DPP No: 21

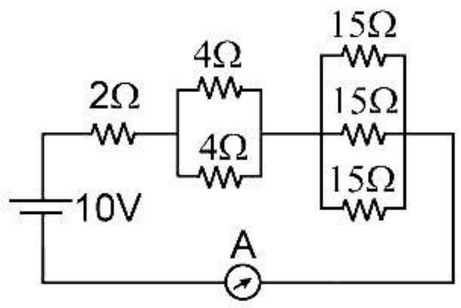
Maximum Time
50 Min

PHYSICS

TARGET
JEE-MAINS

SYLLABUS : CURRENT ELECTRICITY

1. The current through the ammeter shown in figure is 1 A. If each of the 4Ω resistor is replaced by 2Ω resistor, the current in circuit will become nearly :

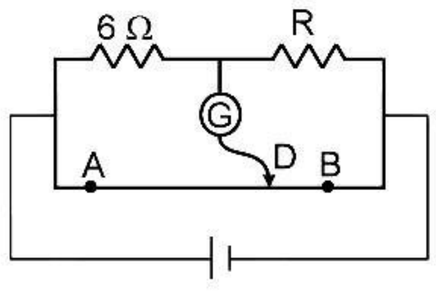


(A) $\frac{10}{9}$ A (B) $\frac{5}{4}$ (C) $\frac{9}{8}$ A (D) $\frac{5}{8}$ A

2. A galvanometer together with an unknown resistance in series is connected to two identical batteries each of 1.5 V. When the batteries are connected in series, the galvanometer records a current of 1A, and when the batteries are in parallel the current is 0.6 A. What is the internal resistance of the battery?

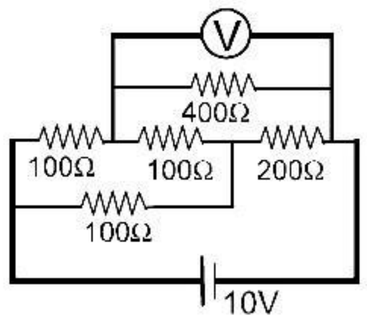
(A) r = $\frac{2}{3}\Omega$ (B) r = $\frac{2}{5}\Omega$ (C) r = $\frac{1}{3}\Omega$ (D) r = $\frac{3}{2}\Omega$

3. The meter-bridge wire AB shown in figure is 50 cm long. When AD = 30 cm, no deflection occurs in the galvanometer. Find R.



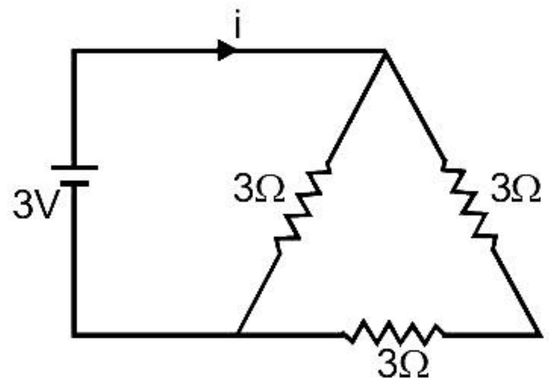
(A) 1 Ω (B) 2 Ω (C) 3 Ω (D) 4 Ω

4. An electrical circuit is shown in the figure. Calculate the potential difference across the resistance of 400 ohm, as will be measured by the voltmeter V of resistance 400 ohm, either by applying Kirchhoff's rules or otherwise.



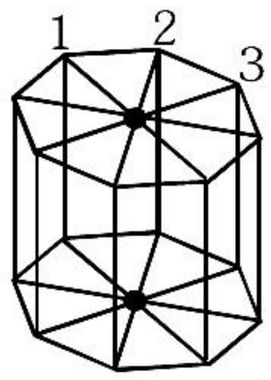
(A) $\frac{10}{3}$ V (B) $\frac{15}{3}$ V (C) $\frac{20}{3}$ V (D) $\frac{30}{3}$ V

5. A 3 volt battery with negligible internal resistance is connected in a circuit as shown in the figure. Current i will be :



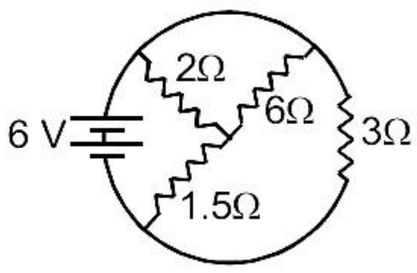
(A) 1/3 A (B) 1 A (C) 1.5 A (D) 2 A

6. In the diagram shown, all the wires have resistance R. The equivalent resistance between the upper and lower dots shown in the diagram is



(A) R/8 (B) R (C) 2R/5 (D) 3R/8

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

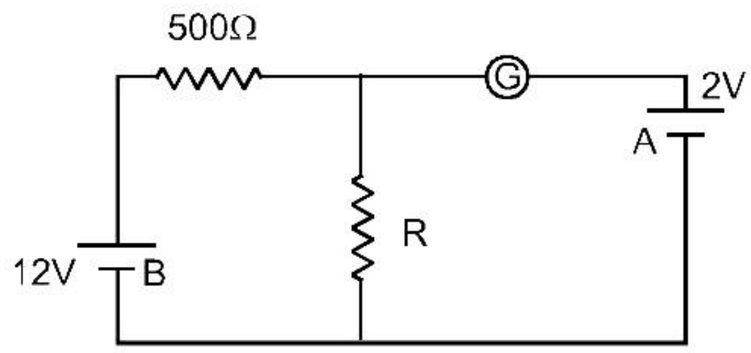


(A) 1 A (B) 2 A (C) 4 A (D) 6 A

8. The resistance of the series combination of two resistances is S. When they are joined in parallel, the total resistance is P. If S = nP, then the minimum possible value of n is :

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

9. In the circuit, the galvanometer G shows zero deflection. If the batteries A and B have negligible internal resistance, the value of the resistor R will be :

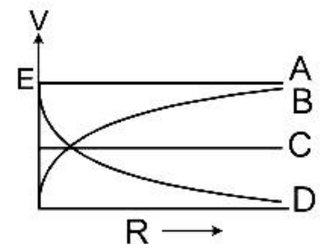


(A) 200 Ω (B) 100 Ω (C) 500 Ω (D) 1000 Ω

10. In a Wheat stone's bridge, three resistances P, Q and R are connected in the three arms and the fourth arm is formed by two resistances S_1 and S_2 connected in parallel. The condition for the bridge to be balanced will be

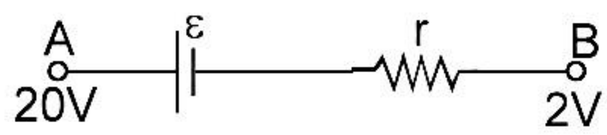
(A) $\frac{P}{Q} = \frac{R(S_1 + S_2)}{2S_1S_2}$ (B) $\frac{P}{Q} = \frac{R}{S_1 + S_2}$ (C) $\frac{P}{Q} = \frac{2R}{S_1 + S_2}$ (D) $\frac{P}{Q} = \frac{R(S_1 + S_2)}{S_1S_2}$

11. A cell of emf E having an internal resistance r is connected to an external resistance R. The potential difference V across the resistance R varies with R as shown in figure by the curve:



(A) A (B) B (C) C (D) D

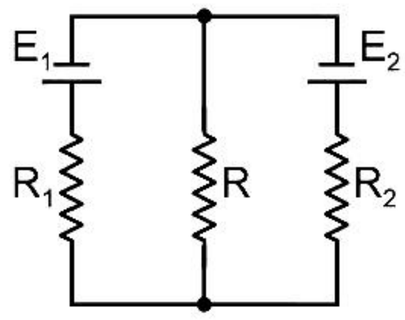
12. In the figure a part of circuit is shown :



(A) current will flow from A to B (B) current may flow from A to B

(C) current will flow from B to A (D) the direction of current will depend on *r*.

13. In a circuit shown in figure resistances R_1 and R_2 are known, as well as emf's E_1 and E_2. The internal resistances of the sources are negligible. At what value of the resistance R will the thermal power generated in it be the highest ?



(A) $R_1 + R_2$ (B) $R_1 - R_2$ (C) $\sqrt{R_1R_2}$ (D) $\frac{R_1R_2}{R_1 + R_2}$

14. Read the following statements carefully :

Y : The resistivity of semiconductor decreases with increase of temperature.

Z : In a conducting solid, the rate of collisions between free electrons and ions increases with increase of temperature.

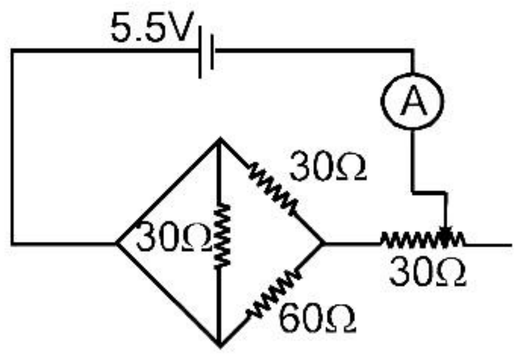
Select the correct statement (s) from the following :

(A) Y is true but Z is false (B) Y is false but Z is true

(C) Both Y and Z are true (D) Y is true and Z is the correct reason for Y

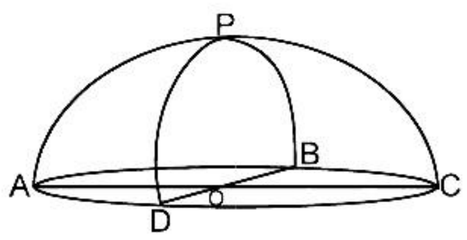
15. The resistance of the rheostat shown in figure is 30 Ω. Neglecting the ammeter resistance, the ratio of minimum and maximum currents through the ammeter, as the rheostat is varied, will be

:



(A) $\frac{2}{5}$ (B) $\frac{83}{15}$ (C) $\frac{9}{43}$ (D) $\frac{19}{43}$

16. A hemispherical network of radius a is made by using a conducting wire of resistance per unit length 'r'. The equivalent resistance across OP is.

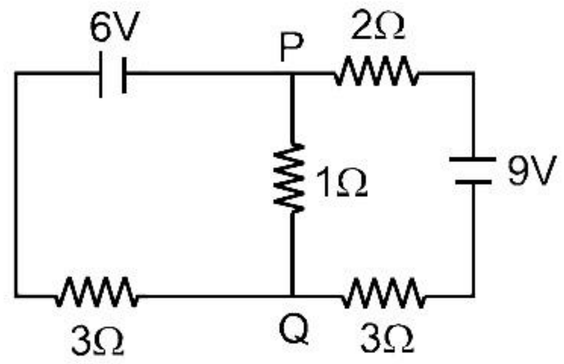


(A) $\frac{8ar}{(2+\pi)}$ (B) $\frac{8ar}{(2-\pi)}$ (C) $\frac{(2+\pi)ar}{8}$ (D) $\frac{(2-\pi)ar}{8}$

17. In a large building, there are 15 bulbs of 40W, 5 bulbs of 100 W, 5 fans of 80 W and 1 heater of 1 kW. The voltage of the electric mains is 220 V. The minimum capacity of the main fuse of the building will be :

(A) 8 A (B) 10 A (C) 12 A (D) 14 A

18. In the circuit shown, the current in the 1Ω resistor is :



(A) 1.3 A, from P to Q

(B) 0 A

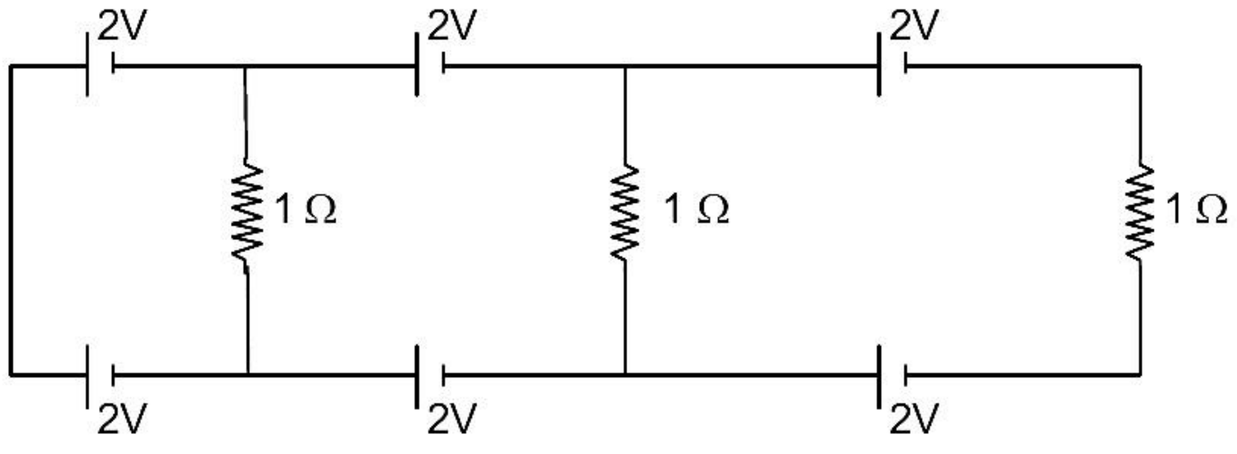
(C) 0.13 A, from Q to P

(D) 0.13 A, from P to Q

19. A galvanometer having a coil resistance of 100 Ω gives a full scale deflection, when a current of 1 mA is passed through it. The value of the resistance, which can convert this galvanometer into ammeter giving a full scale deflection for a current of 10 A, is :

(A) 2 Ω (B) 0.1 Ω (C) 3 Ω (D) 0.01 Ω

20. In the above circuit the current in each resistance is :



(A) 0 A (B) 1 A (C) 0.25 A (D) 0.5 A

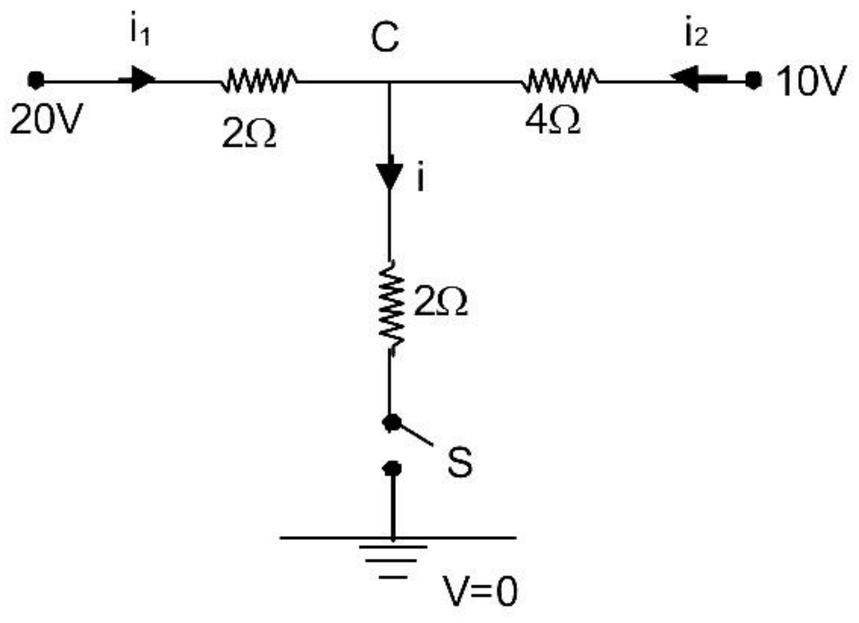
21. Two batteries with e.m.f 12V and 13V are connected in parallel across a load resistor of 10Ω. The internal resistance of the two batteries are 1Ω and 2Ω respectively. The voltage across the load lies between :

(A) 11.4V and 11.5 V (B) 11.7V and 11.8V (C) 11.6V and 11.7V (D) 11.5V and 11.6V

22. A copper wire is stretched to make it 0.5% longer. The percentage change in its electrical resistance if its volume remains unchanged is :

(A) 2.5% (B) 0.5% (C) 2.0% (D) 1.0%

23. When the switch S, in the circuit shown, is closed, then the value of current i will be :



(A) 3A (B) 5A (C) 4A (D) 2A

24. Two resistors 400Ω and 800Ω are connected in series across a 6 V battery. The potential difference measured by a voltmeter of 10kΩ across 400 Ω resistor is close to

(A) 2.05 V (B) 1.8 V (C) 2 V (D) 1.95 V

25. A current through a wire depends on time as $i = \alpha_0 t + \beta t^2$ where α_0 = 20 A/s and β = 8 As^{-2}. Find the charge crossed through a section of the wire in 15s.

(A) 2250 C (B) 11250 C (C) 2100 C (D) 260 C

ANSWER KEY

1.	(A)	**2.**	(C)	**3.**	(D)	**4.**	(C)	**5.**	(C)
6.	(D)	**7.**	(C)	**8.**	(A)	**9.**	(B)	**10.**	(D)
11.	(B)	**12.**	(B)	**13.**	(D)	**14.**	(C)	**15.**	(A)
16.	(C)	**17.**	(C)	**18.**	(C)	**19.**	(D)	**20.**	(A)
21.	(D)	**22.**	(D)	**23.**	(B)	**24.**	(D)	**25.**	(B)