DPP No: 20

Maximum Time
50 Min

PHYSICS

TARGET
JEE-MAINS

SYLLABUS : CURRENT ELECTRICITY

1. In the presence of an applied electric field ($\vec{E}$) in a metallic conductor.

(A) The electrons move in the direction of $\vec{E}$

(B) The electrons move in a direction opposite to $\vec{E}$

(C) The electrons may move in any direction randomly, but slowly drift in the direction of $\vec{E}$.

(D) The electrons move randomly but slowly drift in a direction opposite to $\vec{E}$.

2. A current passes through a wire of non-uniform cross-section. Which of the following quantities are independent of the cross-section?

(A) the charge crossing in a given time interval

(B) drift speed

(C) current density

(D) None of these

3. The current through a wire depends on time as $i = i_0 + \alpha \sin \pi t$, where $i_0 = 10$ A and $\alpha = \frac{\pi}{2}$ A.

Find the charge crossed through a section of the wire in 3 seconds, and average current for that interval.

(A) 25 C , $\frac{31}{3}$ A (B) 31 C , $\frac{31}{3}$ A (C) 31 C , $\frac{17}{3}$ A (D) None of these

4. A piece of copper and another of germanium are cooled from room temperature to 80 K. The resistance of :

(A) each of the them increases

(B) each of them decreases

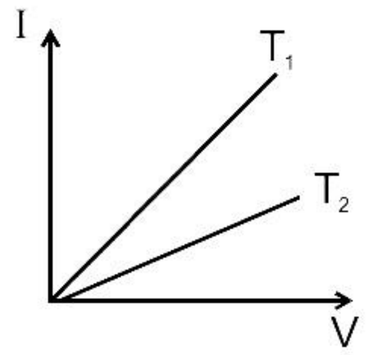
(C) copper increases and germanium decreases

(D) copper decreases and germanium increases

5. A battery sets up an electric field of 25 N/C inside a uniform wire of length 2 m and a resistance of 5 Ω. Find current through the wire.

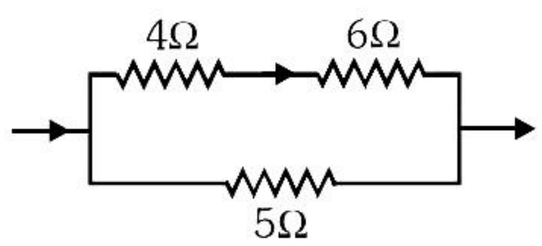
(A) 5 A (B) 7 A (C) 10 A (D) 12 A

6. The current-voltage graphs for a given metallic wire at two different temperature T_1 and T_2 are shown in the figure. Which one is higher, T_1 or T_2



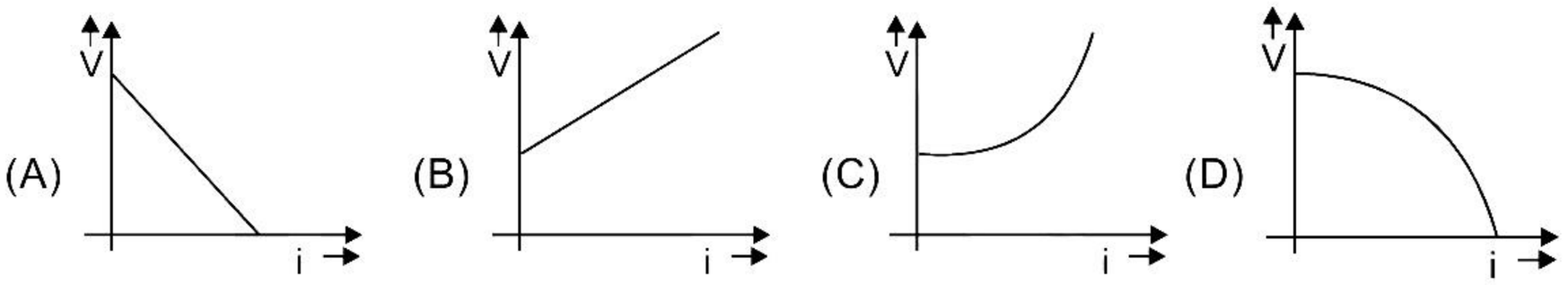
(A) $T_2 < T_1$ (B) $T_2 = T_1$ (C) $T_2 > T_1$ (D) None of these

7. In the circuit shown in figure the heat produced in the 5Ω resistor due to the current flowing through it is 10 cal/s. The heat generated in the 4Ω resistor is :



(A) 1 cal/s (B) 2 cal/s (C) 3 cal/s (D) 4 cal/s

8. If internal resistance of a cell is proportional to current drawn from the cell. Then the best representation of terminal potential difference of a cell with current drawn from cell will be:

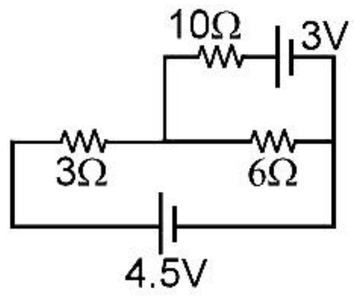


9. A resistor of resistance R is connected to a cell of internal resistance 5 Ω. The value of R is varied from 1 Ω to 5 Ω. The power consumed by R:

(A) increases continuously (B) decreases continuously

(C) first decreases then increases (D) first increases then decreases.

10. Find the current through the 10 Ω resistor shown in figure



(A) zero (B) 1 A (C) 2A (D) 5 A

11. A resistor with a current of 3 A through it converts 500 J of electrical energy to heat energy in 12 s. What is the voltage across the resistor?

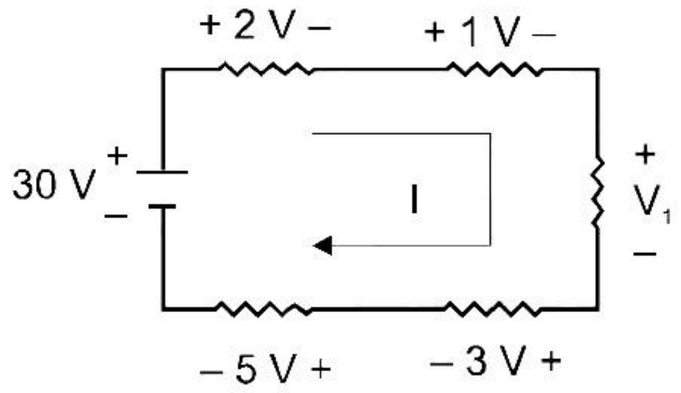
(A) $\frac{120}{9}$ V (B) $\frac{115}{9}$ V (C) $\frac{135}{9}$ V (D) $\frac{125}{9}$ V

12. Two electric bulbs, each designed to operate with a power of 500 watts in 220 volt line, are connected in series. Now they are connected with a 110 volt line. What will be the power generated by each bulb?

(A) $\frac{125}{4}$ = 25 watt (B) $\frac{125}{4}$ = 31.25 watt

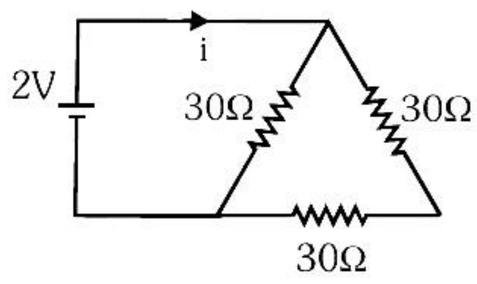
(C) $\frac{115}{4}$ = 31.25 watt (D) $\frac{125}{4}$ = 35.15 watt

13. For the circuit shown in figure, determine the unknown voltage drop V_1 .



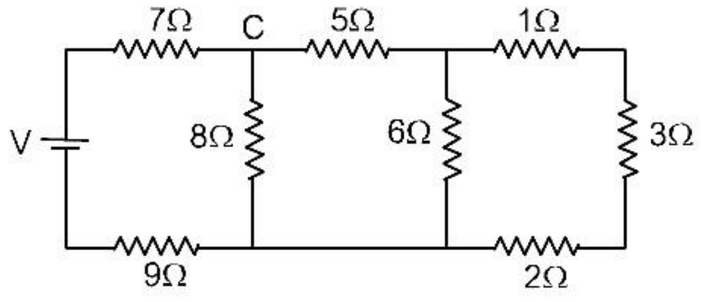
(A) 9 V (B) 12 V (C) 15 V (D) 19 V

14. The current i in the circuit (see figure) is :



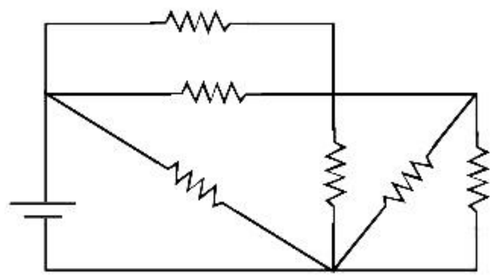
(A) $\frac{1}{45}$ A (B) $\frac{1}{15}$ A (C) $\frac{1}{10}$ A (D) $\frac{1}{5}$ A

15. In the ladder network shown, current through the resistor 3 Ω is 0.25 A. The input voltage 'V' is equal to



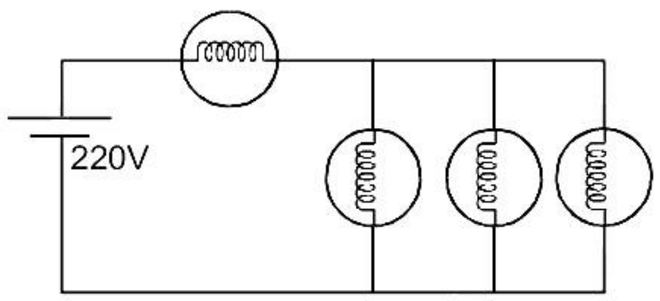
(A) 10 V (B) 20 V (C) 5 V (D) $\frac{15}{2}$ V

16. In the figure shown each resistor is of 20 Ω and the cell has emf 10 volt with negligible internal resistance. Then rate of joule heating in the circuit is (in watts)



(A) 100/11 (B) 10000/11 (C) 11 (D) None of these

17. Four identical bulbs each rated 100 watt, 220 volts are connected across a battery as shown. The total electric power consumed by the bulbs is:

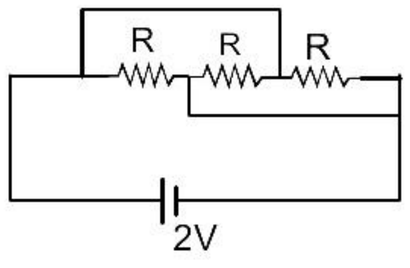


(A) 75 watt (B) 400 watt (C) 300 watt (D) 400/3 watt

18. Three equal resistors connected in series across a source of emf together dissipate 10 watts of power. What would be the power dissipated if the same resistors are connected in parallel across the same source of emf ?

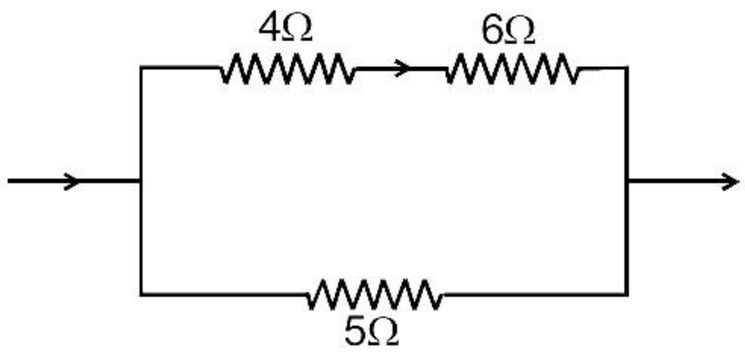
(A) 60 watt (B) 90 watt (C) 100 watt (D) 30 watt

19. Three equal resistance each of R ohm are connected as shown in figure. A battery of 2 volts of internal resistance 0.1 ohm is connected across the circuit. Calculate the value of R for which the heat generated in the exeternal circuit is maximum.



(A) 0.1 Ω (B) 0.2 Ω (C) 0.3 Ω (D) 0.4 Ω

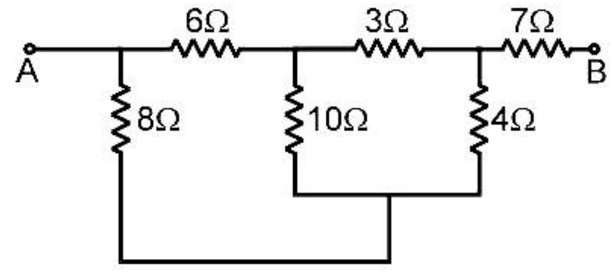
20. In the circuit shown in figure the heat produced in the 5Ω resistor due to the current flowing through it is 10 calories per second.



The heat generated in the 4Ω resistor is :

(A) 1 cal/s (B) 2 cal/s (C) 3 cal/s (D) 4 cal/s

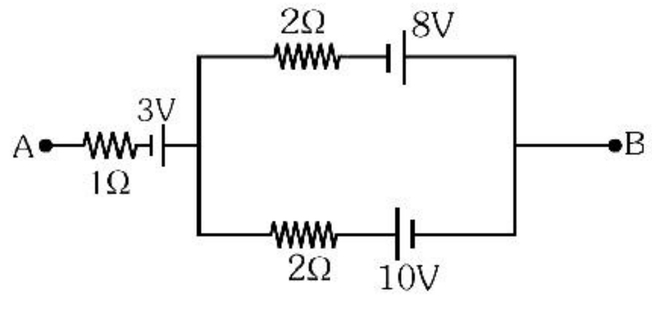
21. The equivalent resistance between the points A and B is :



(A) $\frac{36}{7}\ \Omega$ (B) 10 Ω

(C) $\frac{85}{7}\ \Omega$ (D) none of these

22. The net emf and internal resistance of three batteries as shown in figure is :



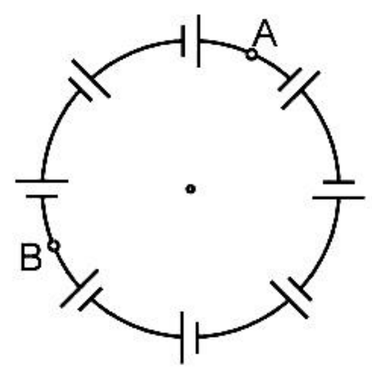
(A) 2V, 1Ω (B) 2V, 2Ω

(C) 2V, 1.5Ω (D) 4V, 2Ω

23. 12 cells each having the same emf are connected in series and are kept in a closed box. Some of the cells are wrongly connected. This battery is connected in series with an ammeter and two cells identical with each other and also identical with the previous cells. The current is 3 A when the external cells support this battery and is 2 A when the cells oppose the battery. How many cells in the battery are wrongly connected?

(A) one (B) two (C) three (D) none

24. N sources of current with different emf's are connected as shown in figure. The emf's of the ources are proportional to their internal resistances, i.e. $E = \alpha R$, where α is an assigned constant. The connecting wire resistance is negligible. The potential difference between points A and B dividing the circuit in n and N – n links



(A) 0 (B) nE/2 (C) NE (D) (N – n)E

25. The length of a given cylindrical wire is increased by 100%. Due to the consequent decrease in diameter the change in the resistance of the wire will be

(A) 300 % (B) 200 % (C) 100 % (D) 50 %

ANSWER KEY

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