

## GENERAL INSTRUCTIONS

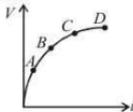
- This test contains 45 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.
- You have to evaluate your Response Grids yourself with the help of solutions provided at the end of this book.
- Each correct answer will get you 4 marks and 1 mark shall be deducted for each incorrect answer. No mark will be given/ deducted if no bubble is filled. Keep a timer in front of you and stop immediately at the end of 60 min.
- The sheet follows a particular syllabus. Do not attempt the sheet before you have completed your preparation for that syllabus.
- After completing the sheet check your answers with the solution booklet and complete the Result Grid. Finally spend time to analyse your performance and revise the areas which emerge out as weak in your evaluation.

1. When 5V potential difference is applied across a wire of length 0.1 m, the drift speed of electrons is  $2.5 \times 10^{-4} \text{ ms}^{-1}$ . If the electron density in the wire is  $8 \times 10^{28} \text{ m}^{-3}$ , the resistivity of the material is close to:

- (a)  $1.6 \times 10^{-6} \Omega \text{m}$  (b)  $1.6 \times 10^{-5} \Omega \text{m}$   
(c)  $1.6 \times 10^{-8} \Omega \text{m}$  (d)  $1.6 \times 10^{-7} \Omega \text{m}$

2. Variation of current passing through a conductor as the voltage applied across its ends is varied as shown in the adjoining diagram. If the resistance ( $R$ ) is determined at the points  $A, B, C$  and  $D$ , we will find that

- (a)  $R_C = R_D$   
(b)  $R_B > R_A$   
(c)  $R_C > R_B$   
(d)  $R_A > R_B$



3. The length of a wire of a potentiometer is 100 cm, and the e.m.f. of its standard cell is E volt. It is employed to measure the e.m.f. of a battery whose internal resistance is  $0.5 \Omega$ . If the balance point is obtained at  $\ell = 30 \text{ cm}$  from the positive end, the e.m.f. of the battery is

- (a)  $\frac{30E}{100.5}$  (b)  $\frac{30E}{(100-0.5)}$   
(c)  $\frac{30(E-0.5E)}{100}$  (d)  $\frac{30E}{100}$

4. The masses of the three wires of copper are in the ratio of 1 : 3 : 5 and their lengths are in the ratio of 5 : 3 : 1. The ratio of their electrical resistance is

- (a) 1 : 3 : 5 (b) 5 : 3 : 1  
(c) 1 : 25 : 125 (d) 125 : 15 : 1

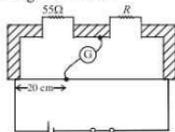
5.  $n$  equal resistors are first connected in series and then connected in parallel. What is the ratio of the maximum to the minimum resistance?

- (a)  $n$  (b)  $1/n^2$  (c)  $n^2$  (d)  $1/n$

6. A battery is charged at a potential of 15V for 8 hours when the current flowing is 10A. The battery on discharge supplies a current of 5A for 15 hours. The mean terminal voltage during discharge is 14V. The "watt-hour" efficiency of the battery is

- (a) 87.5% (b) 82.5% (c) 80% (d) 90%

7. Shown in the figure below is a meter-bridge set up with null deflection in the galvanometer.



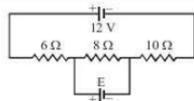
The value of the unknown resistor  $R$  is

- (a) 13.75  $\Omega$  (b) 220  $\Omega$  (c) 110  $\Omega$  (d) 55  $\Omega$
8. In the equation  $AB = C$ ,  $A$  is the current density,  $C$  is the electric field, Then  $B$  is  
(a) resistivity (b) conductivity  
(c) potential difference (d) resistance
9. The Kirchhoff's first law ( $\sum i = 0$ ) and second law ( $\sum iR = \sum E$ ), are respectively based on  
(a) conservation of charge, conservation of momentum  
(b) conservation of energy, conservation of charge  
(c) conservation of momentum, conservation of charge  
(d) conservation of charge, conservation of energy
10. You are given a resistance coil and a battery. In which of the following cases the largest amount of heat generated?  
(a) When the coil is connected to the battery directly  
(b) When the coil is divided into two equal parts and both the parts are connected to the battery in parallel  
(c) When the coil is divided into four equal parts and all the four parts are connected to the battery in parallel  
(d) When only half the coil is connected to the battery
11. The resistance of the coil of an ammeter is  $R$ . The shunt required to increase its range  $n$ -fold should have a resistance

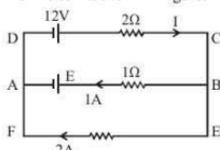
(a)  $\frac{R}{n}$  (b)  $\frac{R}{n-1}$  (c)  $\frac{R}{n+1}$  (d)  $nR$

12. On increasing the temperature of a conductor, its resistance increases because the  
(a) relaxation time increases  
(b) mass of electron increases  
(c) electron density decreases  
(d) relaxation time decreases
13. An electric current is passed through a circuit containing two wires of the same material, connected in parallel. If the lengths and radii are in the ratio of  $\frac{4}{3}$  and  $\frac{2}{3}$ , then the ratio of the current passing through the wires will be  
(a) 8/9 (b) 1/3 (c) 3 (d) 2
14. In a meter bridge experiment null point is obtained at 20 cm. from one end of the wire when resistance  $X$  is balanced against another resistance  $Y$ . If  $X < Y$ , then where will be the new position of the null point from the same end, if one decides to balance a resistance of  $4X$  against  $Y$   
(a) 40 cm (b) 80 cm (c) 50 cm (d) 70 cm
15. In the circuit shown, the current through 8 ohm is same before and after connecting  $E$ . The value of  $E$  is

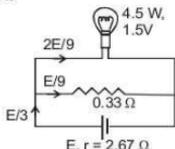
- (a) 12 V  
(b) 6 V  
(c) 4 V  
(d) 2 V



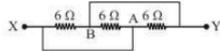
16. Find emf  $E$  of the cell as shown in figure.



- (a) 15 V (b) 10 V (c) 12 V (d) 5 V
17. A torch bulb rated as 4.5 W, 1.5 V is connected as shown in fig. The e.m.f. of the cell, needed to make the bulb glow at full intensity is



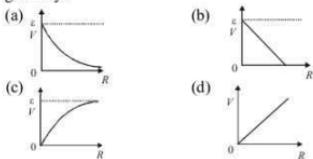
- (a) 4.5 V (b) 1.5 V (c) 2.67 V (d) 13.5 V
18. In a given network, each resistance has value of  $6\Omega$ . The point  $X$  is connected to point  $A$  by a copper wire of negligible resistance and point  $Y$  is connected to point  $B$  by the same wire. The effective resistance between  $X$  and  $Y$  will be



- (a) 18  $\Omega$  (b) 6  $\Omega$  (c) 3  $\Omega$  (d) 2  $\Omega$
19. If  $N$ ,  $e$ ,  $\tau$  and  $m$  are representing electron density, charge, relaxation time and mass of an electron respectively, then the resistance of wire of length  $\ell$  and cross-sectional area  $A$  is given by

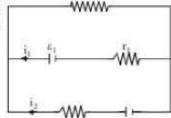
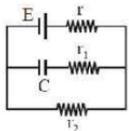
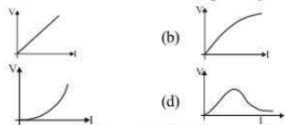
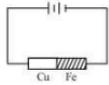
(a)  $\frac{2m\ell}{Ne^2 A \tau}$  (b)  $\frac{2m \tau A}{Ne^2 \ell}$  (c)  $\frac{Ne^2 \tau A}{2m \ell}$  (d)  $\frac{Ne^2 A}{2m \tau \ell}$

20. Cell having an emf  $\epsilon$  and internal resistance  $r$  is connected across a variable external resistance  $R$ . As the resistance  $R$  is increased, the plot of potential difference  $V$  across  $R$  is given by :



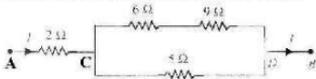
RESPONSE  
GRID

7. (a)(b)(c)(d) 8. (a)(b)(c)(d) 9. (a)(b)(c)(d) 10. (a)(b)(c)(d) 11. (a)(b)(c)(d)  
12. (a)(b)(c)(d) 13. (a)(b)(c)(d) 14. (a)(b)(c)(d) 15. (a)(b)(c)(d) 16. (a)(b)(c)(d)  
17. (a)(b)(c)(d) 18. (a)(b)(c)(d) 19. (a)(b)(c)(d) 20. (a)(b)(c)(d)

21. If voltage across a bulb rated 220 Volt-100 Watt drops by 2.5% of its rated value, the percentage of the rated value by which the power would decrease is :  
 (a) 20% (b) 2.5% (c) 5% (d) 10%
22. If specific resistance of a potentiometer wire is  $10^{-7} \Omega\text{m}$ , the current flow through it is 0.1 A and the cross-sectional area of wire is  $10^{-6} \text{m}^2$  then potential gradient will be  
 (a)  $10^{-2}$  volt/m (b)  $10^{-4}$  volt/m  
 (c)  $10^{-6}$  volt/m (d)  $10^{-8}$  volt/m
23. Two resistances  $R_1$  and  $R_2$  are made of different materials. The temperature coefficient of the material of  $R_1$  is  $\alpha$  and that of material of  $R_2$  is  $-\beta$ . The resistance of the series combination of  $R_1$  and  $R_2$  will not change with temperature if  $\frac{R_1}{R_2}$  equal to  
 (a)  $\frac{\alpha}{\beta}$  (b)  $\frac{\alpha+\beta}{\alpha-\beta}$  (c)  $\frac{\alpha^2+\beta^2}{2\alpha\beta}$  (d)  $\frac{\beta}{\alpha}$
24. Five cells each of emf  $E$  and internal resistance  $r$  send the same amount of current through an external resistance  $R$  whether the cells are connected in parallel or in series. Then the ratio  $\left(\frac{R}{r}\right)$  is  
 (a) 2 (b)  $\frac{1}{2}$  (c)  $\frac{1}{5}$  (d) 1
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) 200% (b) 100% (c) 50% (d) 300%
26. Potentiometer wire of length 1 m is connected in series with 490  $\Omega$  resistance and 2 V battery. If 0.2 mV/cm is the potential gradient, then resistance of the potentiometer wire is  
 (a) 4.9  $\Omega$  (b) 7.9  $\Omega$  (c) 5.9  $\Omega$  (d) 6.9  $\Omega$
27. See the electric circuit shown in the figure. Which of the following equations is a correct equation for it?  
  
 (a)  $\varepsilon_2 - i_2 r_2 - \varepsilon_1 - i_1 r_1 = 0$   
 (b)  $-\varepsilon_2 - (i_1 + i_2)R + i_2 r_2 = 0$   
 (c)  $\varepsilon_1 - (i_1 + i_2)R + i_1 r_1 = 0$   
 (d)  $\varepsilon_1 - (i_1 + i_2)R - i_1 r_1 = 0$
28. In a large building, there are 15 bulbs of 40 W, 5 bulbs of 100 W, 5 fans of 80 W and 1 heater of 1 kW. The voltage of 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
29. Two sources of equal emf are connected to an external resistance  $R$ . The internal resistance of the two sources are  $R_1$  and  $R_2$  ( $R_1 > R_2$ ). If the potential difference across the source having internal resistance  $R_2$  is zero, then  
 (a)  $R = R_2 - R_1$   
 (b)  $R = R_2 \times (R_1 + R_2) / (R_2 - R_1)$   
 (c)  $R = R_1 R_2 / (R_2 - R_1)$   
 (d)  $R = R_1 R_2 / (R_1 - R_2)$
30. 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) 2 (b) 3 (c) 4 (d) 1
31. If an ammeter is to be used in place of a voltmeter, then we must connect with the ammeter a  
 (a) low resistance in parallel  
 (b) high resistance in parallel  
 (c) high resistance in series  
 (d) low resistance in series.
32. A d.c. main supply of e.m.f. 220 V is connected across a storage battery of e.m.f. 200 V through a resistance of 1  $\Omega$ . The battery terminals are connected to an external resistance 'R'. The minimum value of 'R', so that a current passes through the battery to charge it is:  
 (a) 7  $\Omega$  (b) 9  $\Omega$  (c) 11  $\Omega$  (d) Zero
33. In the given circuit diagram when the current reaches steady state in the circuit, the charge on the capacitor of capacitance  $C$  will be:  
  
 (a)  $CE \frac{r_2}{(r_1 + r_2)}$   
 (b)  $CE \frac{r_1}{(r_1 + r)}$   
 (c)  $CE \frac{r_2}{(r + r_1)}$   
 (d)  $CE \frac{r_1}{(r_2 + r)}$
34. Suppose the drift velocity  $v_d$  in a material varied with the applied electric field  $E$  as  $v_d \propto \sqrt{E}$ . Then  $V - I$  graph for a wire made of such a material is best given by:  

35. In a neon gas discharge tube  $\text{Ne}^+$  ions moving through a cross-section of the tube each second to the right is  $2.9 \times 10^{18}$ , while  $1.2 \times 10^{18}$  electrons move towards left in the same time; the electronic charge being  $1.6 \times 10^{19}$  C, the net electric current is  
 (a) 0.27 A to the right (b) 0.66 A to the right  
 (c) 0.66 A to the left (d) zero
36. Two rods are joined end to end, as shown. Both have a cross-sectional area of 0.01  $\text{cm}^2$ . Each is 1 meter long. One rod is of copper with a resistivity of  $1.7 \times 10^{-6}$  ohm-centimeter, the other is of iron with a resistivity of  $10^{-5}$  ohm-centimeter. How much voltage is required to produce a current of 1 ampere in the rods?  
  
 (a) 0.117 V  
 (b) 0.00145 V  
 (c) 0.0145 V  
 (d)  $1.7 \times 10^{-6}$  V

RESPONSE  
GRID

21. (a)(b)(c)(d) 22. (a)(b)(c)(d) 23. (a)(b)(c)(d) 24. (a)(b)(c)(d) 25. (a)(b)(c)(d)  
 26. (a)(b)(c)(d) 27. (a)(b)(c)(d) 28. (a)(b)(c)(d) 29. (a)(b)(c)(d) 30. (a)(b)(c)(d)  
 31. (a)(b)(c)(d) 32. (a)(b)(c)(d) 33. (a)(b)(c)(d) 34. (a)(b)(c)(d) 35. (a)(b)(c)(d)  
 36. (a)(b)(c)(d)

37. An energy source will supply a constant current into the load if its internal resistance is  
 (a) very large as compared to the load resistance  
 (b) equal to the resistance of the load  
 (c) non-zero but less than the resistance of the load  
 (d) zero
38. The resistance of a wire at room temperature  $30^\circ\text{C}$  is found to be  $10\ \Omega$ . Now to increase the resistance by  $10\%$ , the temperature of the wire must be [The temperature coefficient of resistance of the material of the wire is  $0.002\ \text{per } ^\circ\text{C}$ ]  
 (a)  $36^\circ\text{C}$  (b)  $83^\circ\text{C}$   
 (c)  $63^\circ\text{C}$  (d)  $33^\circ\text{C}$
39. If current flowing in a conductor changes by  $1\%$  then power consumed will change by  
 (a)  $10\%$  (b)  $2\%$  (c)  $1\%$  (d)  $100\%$
40. In the circuit shown in figure, the  $5\ \Omega$  resistance develops  $20.00\ \text{cal/s}$  due to the current flowing through it. The heat developed in  $2\ \Omega$  resistance (in cal/s) is  
  
 (a) 23.8 (b) 14.2 (c) 11.9 (d) 7.1
41. In a Wheatstone's bridge, three resistances P, Q and R 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)  $\frac{P}{Q} = \frac{2R}{S_1 + S_2}$  (b)  $\frac{P}{Q} = \frac{R(S_1 + S_2)}{S_1 S_2}$
- (c)  $\frac{P}{Q} = \frac{R(S_1 + S_2)}{2S_1 S_2}$  (d)  $\frac{P}{Q} = \frac{R}{S_1 + S_2}$
42. The electric resistance of a certain wire of iron is R. If its length and radius are both doubled, then  
 (a) the resistance and the specific resistance, will both remain unchanged  
 (b) the resistance will be doubled and the specific resistance will be halved  
 (c) the resistance will be halved and the specific resistance will remain unchanged  
 (d) the resistance will be halved and the specific resistance will be doubled
43. A car battery has e.m.f. 12 volt and internal resistance  $5 \times 10^{-2}$  ohm. If it draws 60 amp current, the terminal voltage of the battery will be  
 (a) 15 volt (b) 3 volt (c) 5 volt (d) 9 volt
44. A conducting wire of cross-sectional area  $1\ \text{cm}^2$  has  $3 \times 10^{23}$  charge carriers per  $\text{m}^3$ . If wire carries a current of 24 mA, then drift velocity of carriers is  
 (a)  $5 \times 10^{-2}\ \text{m/s}$  (b)  $0.5\ \text{m/s}$   
 (c)  $5 \times 10^{-3}\ \text{m/s}$  (d)  $5 \times 10^{-6}\ \text{m/s}$
45. In the series combination of  $n$  cells each cell having emf  $\epsilon$  and internal resistance  $r$ . If three cells are wrongly connected, then total emf and internal resistance of this combination will be  
 (a)  $n\epsilon$ ,  $(nr - 3r)$  (b)  $(n\epsilon - 2\epsilon)$ ,  $nr$   
 (c)  $(n\epsilon - 4\epsilon)$ ,  $nr$  (d)  $(n\epsilon - 6\epsilon)$ ,  $nr$

RESPONSE  
GRID

37. (a)(b)(c)(d) 38. (a)(b)(c)(d) 39. (a)(b)(c)(d) 40. (a)(b)(c)(d) 41. (a)(b)(c)(d)  
 42. (a)(b)(c)(d) 43. (a)(b)(c)(d) 44. (a)(b)(c)(d) 45. (a)(b)(c)(d)

PHYSICS CHAPTERWISE SPEED TEST-17

Total Questions	45	Total Marks	180
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	45	Qualifying Score	60
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct $\times$ 4) – (Incorrect $\times$ 1)			

Space for Rough Work