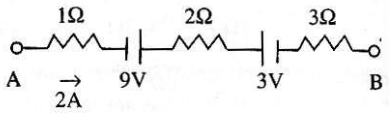


1) 200Ω 2) 100Ω 3) 400Ω 4) 600Ω

4. Four wires made of same material have different lengths and radii. The wire having more resistance in the following is

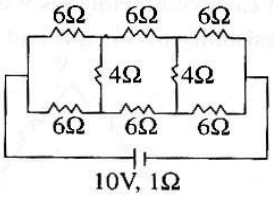
1) l = 100 cm r = 1 mm
2) l = 50 cm r = 2 mm
3) l = 100 cm r = 1/2 mm
4) l = 50 cm r = 1/2 mm

5. The potential difference between A & B in the given branch of a circuit is



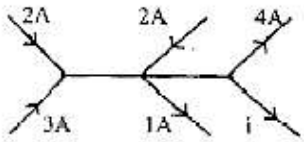
1) 6V 2) 12V 3) 9V 4) 0V

6. Current in the main circuit shown is



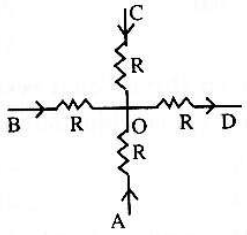
1) 1.5 A 2) 2 A 3) 0.6 A 4) 1 A

7. Value of 'i' in the given branch is



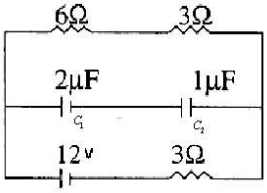
1) 4A 2) 2A 3) 1A 4) 3A

8. The given four terminal network is a part of larger circuit. The points A, B, C are at the same potential. The pd between any one of A, B or C and D is 40V. The pd between A & O is



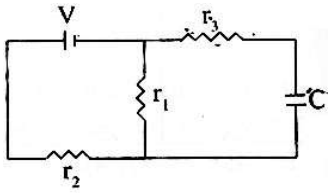
1) 10 V 2) 15 V 3) 18 V 4) 20 V

9. The charge stored in each capacitor C_1 and C_2 in the circuit shown below are



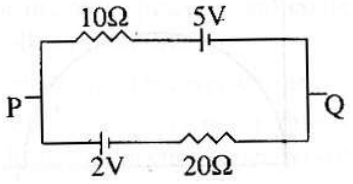
1) 6μC, 6μC 2) 6μc, 3μC
3) 3μC, 6μC 4) 3μc, 3μC

10. In the given circuit, the steady state voltage drop across the capacitor C is



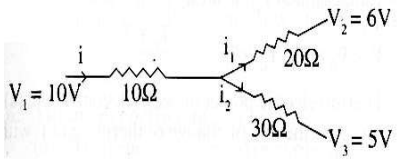
1) $\frac{Vr_1}{r_2+r_3}$ 2) $\frac{Vr_2}{r_1+r_3}$ 3) $\frac{Vr_1}{r_1+r_2}$ 4) $\frac{Vr_2}{r_1+r_2}$

11. If the resistance of cells are negligible, the pd between the points P and Q is



1) 4V 2) 8V 3) 3.5V 4) 5V

12. The current 'i' in the given branch of circuit is



1) 0.1 A 2) 0.2 A 3) 0.5 A 4) 0.4 A

13. An Aluminium ($\alpha = 4 \times 10^{-3} K^{-1}$) resistance R_1 and a carbon ($\alpha = -0.5 \times 10^{-3} K^{-1}$) resistance R_2 are connected in series to have a resultant resistance of 36 Ω at all temperatures. The values of R_1 and R_2 in Ω respectively are :

1) 32, 4 2) 16, 20 3) 4, 32 4) 20, 16

14. Aluminium ($\alpha = 4 \times 10^{-3} K^{-1}$) resistance of 60Ω and carbon ($\alpha = -0.5 \times 10^{-3} K^{-1}$) resistance 40Ω are connected in parallel. The combination is heated. The effective resistance is

1) Greater than 24 Ω 2) Less than 24 Ω
3) Greater than 40 Ω 4) Greater than 100 Ω

15. A copper tube is of internal radius 4mm and outer radius 5mm. Its resistance is R_1. The tube is filled with suitable copper wire. The resistance of the arrangement is R_2. Then R_2/R_1 is

1) 25/9 2) 1/2 3) 4 4) 9/25

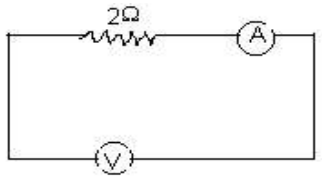
16. A resistance is made by connecting two wires (series) of same material of radii 2 mm and 5 mm and length 8 cm and 5 cm. A potential difference of 22V is applied to them. The potential difference on the longer wire is

1) 15 V 2) 18 V 3) 16 V 4) 20 V

17. The combined resistance of two conductors in series is 1Ω. If the conductance of one conductor is 1.1 siemen, the conductance of the other conductor in siemen is

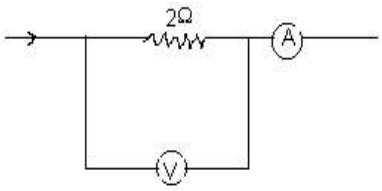
1) 10 2) 11 3) 1 4) 1.1

18. If the voltmeter reads 0.21V and the ammeter reads 0.1A, the resistance of the ammeter is (in ohm)



1) 0.01 2) 0.15 3) 0.2 4) 0.1

19. If the voltmeter reads 0.2 V and the ammeter reads 0.101A, the resistance of the voltmeter is (in ohm)



1) 500 2) 1000 3) 200 4) 400

KEY

1.2	2.1	3.4	4.3	5.1
6.4	7.2	8.1	9.1	10.3
11.1	12.3	13.3	14.2	15.4
16.4	17.2	18.4	19.3	

HINTS

1. $R^1 = r\left[\frac{3R+r}{3r+R}\right]$

2. Apply Kirchhoff's voltage law to both the meshes.

3. When S_1 and S_2 are opened, $i = \frac{1.5}{450}$ ..... (1)

When S_1 and S_2 are closed,

$i = \frac{1.5[100+R]}{400R+30{,}000}$ ..... (2)

Solve for R from (1) and (2).

4. $\frac{l}{r^2}$ must be maximum.

5. Using, Kirchhoff's voltage law 2-9+4-3+6 = 6 V.

6. $i = \frac{E}{R+r}$; $R = \frac{18}{2} = 9$ ohm.

7. Apply Kirchhoff's current law.

8. OA, OB & OC are in parallel and OD is in series to all.

9. $i = \frac{E}{R_{eff}} = 1$ A.

Potential difference across the capacitors is 9 V.

$\therefore$ Charge $Q = [C_{eff}]\,V$.

10. Current $i = \frac{V}{r_1 + r_2}$

$\therefore$ potential difference across the capacitor $C = ir_1$.

11. $V = E - ir$.

12. $4 = 10i + 20i_1$ where $i = i_1 + i_2$

$5 = 10i + 30i_2$

13. $R_1\alpha_1 = R_2\alpha_2$ and $R_1 + R_2 = 36$ ohm.

14. Here resistances are in parallel, Effective resistance will be less than the least.

15. $\frac{R_2}{R_1} = \frac{r_2^2 - r_1^2}{r_2^2}$.

16. Apply Ohm's law.

17. $R_1 + R_2 = 1$ ohm.

$\frac{1}{R_1} = 1.1 \Rightarrow R_1 = \frac{10}{11}$

$R_2 = 1 - R_1 \quad \therefore \frac{1}{R_2} = \frac{1}{1 - R_1}$

18. $(2+x)(0.1) = 0.21$ solve for 'x'.

19. $\left[\frac{2x}{2+x}\right](0.101) = 0.2$ solve for 'x'.

PREVIOUS EAMCET QUESTIONS

1. A conductor of resistance $3\,\Omega$ is stretched uniformly till its length is doubled. The wire now is bent in the form of an equilateral triangle. The effective resistance between the ends of any side of the triangle in ohms is [2002 (E)]

1) $\frac{9}{2}$ 2) $\frac{8}{3}$ 3) 2 4) 1

2. A uniform conductor of resistance R is cut into 20 equal pieces. Half of them are joined in series and the remaining half of them are connected in parallel. If the two combinations are joined in series, the effective resistance of all the pieces is [2002 (E)]

1) R 2) $\frac{R}{2}$ 3) $\frac{101R}{200}$ 4) $\frac{201R}{200}$

3. The balancing length for a cell is 560 cm in a potentiometer experiment. When an external resistance of $10\,\Omega$ is connected in parallel to the cell, the balancing length changes by 60cm. The internal resistance of the cell in ohms is [2002 (E)]

1) 1.6 2) 1.4 3) 1.2 4) 0.12

4. The sides of a rectangular block are 2cm, 3cm and 4cm. The ratio of the maximum to minimum resistance between its parallel faces is [2002 (M)]

1) 4 2) 3 3) 2 4) 1

5. Three equal resistances each of $3\,\Omega$ are in series and connected to a cell of internal resistance one ohm. If these resistances are in parallel and connected to the same cell, then the ratio of the respective currents through the electric circuits in the two cases is [2002 (M)]

1) $\frac{1}{8}$ 2) $\frac{1}{7}$ 3) $\frac{1}{5}$ 4) $\frac{1}{3}$

6. In potentiometer experiment a cell of emf. 1.5 V connected in the secondary circuit gives a balancing length of 165cm of the wire. If a resistance of $5\,\Omega$ is connected parallel to the cell, the balancing length of the wire is 150cm. The internal resistance of the cell is [2002 (M)]

1) $5\,\Omega$ 2) $1.5\,\Omega$ 3) $1\,\Omega$ 4) $0.5\,\Omega$

7. A nichrome wire 50cm long and one square millimeter cross-section carries a current of 4A when connected to a 2V battery. The resistivity of nichrome wire in ohm-meter is [2002 (M)]

1) 1×10^{-6} 2) 4×10^{-7} 3) 3×10^{-7} 4) 2×10^{-7}

8. When a resistor of $11\,\Omega$ is connected in series with an electric cell, the current flowing in it is 0.5A. Instead when a resistor of $5\,\Omega$ is connected to the same electric cell in series, the current increases by 0.4A. The internal resistance of the cell is [2002 (M)]

1) $1.5\,\Omega$ 2) $2\,\Omega$ 3) $2.5\,\Omega$ 4) $3.5\,\Omega$

9. An ideal battery of emf 2V and a series resistance R are connected in the primary circuit of a potentio meter of length 1m and resistance $5\,\Omega$. The value of R to give a potential difference of 5mV across the 10cm of potentiometer wire is [2002 (M)]

1) $180\,\Omega$ 2) $190\,\Omega$ 3) $195\,\Omega$ 4) $200\,\Omega$

10. Two wires of equal diameters, of resistivities ρ_1, ρ_2 and lengths x_1 and x_2 respectively are joined in series. The equivalent resistivity of the combination is [2002 (E)]

1) $\frac{\rho_1 x_1 + \rho_2 x_2}{x_1 + x_2}$ 2) $\frac{\rho_1 x_2 - \rho_2 x_1}{x_1 - x_2}$

3) $\frac{\rho_1 x_2 + \rho_2 x_1}{x_1 + x_2}$ 4) $\frac{\rho_1 x_1 - \rho_2 x_2}{x_1 - x_2}$

11 Four resistances $10\,\Omega$, $5\,\Omega$, $7\,\Omega$ and $3\,\Omega$ are connected so that they form the sides of a rectangle AB, BC, CD and DA respectively. Another resistance of $10\,\Omega$ is connected across the diagonal AC. The equivalent resistance between A and B is [2000 (M)]
1) $2\,\Omega$ 2) $5\,\Omega$ 3) $7\,\Omega$ 4) $10\,\Omega$

12. If an electron revolves in the path of a circle of radius 0.5×10^{-10} m at a frequency of 5×10^{15} cycles/s, the electric current in the circle is (charge of an electron = 1.6×10^{-19} C) 2000 (M)
1) 0.4mA 2) 0.8mA 3) 1.2mA 4) 1.6 mA

13. In a meter bridge, the gaps are closed by resistances 2 and 3 ohms. The value of shunt to be added to 3 ohm resistor to shift the balancing point by 22.5 cm is 1999 (E)
1) $1\,\Omega$ 2) $2\,\Omega$ 3) $2.5\,\Omega$ 4) $5\,\Omega$

14. A wire of resistance $10\,\Omega$ is elongated by 10%. The resistance of the elongated wire is (1998 E)
1) $11\,\Omega$ 2) $11.1\,\Omega$ 3) $12.1\,\Omega$ 4) $13.1\,\Omega$

15. In a meter bridge, the balancing length from the left end (standard resistance of one ohm is in the right gap) is found to be 20cm. The value of the unknown resistance is 1998 (E)
1) $0.3\,\Omega$ 2) $0.25\,\Omega$ 3) $0.4\,\Omega$ 4) $0.5\,\Omega$

16. The electrical resistance of a mercury column in a cylindrical container is R. When the same mercury is poured into another cylinderical container twice the radius of cross-section, the resistance of mercury column row is 1998 (M)
1) $\frac{R}{2}$ 2) $\frac{R}{4}$ 3) $\frac{R}{6}$ 4) $\frac{R}{16}$

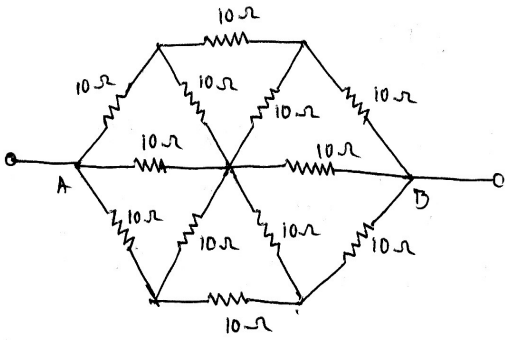
17. A $3\,\Omega$ resistor and a $6\,\Omega$ resistor are connected in parallel and the combination is connected in series to a battery of 5V and a $3\,\Omega$ resistor. What is the potential difference across the $6\,\Omega$ resistor? 1998 (M)
1) 2V 2) 4V 3) 3V 4) 1V

18. The emf of a Daniel cell is 1.08V. When the terminals of the cells are connected to a resistance of $3\,\Omega$, the potential difference across the terminals is found to be 0.6V. Then the internal resistance of the cell is 1997 (E)
1) $1.8\,\Omega$ 2) $2.4\,\Omega$ 3) $3.24\,\Omega$ 4) $0.2\,\Omega$

19. The potential difference across the terminals of a battery is 50V when 11A are drawn and 60V when 1A is drawn. The emf and the internal resistance of the battery are 1996 (E)
1) 62V ; 2ohm 2) 63V ; 1 ohm
3) 61V ; 1 ohm 4) 64V ; 2 ohm

20. If in a Wheatstone bridge the battery and Galvanometer are interchanged, the condition for balance 1996 (E)
1) is disturbed 2) is not disturbed
3) depends on the internal resistance of the bridge
4) depends on the values of the resistances in the bridge.

21. 12 resistors each of $10\,\Omega$ are connected as shown in figure. The effective resistance between A and B is 1996 (M)



1) $120\,\Omega$ 2) $8\,\Omega$ 3) $12\,\Omega$ 4) $10\,\Omega$

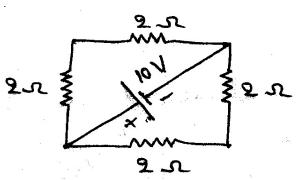
22. Four bulbs each marked 40W, 250V are connected in series with a 250V source. The total power out put is 1995 (E)
1) 10W 2) 40W 3) 160W 4) 320W

23. A uniform wire of $16\,\Omega$ resistance is made into the form of a square. Two opposite corners of the square are connected by a wire of resistance $16\,\Omega$. The effective resistance between the other two opposite corners is 1995 (M)
1) $32\,\Omega$ 2) $16\,\Omega$ 3) $8\,\Omega$ 4) $4\,\Omega$

24. If six identical cells each having an emf of 6V are connected in parallel, the emf of the combination is 1995 (M)
1) 1V 2) 36V 3) $\frac{1}{6}$ V 4) 6V

25. A current is passed through two coils connected in series. The potential difference across the first coil is 3 V and that of the second coil 4.5V. If the first coil has a resistance of 2 ohms, the resistance of the second coil is 1994 (E)
1) 3 Ω 2) 5 Ω 3) 7 Ω 4) 9 Ω

26. Four 2 ohm resistors are connected together along the edges of a square. A 10V battery of negligible internal resistance is connected across a pair of the diagonally opposite corners of the square. The power dissipated in the circuit is 1992 (E)



1) 100 W 2) 50W 3) 25W 4) 20W

27. In a hydrogen atom an electron makes 6.6×10^{15} rev /sec, around the nucleus. Then its equivalent current is [EAMCET 89E]
1. 1.06×10^{-3} amp 2. 4×10^{3} amp
3. 4.6×10^{-4} amp 4. 1.06×10^{-4} amp

28. The value of internal resistance of ideal cell is [EAMCET 89M]
1. Zero 2. infinite 3. 1 Ω 4. none

29. If a copper wire is stretched to make it 0.1% longer, the % change in the resistance is [EAMCET 89E]
1. 0.3% 2. 0.2% 3. 0.1% 4. 0.02%

30. Two resistances 6 and 12 ohms are connected in parallel to a battery of 10Volts. The current in 12 ohm resistor is
1. 5/6 2. 6/5 3. 4/3 4. 3/4

31. Two conductors of resistance 2R and R are connected in series in a battery circuit. The ratio of heats developed in them is [EAMCET 87E]
1. 1 : 2 2. 1 : 1 3. 2 : 1 4. 1 : 4

32. Three equal resistors connected in series across a source of e.m.f together dissipate 10W power. The power dissipated if the same resistors are connected in parallel across the same source of emf is [EAMCET 86E]
1. 10W 2. 30W 3. 90W 4. 60W

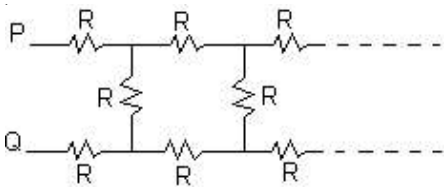
33. In a meter bridge experiment the null deflection is obtained at a length of 25cm. When a standard resistance of 5 ohm is employed. The value of resistance in the left gap is [EAMCET 86M]
1. 2 Ω 2. 1.66 Ω 3. 4 Ω 4. 1.2 Ω

34. The unit of an electrical parameter whose formula is $M^1L^2T^{-3}A^{-2}$ is [EAMCET 86M]
1. ohm 2. ampere 3. volt 4. farad

35. Two cells of the same e.m.f are in series with an external resistance R. The internal resistance r, is greater than r_2, the pd across the first cell is found to be zero. Then the value of R is [EAMCET 85E]
1. $r_1 + r_2$ 2. $r_1 - r_2$ 3. $\frac{r_1 + r_2}{2}$ 4. $\frac{r_1 - r_2}{2}$

36. Two resistors when connected in parallel across a cell of negligible internal resistance use fourtimes the power that they would use when connected in series across the same cell. If one of the resistors has a resistance of 10 Ω the resistance of the other is [EAMCET 85E]
1. 10 Ω 2. 5 Ω 3. 12 Ω 4. 20 Ω

37. The equivalent resistance between the terminals P and Q of infinite network as shown in the figure is [EAMCET 85E]



1. $\sqrt{R}$ 2. $\left(1+\sqrt{3}\right)R$
3. $\left(2+\sqrt{3}\right)R$ 4. infinite

38. Two wires are as follows. The resistivities, the lengths and radii are in the ratio 2:3, 3:5 and 2:7 respectively. Their resistance are in the ratio of [EAMCET 84M]
1. 49:10 2. 7:2 3. 2:4 4. 1:2

39. A potential difference of 2V exists across a potentiometer wire of 2m is length. When the potential difference across a 2Ω resistance of a second circuit is measured by the potentiometer wire, it amounts to 5 mm balancing lenght. The current in the second circuit is [EAMCET 84E]
1. 2.5 mA 2. 3 mA 3. 4.5 mA 4. 1 mA

40. Four equal resistances of 'R' ohm each are connected in the from of a square. The effective resistance between any two adjacent corners of the square is ..... ohm [EAMCET 83E]
1. R/4 2. 3R/4 3. 2R 4. R

41. In a circuit two or more cells of the same e.m.f are connected in parallel in order [EAMCET 83M]
1. Increases the pd across a resistance in the circuit.
2. Decreases pd across a resistance in the circuit
3. Facilitate drawing more current from the battery system
4. Change the e.m.f across the system of batteries

42. Two equal resistances are connected in series and parallel combination. The ratio of resistances in parallel and series combination is [EAMCET 82E]
1. 4 : 1 2. 1 : 4 3. 2 : 1 4. 1 : 2

43. If the current in a source of e.m.f is in the direction of e.m.f, the energy of the source [EAMCET 82M]
1. increases 2. decreases
3. remains constant 4. zero

KEY

1.2	2.3	3.3	4.1	5.3
6.4	7.1	8.3	9.3	10.1
11.2	12.2	13.2	14.3	15.2
16.4	17.1	18.2	19.3	20.2
21.2	22.1	23.4	24.4	25.1
26.2	27.1	28.1	29.2	30.1
31.3	32.3	33.2	34.1	35.2
36.1	37.2	38.1	39.1	40.2
41.3	42.2	43.2		

NEW PATTERN QUESTIONS

1. Match list - I with List - II

List - I	List - II
a) Thermistor	e) High positive 'α'
b) Carbon	f) α almost zero
c) Nichrome	g) either positive or negative 'α'
d) Costantan, manganin	h) Negative 'α'

1) a-g, b-h, c-e, d-f 2) a-h, b-g, c-e, d-f
3) a-e, b-f, c-g, d-h 4) a-e, b-g, c-h, d-f

2. Match list - I with List - II

List - I	List - II
a) Charging cell	e) V=O
b) Discharging cell	f) V = E
c) Cell short circuited	g) V<E
d) Cell in open circuit	h) V>E

1) a-g, b-h,c-e,d-f 2) a-g, b-e,c-h,d-f
3) a-f, b-g, c-h, d-e 4) a-h,b-g,c-e,d-f

03. The following table gives the lengths of three coppor rods, their diameters. The resistances between the two ends of the rod arranged in ascending order

Rod	Length	Diameter
A	l	d
B	$2l$	$d/2$
C	$l/2$	d
D	l	$d/2$

1) A, B, C, D 2) C, A, B, D
3) C, A, D, B 4) C, B, D, A

04. The following table gives the current i through two devices for several values of potential difference V

Device 1		**Device 2 (SI Units)**	
V	I	V	I
2	4.5	2	1.5
3	6.75	3	2.2
4	9.0	4	2.8

1) Device 1 is ohmic, device 2 is non ohmic
2) Device 1 is non ohmic, device 2 is ohmic
3) Both are non ohmic 4) Both are ohmic

05. (A) : Bending of a conducting wire effects electrical resistance.
(R) : Resistance of a wire depends on resistivity of that material.
1) Both A & R are true and R is the correct explanation of A
2) Both A & R are true and R is not a correct explanation of A
3) A is true but R is false
4) A is false but R is true

06 Assertion (A) : When the radius of a copper wire is doubled, its specific resistance gets increased.
Reason (R) : Specific resistance is independent of cross-section of material used
1) Both A & R are true and R is the correct explanation of A
2) Both A & R are true and R is not a correct explanation of A
3) A is true but R is false 4) A is false but R is true

07. A : The e.m.f of the cell in secondary circuit must be less than e.m.f of cell in primary circuit in potentiometer.
R : Balancing length cannot be more than length of potentiometer wire.
1) Both A & R are true and R is the correct explanation of A
2) Both A & R are true and R is not a correct explanation of A
3) A is true but R is false 4) A is false but R is true

08 Out of the statements : A) The potential difference across battery may be equal to its emf (B) The potential differences across battery may be greater than its emf (C) The potential difference across battery may be less than its emf
1) A and B are correct, C is wrong
2) A is correct, B and C are wrong
3) B is correct, A and C are worng
4) A,B and C are correct

09. (A) : To draw more current at low P.d; Parallel connection of cells is preferred.
(R) : In parallel connection, current $i = \frac{nE}{r}$, if $r >>$ R.
1) Both A & R are true and R is the correct explanation of A
2) Both A & R are true and R is not a correct explanation of A
3) A is true but R is false 4) A is false but R is true

10. (A) : In a metrebridge ; copper wire is connected in the left gap and silicon is connected in the right gap, when the temp of both wires increase, balancing point shifts to right.
(R) : Temperature coeficient of copper is (-)Ve and that of silicon is (+) Ve.
1) Both A & R are true and R is the correct explanation of A
2) Both A & R are true and R is not a correct explanation of A
3) A is true but R is false 4) A is false but R is true

11. Assertion (A) : Meterbridge wire is made up of manganin
Reason (R) : The temperature coeffiecient of resistance is very small for manganin
1) Both A & R are true and R is the correct explanation of A
2) Both A & R are true and R is not a correct explanation of A
3) A is true but R is false 4) A is false but R is true

12. Sensitivity of potentiometer can be increased by
a) increasing series resistance in the primary circuit
b) decreasing the length of potentiometere wire
c) using thin and high resistivity wire as potentiometer wire
d) increasing the length of the wire
1) a and c are correct 2) b and d are correct
3) b and c are correct 4) a and d are correct

KEY

1.1	2.4	3.2	4.1	5.2
6.4	7.1	8.4	9.1	10.3
11.1	12.4			