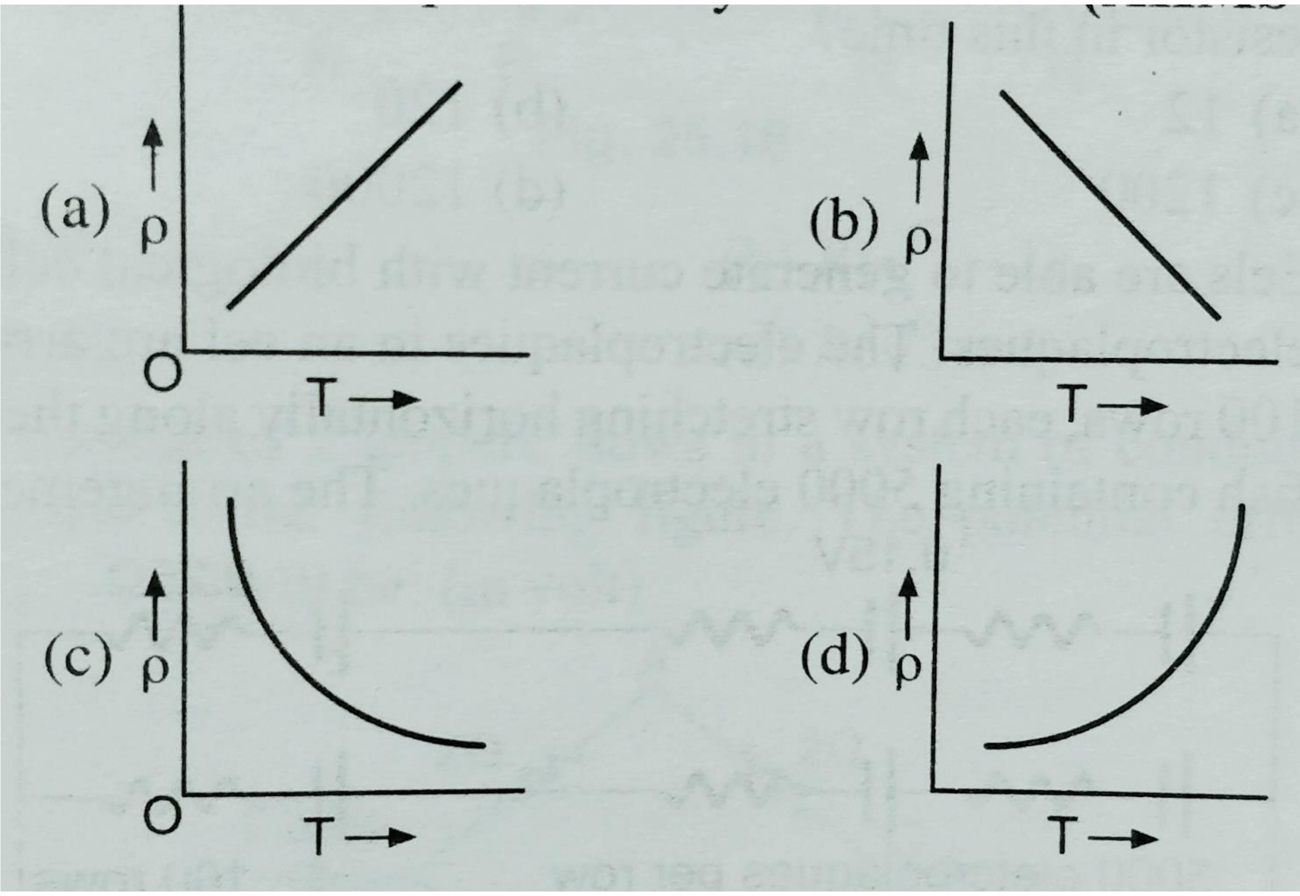
Ohm's Law, Kirchhoff's Laws and DC Circuits

1. For which of the following dependence of drift velocity υ on electric field E is ohm's law obeyed?
   (a) $\upsilon \propto E$ (b) υ = constant (c) $\upsilon \propto E^{1/2}$ (d) $\upsilon \propto E^2$
2. in metals the time of relaxation of electrons:
   (a) increases with increasing temperature
   (b) decreases with increasing temperature
   (c) does not depend on temperature
   (d) changes suddenly at 400 K
3. Constantan wire is used for making standard resistance because it has:
   (a) low specific resistance
   (b) high specific resistance
   (c) negligible temperature coefficient of resistance
   (d) high melting point
4. A potential difference is applied across the ends of a metallic wire. If the potential difference is doubled, the drift velocity:
   (a) will be doubled (c) will be quadrupled
   (b) will be halved (d) will remain unchanged
5. The maximum current that flows in the fuse wire, before it blow out, varies with the radius r as:
   (a) $r^{3/2}$ (b) r (c) $r^{2/3}$ (d) $r^{1/2}$
6. A wire of resistance R is cut into n equal parts. These parts are then connected in parallel. The equivalent resistance of the combination will be:
   (a) nR (b) R/n (c) n/R (d) R/n^2
7. The masses of three wires of copper are in the ratio of 1 : 3 : 5 and their lengths are in the ratio 5 : 3 : 1. The ratio of their electrical resistances is:
   (a) 1 : 3 : 5 (b) 5 : 3 : 1 (c) 1 : 15 : 125 (d) 125 : 15 : 1
8. Kirchhoff's first law is based on the law of conservation of:
   (a) charge (b) energy (c) momentum (d) sum of mass and energy
9. Kirchhoff's second law is based on the law of conservation of:
   (a) charge (b) energy (c) momentum (d) sum of mass and energy
10. A call of emf E is connected across a resistance r. The potential difference between the terminal of the cell is found to be V. The internal resistance of the cell must be:
    (a) 2(E – V)V/r (b) 2(E – V)r/E (c) (E – V)r/V (d) (E – V)r

11.The temperature (T) dependence of resistivity (ρ) of a semiconductor is represented by:



12.A wire of resistance R is stretched till its radius is half of the original value. Then, the resistance of the stretched wire is:

(a) 2R (b)4R (c)8R (d)16R

13.A wire of resistance R is stretched till is length is double of the original wire.

Then the, resistance of the stretched wire is:

(a)2R (b)4R (c)8R (d)16R

14.If a copper wire is stretched to make it 0.1% longer, then the percentage

Change in resistance is approximately:

(a)0.1% (b)0.2% (c)0.4% (d)0.8%

15.If a copper wire is stretched to make it radius decrease by 0.1% ,then the

Percentage in increase in resistance is approximately:

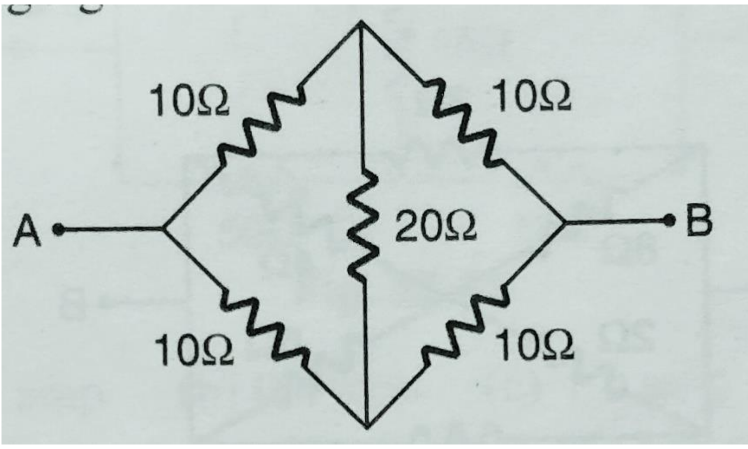
(a)0.1% (b)0.2% (c)0.4% (d)0.8%

16.A cell of emf E and internal resistance r is connected in series with an external

resistance nr . the, the ratio of the terminal potential difference to emf is:

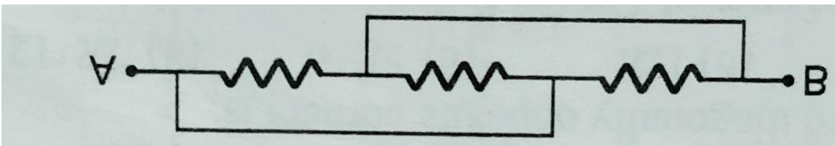
(a) (1/n) (b) 1/(n+1) (c)n/(n+1) (d) (n+1)/n

17.The equivalent resistance between the points A and B in the following figure is:



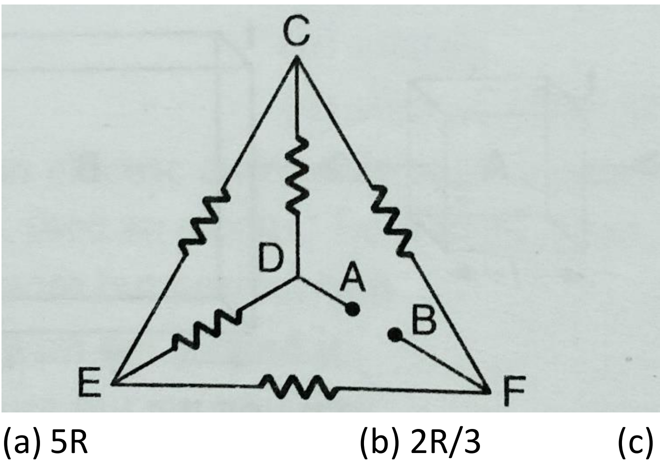
(a) 10Ω (b) 20Ω (c) 40Ω (d) 5Ω

18.Three equal resistors, each equal to R, are connected as shown in the following figure, then the equivalent resistance between points A and B is:



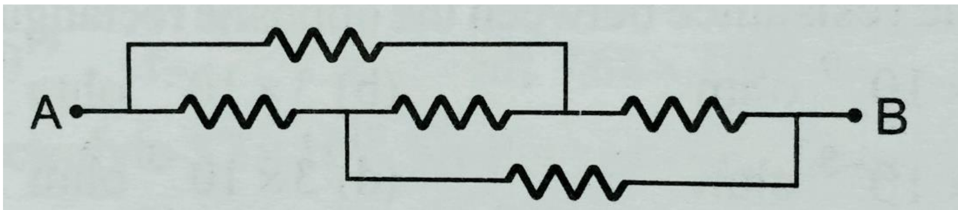
(a) R (b) 3R (c) R/3 (d) 2R/3

19.In the given network of resistors, each of resistance R ohm, the equivalent resistance between points A and B is:



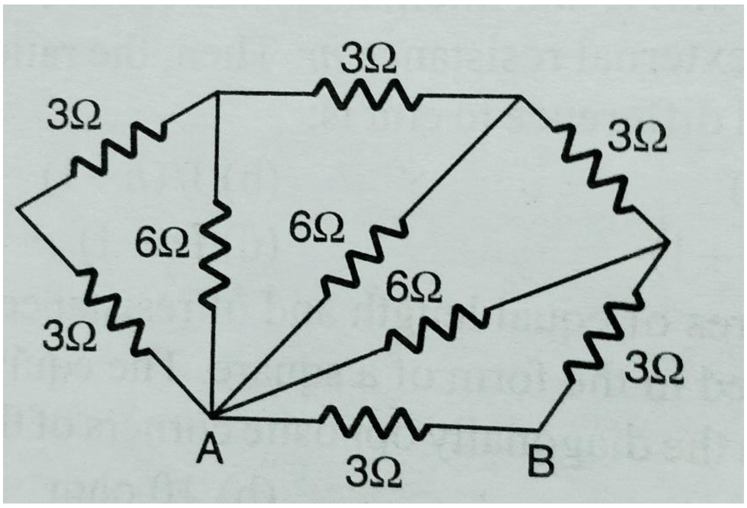
(a) 5R (b) 2R/3 (c) R (d) R/2

20. Five equal resistors, each equal to R, are connected as shown in the following figure; then the equivalent resistance between points A and B is:



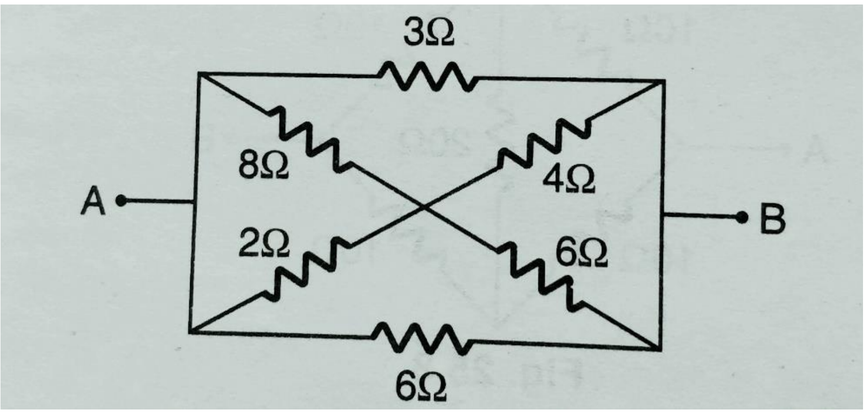
(a) R (b) 5R (c) R/5 (d) 2R/3

21. The resistances in the following figure are in ohm. Then, the effective resistance between the points A and B is:



(a) 3Ω (b)2Ω (c) 6 (d) 36Ω

22. In the following figure, the equivalent resistance between A and B is : (figure



(a) (17/24)Ω (b) (4/3)Ω (c) 29Ω (d) (24/17)Ω

23. Two wires of same metal have same length but their cross-sections are in the ratio 3 : 1. They are joined in the series. The resistance of the thicker wire is 10Ω. The total resistance of the combination will be:

(a) (5/2) Ω (b) (40/3) Ω (c) 40 Ω (d) 100 Ω

24. The tolerance level of a resistor with the colour code red, blue, orange, gold is:

(a) ± 5% (b) ± 10% (c) ± 20% (d) ± 40% (e) ± 30%

25. Two cells of emfs E_1 and E_2 and internal resistances r_1 and r_2 are connected in parallel. Then, the emf and internal resistance of the equivalent source is:

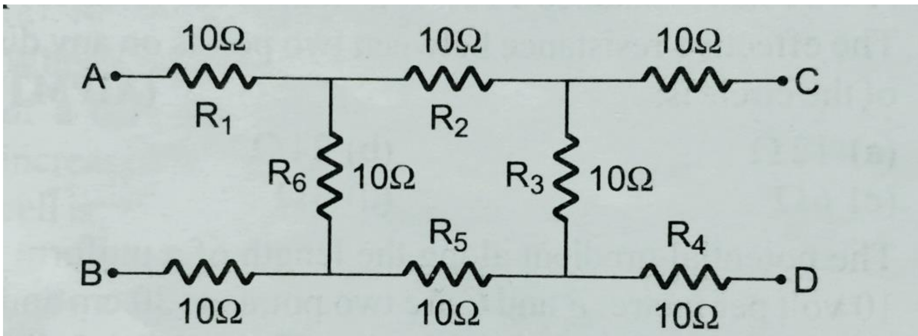
(a) $E_1 + E_2$ and $r_1r_2/r_1 + r_2$ (c) $E_1r_2 + E_2r_1/r_1 + r_2$ and $r_1r_2/r_1 + r_2$

(b) $E_1 - E_2$ and $r_1 + r_2$ (d) $E_1r_2 + E_2r_2/r_1 r_2$ and $r_1 + r_2$

26.A wire has resistance 12Ω. It is bent in the from of a circle. The effective resistance between two points on any dimeter of the circle is:

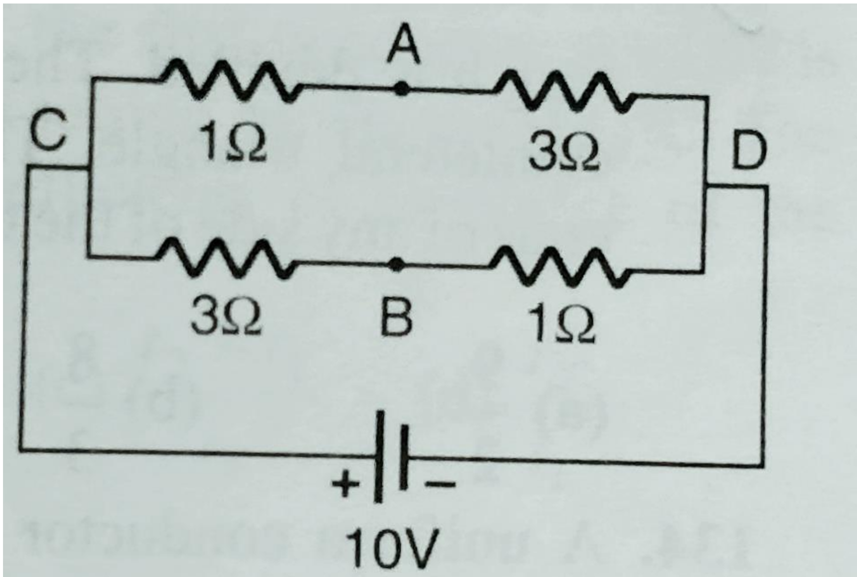
(a) 12 Ω (b) 24 Ω (c) 6 Ω (d) 3 Ω

27.What will be the equivalent resistance between the two points A and D?



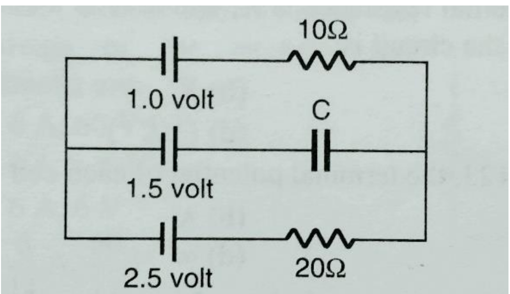
(a) 10 Ω (b) 20 Ω (c) 30 Ω (d) 40 Ω

28.A battery of emf 10 V is connected to resistance as shown in the figure. The potential difference between A and B, (V_A -V_B) is:



(a) -2V (b) 2V (c) 5V (d) (20/11)V

29.In the following circuit diagram the potential difference across the plates of the capacitor C is:

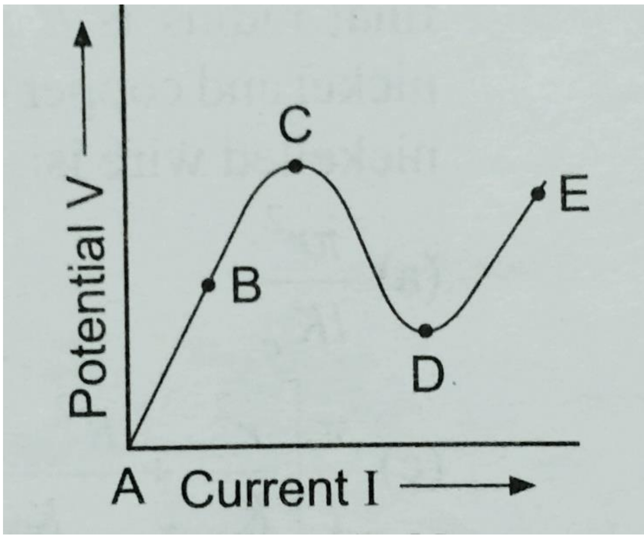


(a) 2.5 volt (b) 1.5 volt (c) 1.0 volt (d) zero

30. n cells of emfs E_1, E_2, E_3, ….., E_n and internal resistance r1, r2, r3,……, rn are connected in series to from a closed circuit with zero external resistance. For each cell the ratio of emf to internal resistance is K, where K is a constant; then current in the circuit is:

(a) (1/K) (b) K (c) K^2 (d) $(1/K^2)$

31. Which part represents the negative dynamic resistance?



(a) AB (b) BC (c) CD (d) DE

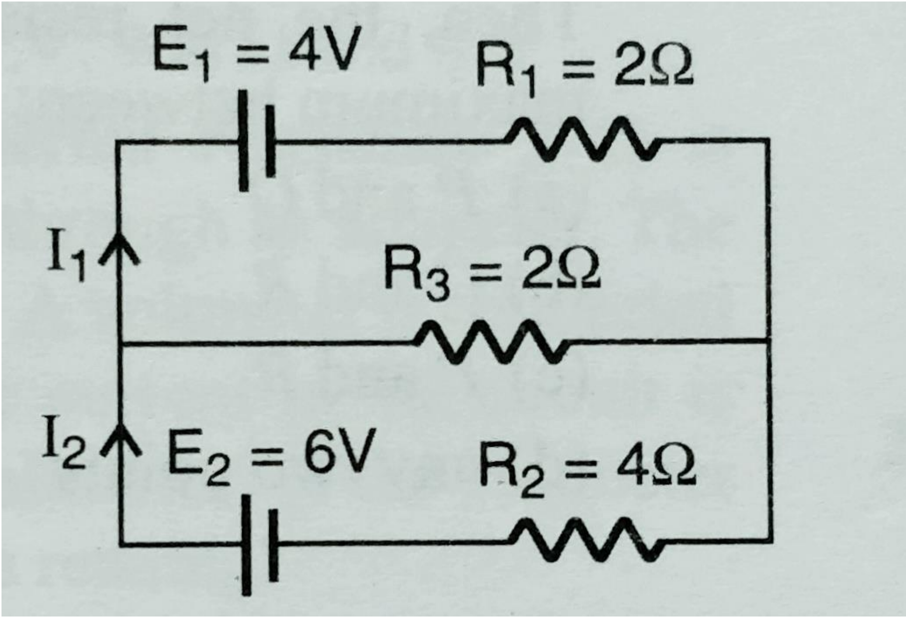
32. A conductor of resistance 3Ω is stretched uniformly till its length is doubled. The wire is now bent in the form of an equilateral triangle. The effective resistance between the ends of any side of the triangle (in ohm) is:

(a) 9/2 (b) 8/3 (c) 2 (d) 1

33. The sides of a rectangular block are 2cm, 3cm and 4cm. The ratio of maximum to minimum resistance between its parallel faces is:

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

34.In the circuit shown:



$E = 4.0V$, $R_1 = 2\Omega$,

$E_2 = 6.0V$, $R_2 = 4\Omega$

and $R_3 = 2\Omega$. The current I_1 is:

(a) 1.6 A

(b) 1.8 A

(c) 1.25 A

(d) 1.0 A

35.n cells each of emf E and internal resistance r send the same current through an external resistance R whether the cells are connected in series or in parallel. Then:

(a) R = nr (b) R = r (c) r = nR (d) $R = \sqrt{nr}$ (e) $r = \sqrt{nR}$

36.In a meter bridge with standard resistance of 5Ω in the left gap, the ratio of balancing lengths of meter bridge wire is 2 : 3. The unknown resistance is:

(a) 1 Ω (b) 15 Ω (c) 10 Ω (d) 33 Ω (e) 7.5 Ω

37.The electric resistance of a certain wire of iron is R. If its length and radius are both doubled, then:

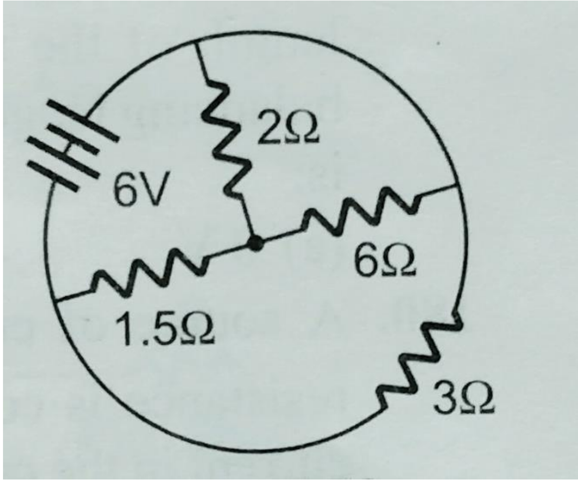
(a) the resistance will be doubled and the specific resistance will be halved

(b) the resistance will be halved and the specific resistance will remain unchanged

(c) the resistance will be halved and the specific resistance will be doubled

(d) the resistance and the specific resistance will both remain unchanged

38. The total current supplied to the circuit by the battery is:



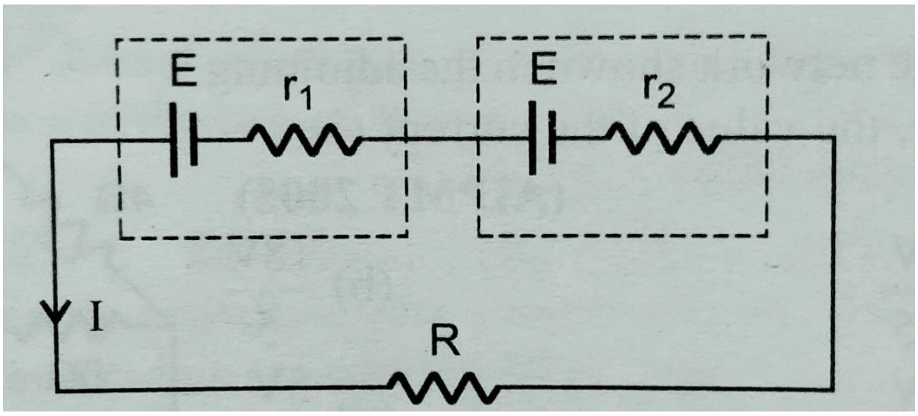
(a) 1 A

(b) 2 A

(c) 4 A

(d) 6 A

39. If the potential difference across the internal resistance r_1 is equal to the emf E of the battery, then:



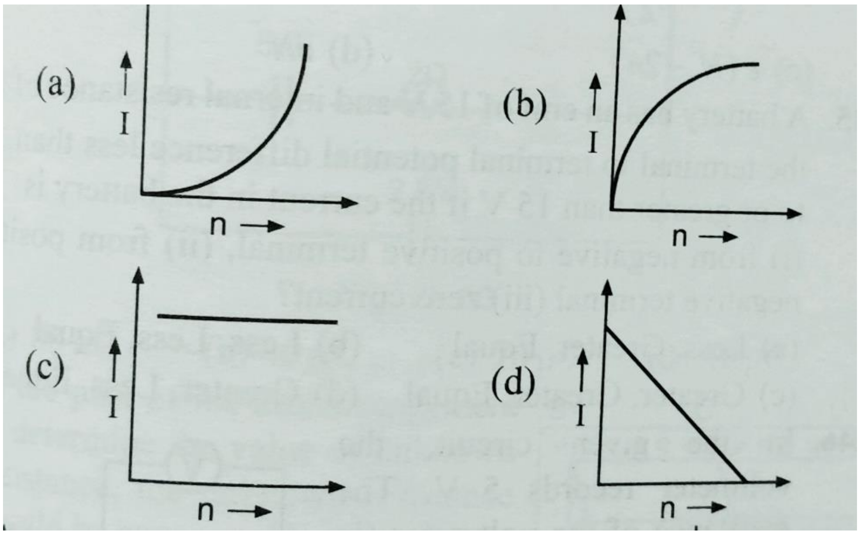
(a) $R = r_1 + r_2$ (b) $R = r_1/r_2$ (c) $R = r_1 - r_2$ (d) $R = r_2/r_1$

40. Potentiometer wire of length 1 m is connected in series with 490 Ω resistance and 2 V battery. If 0.2 mV/cm is the potential gradient, then resistance of the potentiometer wire is:

(a) 4.9 Ω (b) 7.9 Ω (c) 5.9 Ω (d) 6.9 Ω

41. A battery consists of a variable number (n) of identical cells, each having an internal resistance r connected in series. The terminals of the battery are short-circuited. A graph of current (I) in the circuit versus the number of cells

will be as shown in the following figure:



42.Two copper wires of length l and 2l have radii, r and 2r respectively. What is the ratio of their specific resistances?

(a) 1 : 2 (b) 2 : 1 (c) 1 : 1 (d) 1 : 3

43.Two wires have lengths, diameters and specific resistance all in the ratio of 1 : 2. The resistance of the first wire is 10 ohm. Resistance of the second wire (in ohm) will be:

(a) 5 (b) 10 (c) 20 (d) infinite

44.A carbon resistor is marked with the rings coloured brown, black, green and gold. The resistance (in ohm) is:

(a) $3.2 \times 10^5 \pm 5\%$

(b) $1 \times 10^6 \pm 10\%$

(c) $1 \times 10^7 \pm 5\%$

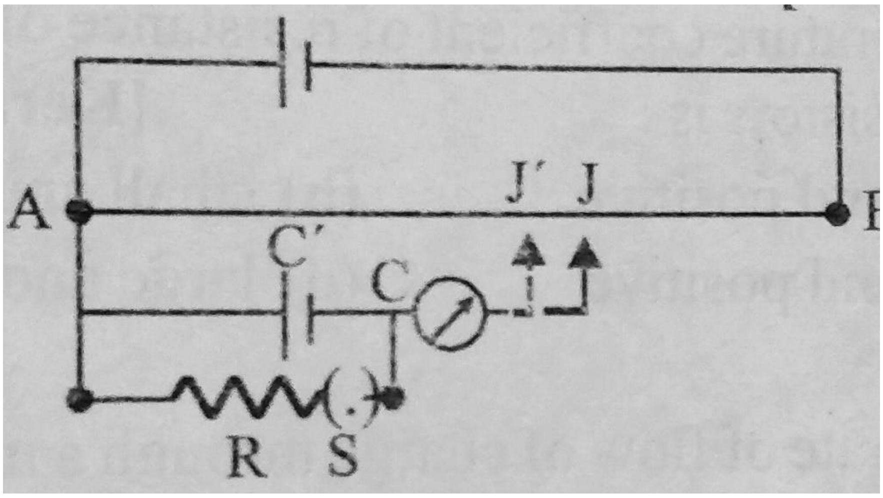
(d) $1 \times 10^6 \pm 5\%$

(e) $1 \times 10^5 \pm 5\%$

45.Two identical conductors maintained at different temperatures are given potential differences in the ratio 1 : 2. Then, the ratio of their drift velocities is:

(a) 1 : 2 (b) 3 : 2 (c) 1 : 1 (d) $1 : 2^{1/2}$ (e) 1 : 4

46.In the potentiometer circuit shown in the figure, the balance length AJ = 60 cm when switch S is open. When switch S is closed and the value of R = 5Ω, the balance length AJ' = 50 cm. The internal resistance of the cell C' is:



(a) 1.2 Ω (b) 1.0 Ω (c) 0.8 Ω (d) 0.6 Ω

47. A potentiometer wire is 100cm long and a constant potential difference is maintained across it. Two cells are connected in series first to support one another and then in opposite direction. The balance points end of the wire in the two cases. The ratio of emf's is:

(a) 5 : 1 (b) 5 : 4 (c) 3 : 4 (d) 3 : 2

Answers :-

1. (a),	21. (b),	41. (c),
2. (b),	22. (b),	42. (c),
3. (c),	23. (c),	43. (b),
4. (a),	24. (a),	44. (d),
5. (a),	25. (c),	45. (a),
6. (d),	26. (d),	46. (b),
7. (d)	27. (c),	47. (d),
8. (a),	28. (c),	
9. (b),	29. (d),	
10. (c),	30. (b),	

11. (b),

12. (d),

13. (b),

14. (b),

15. (c),

16. (c),

17. (a),

18. (c),

19. (c),

20. (a),

31. (c),

32. (b),

33. (a),

34. (b),

35. (b),

36. (e),

37. (b),

38. (c),

39. (c),

40. (a),