Additional Problems For Self Practice (APSP)

Marked Questions can be used as Revision Questions.

PART-I : PRACTICE TEST PAPER

Max. Marks : 120 **Max. Time : 1 Hr.**

Important Instructions :

1. The test is of **1 hour** duration and max. marks 120.

2. The test consists **30** questions, **4 marks** each.

3. Only one choice is correct **1 mark** will be deducted for incorrect response. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.

4. There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instructions 3 above.

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

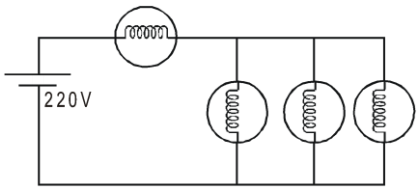
(1) each of the them increases

(2) each of them decreases

(3) copper increases and germanium decreases

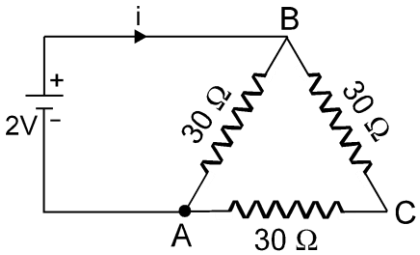
(4) copper decreases and germanium increases

2. 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:



(1) 75 watt (2) 400 watt (3) 300 watt (4) 400/3 watt

3. The current i in the circuit of figure is -

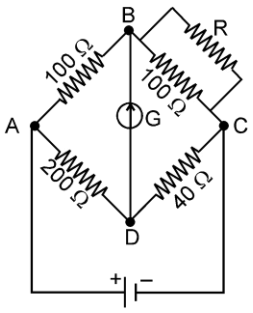


(1) $\frac{1}{45}$amp. (2) $\frac{1}{15}$amp. (3) $\frac{1}{10}$amp. (4) $\frac{1}{5}$amp.

4. 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 ?

(1) 60 watt (2) 90 watt (3) 100 watt (4) 30 watt

5. The given Wheatstone bridge is showing no deflection in the galvanometer joined between the points B and D (Figure). Calculate the value of R.



(1) 25 Ω (2) 50 Ω (3) 40 Ω (4) 100 Ω

6. A wire of resistance 0.1 ohm cm^{-1} bent to form a square ABCD of side 10 cm. A similar wire is connected between the corners B and D to form the diagonal BD. Find the effective resistance of this combination between corners A and C. If a 2V battery of negligible internal resistance is connected across A and C calculate the total power dissipated.

(1) 1 Ω, 3 W (2) 1 Ω, 4 W (3) 2 Ω, 4 W (4) 2 Ω, 4 W

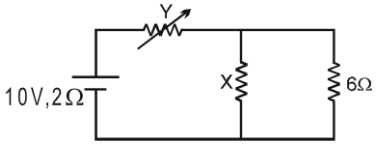
7. A galvanometer together with an unknown resistance in series is connected to two identical batteries each of 1.5 V. When the batteries are connected in series, the galvanometer records a current of 1A, and when the batteries are in parallel the current is 0.6 A. What is the internal resistance of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

(1) r = $\frac{2}{3}\Omega$ (2) r = $\frac{2}{5}\Omega$ (3) r = $\frac{1}{3}\Omega$ (4) r = $\frac{3}{2}\Omega$

8. A potentiometer wire of length 100 cm has a resistance of 10 ohm. It is connected in series with a resistance and an accumulator of emf 2V and of negligible internal resistance. A source of emf of 10 mV is balanced against a length of 40 cm of the potentiometer wire. What is the value of external resistance ?

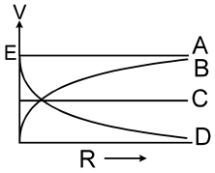
(1) 890 Ω (2) 600 Ω (3) 650 Ω (4) 790 Ω

9. For a particular resistance X in the figure shown the thermal power generated in ' Y ' is maximum when Y = 4 Ω. Then X is:



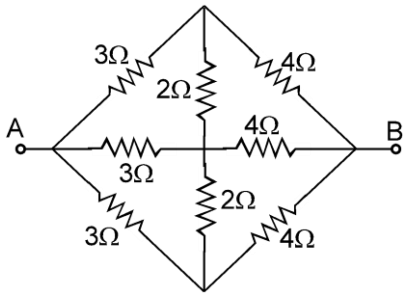
(1) 2 Ω (2) 3 Ω (3) 1 Ω (4) 6 Ω

10. 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 :



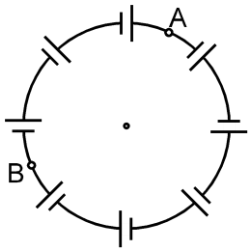
(1) A (2) B (3) C (4) D

11. The equivalent resistance between A and B will be (in Ω)



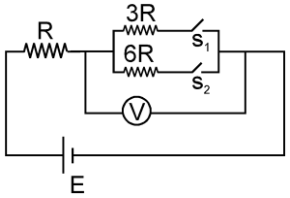
(1) 2/7 (2) 8 (3) 4/3 (4) 7/3

12. N sources of current with different emf's are connected as shown in figure. The emf's of the sources 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



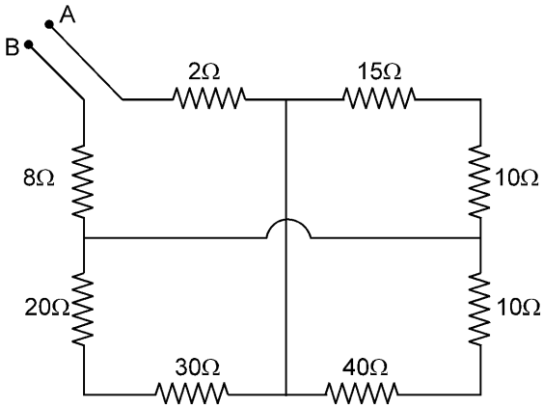
(1) 0 (2) nE/2 (3) NE (4) (N – n)E

13. In the circuit shown in figure reading of voltmeter is V_1 when only S_1 is closed, reading of voltmeter is V_2 when only S_2 is closed and reading of voltmeter is V_3 when both S_1 and S_2 are closed. Then



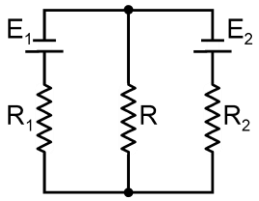
(1) $V_3 > V_2 > V_1$ (2) $V_2 > V_1 > V_3$ (3) $V_3 > V_1 > V_2$ (4) $V_1 > V_2 > V_3$

14. The equivalent resistance between points A and B is :



(1) $\frac{65}{2}\ \Omega$ (2) $\frac{45}{2}\ \Omega$ (3) $\frac{5}{2}\ \Omega$ (4) $\frac{91}{2}\ \Omega$

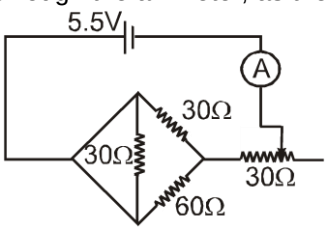
15. In a circuit shown in figure resistances R_1 and R_2 are known, as well as emf's E_1 and E_2. The internal resistances of the sources are negligible. At what value of the resistance R will the thermal power generated in it be the highest ?



(1) $R_1 + R_2$ (2) $R_1 - R_2$ (3) $\sqrt{R_1R_2}$ (4) $\frac{R_1R_2}{R_1+R_2}$

16. The potential difference between the terminals of a battery of emf 10 V and internal resistance 1Ω drops to 9.8 V when connected across an external resistance. The resistance of the external resistor is:
(1) 49 Ω (2) 25 Ω (3) 31 Ω (4) 43 Ω

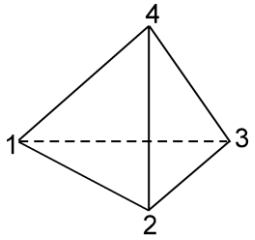
17. The resistance of the rheostat shown in figure is 30 Ω. Neglecting the ammeter resistance, the ratio of minimum and maximum currents through the ammeter, as the rheostat is varied, will be :



(1) $\frac{2}{5}$A (2) $\frac{83}{15}$A (3) $\frac{9}{43}$A (4) $\frac{19}{43}$A

18. Three copper wires of length and cross–sectional area (L, A), (2L, A/2) and (L/2, 2A). Resistance is minimum in
(1) wire of cross–sectional area A (2) wire of area A/2
(3) wire of cross–sectional area 2A (4) same in all three cases

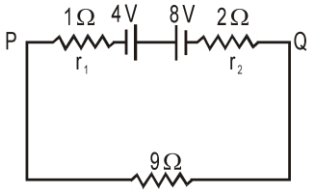
19. A wire is in the form of a tetrahedron. The resistance of each edge is r. The equivalent resistances between corners 1–2 and 1–3 are respectively



(1) $\frac{r}{2}, \frac{r}{2}$ (2) r, r (3) $\frac{r}{2}$, r (4) r, $\frac{r}{2}$

20. A wire of length L and 3 identical cells of negligible internal resistances are connected in series. Due to the current the temperature of the wire is raised by ΔT in a time t. A number N of similar cells is now connected in series with a wire of the same material and cross-section but of length 2 L.The temperature of the wire is raised by the same amount ΔT in the same time t. The value of N is:
(1) 4 (2) 6 (3) 8 (4) 9

21. Two batteries of e.m.f. 4 V and 8 V with internal resistances 1 Ω and 2 Ω are connected in a circuit with a resistance of 9 Ω as shown in figure. The current and potential difference between the points P and Q are

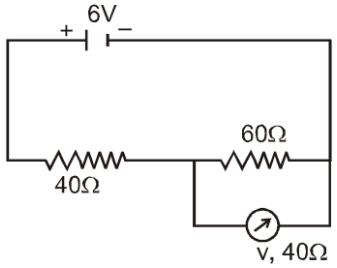


(1) 1/3 A 3 V (2) 1/6 A 4 V (3) 1/9 A 9 V (4) 1/2 A 12 V

22. Two bulbs 25W, 220V and 100W, 220V are given. Which has higher resistance ?
(1) 25W bulb (2) 100 W bulb
(3) Both bulbs will have equal resistance (4) Resistance of bulbs cannot be compared

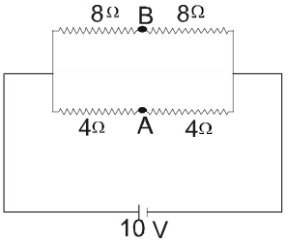
23. Potentiometer measure the potential difference more accurately than a voltmeter because
(1) It has a wire of high resistance. (2) It has a wire of low resistance
(3) It does not draw current from external circuit (4) It draws a heavy current from external circuit

24. The reading of voltmeter in the circuit shown is



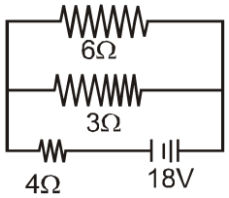
(1) 2.25 V (2) 3.25 V (3) 4.25 V (4) 6.25 V

25. The potential difference between points A and B is :



(1) $\frac{20}{7}$ V (2) $\frac{40}{7}$ V (3) $\frac{10}{7}$ V (4) zero

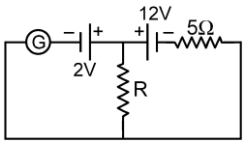
26. The total power dissipated in watts in the circuit shown here is :-



(1) 4W (2) 16W (3) 40W (4) 54W

27. A potentiometer wire of length 10 m and resistance 10 ohm is connected in series with an ideal cell of E.M.F. 2 V. If a rheostat having range 0 –10 ohm is used in series with the cell then maximum potential gradient of the wire will be :
(1) 2 V/m (2) 0.2 V/m (3) 2 μV/m (4) 0.2 μV/m

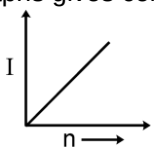
28. In the circuit shown, the galvanometer shows zero current. The value of resistance R is :

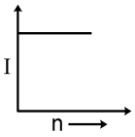


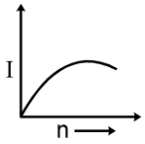
(1) 1 Ω (2) 2 Ω (3) 4 Ω (4) 9 Ω

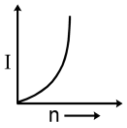
29. Three similar cells, each of emf 2V and internal resistance r send the same current through an external resistance of 2Ω, when connected in series or in parallel. Then the magnitude of current flowing through the external resistance is :
(1) 0.75 A (2) 1 A (3) 1.5 A (4) zero

30. A battery consists of variable number (n) of identical cells having internal resistance r each, connected in series. The terminals of the battery are short-circuited and the current I measured. Which of the following graphs gives correct relationship between I and n?

(1) 

(2) 

(3) 

(4) 

Practice Test (JEE-Main Pattern)

OBJECTIVE RESPONSE SHEET (ORS)

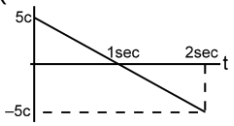
Que.	1	2	3	4	5	6	7	8	9	10
Ans.										
Que.	11	12	13	14	15	16	17	18	19	20
Ans.										
Que.	21	22	23	24	25	26	27	28	29	30
Ans.										

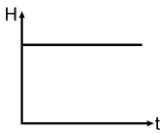
PART - II : PRACTICE QUESTIONS

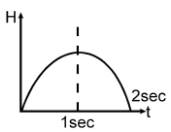
1. Power developed in a uniform wire when connected to a certain cell of negligible internal resistance is P. If the wire is melted and recast in a wire of length double that of the original and the new wire is connected to the same cell, then the power developed in the wire would be :
(1) 2 P (2) 4 P (3) P (4) P/4

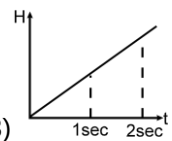
2. The terminal voltage across a battery of emf ε cannot be :
(1) 0 (2) > ε (3) < ε (4) none of these is correct

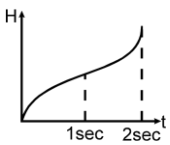
3. A charge passing through a resistor is varying with time as shown in the figure. The amount of heat generated in time 't' is best represented (as a function of time) by :



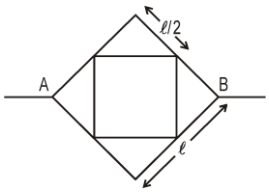
(1) 

(2) 

(3) 

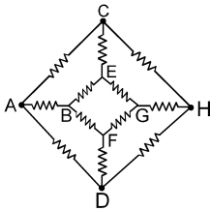
(4) 

4. A wire has α resistance per unit length and is arranged as shown. If side of the bigger square is ℓ then equivalent resistance between points A and B will be



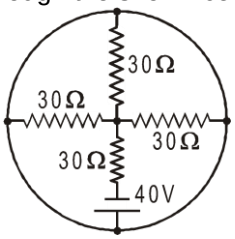
(1) $\frac{\alpha\ell}{\sqrt{2}}$ (2) $\sqrt{2}\ \alpha\ell$ (3) $2\ \alpha\ell$ (4) $\alpha\ell$

5. Twelve resistors each of resistance 1 Ω are connected in the circuit shown in the figure. Net resistance between points A and H would be :



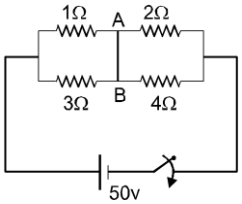
(1) $\frac{5}{3}\Omega$ (2) 1Ω (3) $\frac{3}{4}\Omega$ (4) $\frac{7}{6}\Omega$

6. In the circuit shown, all the conducting wires have negligible resistance, all four resistors are identical and the cell is ideal. The current flowing through the shown cell is :



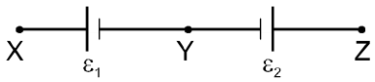
(1) 0.5 A (2) 1 A (3) $\frac{16}{3}$ A (4) $\frac{4}{3}$ A

7. Four resistances are connected by an ideal battery of emf 15 volt, circuit is in steady state then the current in wire AB is :



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

8. Two cells of emf ε_1 and ε_2 ($\varepsilon_2 < \varepsilon_1$) are joined as shown in figure :



When a potentiometer is connected between x and y it balances for 300 cm length against ε_1. On connecting the same potentiometer between x and z it balances for 100 cm length against ε_1 and ε_2. Then the ratio $\frac{\varepsilon_2}{\varepsilon_1}$ is :

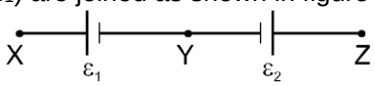
(1) $\frac{1}{3}$ (2) $\frac{3}{4}$ (3) $\frac{1}{4}$ (4) $\frac{2}{3}$

9. There are total N identical cells each of internal resistance r and emf ε. n such cells are connected in series and $\frac{N}{n}$ such groups are connected in parallel. This arrangement is connected to an external resistor of resistance R. R can be varied but other perameters are fixed.

(1) R should be zero for current to be maximum in R. (2) R = $\frac{n^2r}{N}$ for current to be maximum in R.

(3) R = 0 for maximum power in R (4) R = $\frac{nr}{N}$ for maximum power in R.

10. Two cells of emf ε_1 and ε_2 ($\varepsilon_2 < \varepsilon_1$) are joined as shown in figure :



When a potentiometer is connected between X and Y it balances for 300 cm length against ε_1. On connecting the same potentiometer between X and Z it balances for 100 cm length against ε_1 and ε_2. Then the ratio $\frac{\varepsilon_2}{\varepsilon_1}$ is :

(1) $\frac{1}{3}$ (2) $\frac{3}{4}$ (3) $\frac{1}{4}$ (4) $\frac{2}{3}$

11. Three similar cells, each of emf 2V and internal resistance r send the same current through an external resistance of 2Ω, when connected in series or in parallel. Then the magnitude of current flowing through the external resistance is :

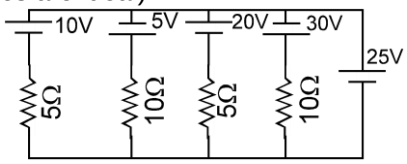
(1) 0.75 A (2) 1 A (3) 1.5 A (4) zero

12. In the figure shown:

(1) current will flow from A to B (2) current may flow from A to B

(3) current will flow from B to A (4) the direction of current will depend on r.

13. In the figure shown: (All batteries are ideal)

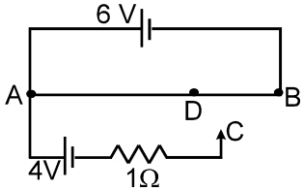


(1) current through 25 V cell is 20 A (2) current through 25 V cell is 12.5 A

(3) power supplied by 20 V cell is 20 W (4) power supplied by 20 V cell is - 10 W

Comprehension # 1

A 6 volt battery of negligible internal resistance is connected across a uniform wire AB of length 100 cm. The positive terminal of another battery of emf 4V and internal resistance 1Ω is joined to the point A as shown in figure. Take the potential at B to be zero.



14. The potentials at the points A and C

(1) V_A = 6 V, V_C = 2V (2) V_A = 3V, V_C = 2V (3) V_A = 2V, V_C = 3V (4) None of these

15. Which point D of the wire AB, the potential is equal to the potential at C.

(1) AD = 200 (2) AD = $\frac{200}{3}$

(3) AD = $\frac{100}{3}$ (4) None of these

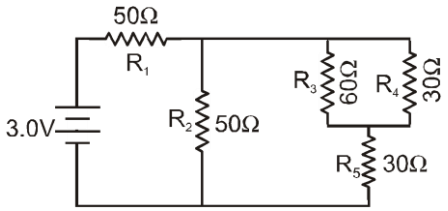
16. If the 4V battery is replaced by 7.5 V battery, what would be the potentials at the points A and C

(1) V_A = 6 V, V_C = 2V (2) V_A = 6 V, V_C = 1.5V

(3) V_A = –6 V, V_C = 1.5V (4) V_A = 6 V, V_C = –1.5V

Comprehension # 2

In the circuit shown, the resistances are given in ohms and the battery is assumed ideal with emf equal to 3.0 volts.



17. The resistor that dissipates maximum power.

(1) R_1 (2) R_2 (3) R_4 (4) R_5

18. The potential difference across resistor R_3 is

(1) 0.4 V (2) 0.6 V (3) 1.2 V (4) 1.5 V

19. The current passing through 3V battery is

(1) 10 mA (2) 30 mA (3) 40 mA (4) 60 mA

APSP Answers

PART- I

1.	(4)	**2.**	(1)	**3.**	(3)	**4.**	(2)	**5.**	(1)	**6.**	(2)	**7.**	(3)
8.	(4)	**9.**	(2)	**10.**	(2)	**11.**	(4)	**12.**	(1)	**13.**	(2)	**14.**	(2)
15.	(4)	**16.**	(1)	**17.**	(1)	**18.**	(3)	**19.**	(1)	**20.**	(2)	**21.**	(1)
22.	(1)	**23.**	(3)	**24.**	(1)	**25.**	(4)	**26.**	(4)	**27.**	(2)	**28.**	(1)
29.	(1)	**30.**	(2)										

PART - II

1.	(4)	**2.**	(4)	**3.**	(3)	**4.**	(1)	**5.**	(3)	**6.**	(2)	**7.**	(2)
8.	(4)	**9.**	(1)	**10.**	(4)	**11.**	(1)	**12.**	(2)	**13.**	(2)	**14.**	(1)
15.	(2)	**16.**	(4)	**17.**	(1)	**18.**	(1)	**19.**	(3)				