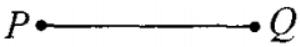
Exam Code

12th JEE 9.8,20

Test Booklet Code

1. Ten million electrons pass from point P to point Q in one micro second. The current and its direction is



(a) $1.6 \times 10^{-14}\mathrm{A}$, from point P to point Q
(b) $3.2 \times 10^{-14}\mathrm{A}$, from point P to point Q
(c) $1.6 \times 10^{-6}\mathrm{A}$, from point Q to point P
(d) $3.2 \times 10^{-12}\mathrm{A}$, from point Q to point P

2. 1 ampere current is equivalent to

(a) 6.25×10^{18} electrons s^{-1}
(b) 2.25×10^{-18} electrons s^{-1}
(c) 6.25×10^{14} electrons s^{-1}
(d) 2.25×10^{14} electrons s^{-1}

3. A current in a wire is given by the equation, $\mathrm{I} = 2\mathrm{x}^2 - 3\mathrm{t} + 1$ the charge through cross section of wire in time interval $\mathrm{t} = 3\mathrm{s}$ to $\mathrm{t} = 5\mathrm{s}$ is $\mathrm{t} = 5\mathrm{s}$ is

(a) $32.33\mathrm{C}$
(b) $43.34\mathrm{C}$
(c) $45.5\mathrm{C}$
(d) $42\mathrm{c}$

4. A wire of resistance 4Ω is used to wind a coil of radius $7\mathrm{cm}$. The wire has a diameter of $1.4\mathrm{mm}$ and the specific resistance of its material is $2 \times 10^{-2}\Omega\mathrm{m}$. The number of turns in the coil is

(a) 50
(b) 40
(c) 60
(d) 70

5. The electrical resistance of a conductor depends upon

(a) Size of conductor
(b) Temperature of conductor
(c) Geometry of conductor
(d) All of these

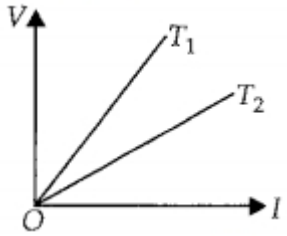
6. A cylindrical rod is reformed to half of its original length keeping volume constant. If its resistance before this change were R, then the resistance after reformation of rod will be

(a) R
(b) $R/4$
(c) $3\mathrm{R}/4$
(d) $\mathrm{R}/2$

7. Three resistors $2\Omega, 4\Omega$ and 5Ω are combined in parallel. This combination is connected to battery of emf $20\mathrm{V}$ and negligible internal resistance. The total current drawn from the battery is

(a) $10\mathrm{A}$
(b) $15\mathrm{A}$
(c) $19\mathrm{A}$
(d) $23\mathrm{A}$

8. The voltage V and current I graphs for a conductor at two different temperatures $\mathrm{T_1}$ and $\mathrm{T_2}$ are shown in the figure. The relation between $\mathrm{T_1}$ and $\mathrm{T_2}$ is

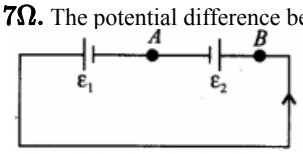


(a) $\mathrm{T_1} > \mathrm{T_2}$
(b) $\mathrm{T_1} < \mathrm{T_2}$
(c) $\mathrm{T_1} = \mathrm{T_2}$
(d) $\mathrm{T_1} = \dfrac{1}{\mathrm{T_2}}$

9. Two metal wires of identical dimensions are connected in series. If σ_1 and σ_2 and are the conductivities of the metals respectively, the effective conductivity of the combination is

(a) $\sigma_1 + \sigma_2$
(b) $\dfrac{\sigma_1 + \sigma_2}{2}$
(c) $\sqrt{\sigma_1\sigma_2}$
(d) $\dfrac{2\sigma_1\sigma_2}{\sigma_1 + \sigma_2}$

10. Two cells ε_1 and ε_2 connected in opposition to each other as shown in figure. The cell ε_1 is of emf $9\mathrm{V}$ and internal resistance 3Ω the cell ε_2 is of emf $7\mathrm{V}$ and internal resistance 7Ω. The potential difference between the points A and B is



(a) $8.4\mathrm{V}$
(b) $5.6\mathrm{V}$
(c) $7.8\mathrm{V}$
(d) $6.6\mathrm{V}$

11. The resistance of a heating element is 99Ω at room temperature. What is the temperature of the element if the resistance is found to be 116Ω?
(Temperature coefficient of the material of the resistor is $1.7 \times 10^{-4} {}^{\circ}C^{-1}$)

(a) $999.9C$
(b) $1005.3C$
(c) $1020.2C$
(d) $1037.1C$

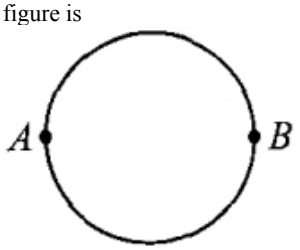
12. The resistance of the wire in the platinum resistance thermometer at ice point is 5Ω and at steam point is 5.25Ω . When the thermometer is inserted in an unknown hot bath its resistance is found to be 5.5Ω. The temperature of the hot bath is

(a) $100^{\circ}C$
(b) $200^{\circ}C$
(c) $300^{\circ}C$
(d) $350^{\circ}C$

13. A heater coil is rated $100W, 200V$. It is cut into two identical parts. Both parts are connected together in parallel, to the same source of $200V$. The energyl liberated per second in the new combination is

(a) $100J$
(b) $200J$
(c) $300J$
(d) $400J$

14. A wire of resistance 12 ohms per meter is bent to form a complete circle of radius $10cm$. The resistance between its two diametrically opposite points, A and B as shown in the figure is

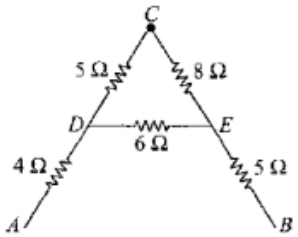


(a) 3Ω
(b) $6\pi\Omega$
(c) 6Ω
(d) $0.6\pi\Omega$

15. The total resistance in the parallel combination of three resistance $9\Omega, 7\Omega,$ and 5Ω is

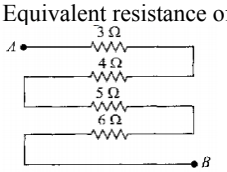
(a) 1.22Ω
(b) 2.29Ω
(c) 4.22Ω
(d) 2.02Ω

16. The equivalent resistance between A and B for the circuit shown in figure is



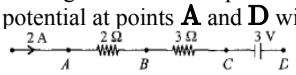
(a) 13.1Ω
(b) 15.1Ω
(c) 17.1Ω
(d) 19.1Ω

17. Equivalent resistance of the given network is



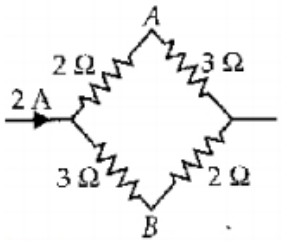
(a) 28
(b) 18
(c) 26
(d) 25

18. In the given circuit the potential at point B is zero, the potential at points A and D will be



(a) $V_a = 4V; V_D = 9V$
(b) $V_A = 3V; V_D = 4V$
(c) $V_A = 9V; V_D = 3V$
(d) $V_A = 4V; V_D = 3V$

19. The potential difference between A and B as shown in figure is



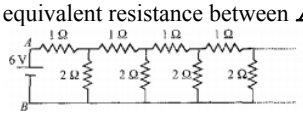
(a) $1V$
(b) $2V$
(c) $3V$
(d) $4V$

20. Three resistance, $2\Omega, 4\Omega, 5\Omega,$ are combined in series and this combination is connected to a battery of $12\mathrm{V}$ emf and negligible internal resistance. The potential drop across these resistances are

(a) $(5.45, 4.36, 2.18)\mathrm{V}$
(b) $(2.18, 5.45, 4.36)\mathrm{V}$
(c) $(4.36, 2.18, 5.45)\mathrm{V}$
(d) $(2.18, 4.36, 5.45)\mathrm{V}$

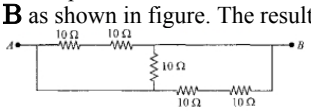
21. If voltage across a bulb rated $220\mathrm{V}\ 100\mathrm{W}$ drops by 2.5% of its rated value, the percentage of the rated value by which the power would decrease is $\%$

22. An infinite ladder network of resistance is constructed with 1Ω and 2Ω resistance as shown in figure. The $6\mathrm{V}$ battery between A and B has negligible internal resistance. The equivalent resistance between A and B is

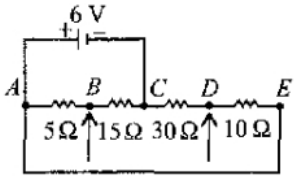


23. The equivalent resistance of series combination of Two equal resistors is S. If they are joined in parallel, the total resistance if P. The relation between S and P is given by $\mathrm{S} = \mathrm{nP}$. Then the minimum possible value of n is

24. Five equal resistances of 10Ω are connected between A and B as shown in figure. The resultant resistance is



25. Four resistors are connected as shown in the figure $A\ 6V$ battery of negligible resistance is connected across terminals A and C. The potential difference across terminals B and D will be



26. A solid AB has the $NaCl$ structure. If radius of cation A^+ is 120pm, calculate the maximum possible value of the radius of the anion B^-

(a) $240\mathrm{pm}$
(b) $280\mathrm{pm}$
(c) $270\mathrm{pm}$
(d) $290\mathrm{pm}$

27. $CsBr$ has a (bcc) arrangement and its unit cell edge length is 400 pm. Calculate the interionic distance in $CsCl$.

(a) $346.4\mathrm{pm}$
(b) $643\mathrm{pm}$
(c) $66.31\mathrm{pm}$
(d) $431.5\mathrm{pm}$

28. An ionic compound AB has ZnS type of structure, if the radius of A^+ is $22.5\mathrm{pm},$ then the ideal radius of B^- is

(a) $54.35\mathrm{pm}$
(b) $100\mathrm{pm}$
(c) $145.16\mathrm{pm}$
(d) None

29. In a cubic packed structure of mixed oxides, the lattice is made up of oxide ions, one fifth of tetrahedral voids are occupied by divalent (X^{++}) ions while one- half of the octahedral voids are occupied by trivalent ions (Y^{+3}) , then the formula of the oxide is.

(a) $\mathrm{XY_2O_4}$
(b) $\mathrm{X_2YO_4}$
(c) $\mathrm{X_4Y_5O_{10}}$
(d) $\mathrm{X_5Y_4O_{10}}$

30. A substance has density of $2\mathrm{kg\ dm}^{-3}$ & it crystallizes to fcc lattice with edge length equal to $700\mathrm{pm},$ then the molar mass of the substance is

(a) $75.50\mathrm{gmmol}^{-1}$
(b) $103.30\mathrm{gmmol}^{-1}$
(c) $56.02\mathrm{gmmol}^{-1}$
(d) $65.36\mathrm{gmmol}^{-1}$

31. The anions (a) form hexagonal closest packing and the cations(c) occupy only $2/3$ of octahedral holes. The simplest formula of the ionic compound is -

(a) CA
(b) $\mathrm{C_3A_2}$
(c) $\mathrm{C_4A_3}$
(d) $\mathrm{C_2A_3}$

32. An elemental crystal has a density of $8570\mathrm{kg/m}^3$. The packing efficiency is $0.68.$ The closest distance of approach between neighbouringatom is 2.86Å. What is the mass of one atom approximately?

(a) 29 amu
(b) 39 amu
(c) 63 amu
(d) 93 amu

33. If Z is the number of atoms in the unit cell that represents the closest packing sequence $ABC\ ABC\ldots$, the number of tetrahedral voids in the unit cell is equal to -

(a) Z
(b) $2Z$
(c) $\frac{Z}{2}$
(d) $\frac{Z}{4}$

34. In a solid 'AB' having the $NaCl$ structure, 'A' atoms occupy the corners of the cubic unit cell. If all the face centred atoms along one of the axes are removed, then the resultant stoichiometry of the solid is -

(a) AB_2
(b) A_2B
(c) A_4B_3
(d) A_3B_4

35. When heated above $916^\circ C$, iron changes its bcc crystalline form to foc without the change in the radius of atom. The ratio of density of the crystal before heating and after heating is [At. wt. $Fe = 56$]

(a) 1.069
(b) 0.918
(c) 0.725
(d) 1.231

36. The crystal system for which $a \neq b \neq c$ and $\alpha = \beta = \gamma = 90^0$ is said to be :

(a) Triclinic
(b) Tetragonal
(c) Cubic
(d) Orthorhombic

37. A metal crystallizes in a body centered cubic lattice (bcc) with the edge of the unit cell 5.2Å. The distance between the two nearest neighbour is

(a) 10.4Å
(b) 4.5Å
(c) 5.2Å
(d) 9.0Å

38. Consider a Body Centered Cubic(bcc) arrangement, let d_e, d_{fd}, d_{bd} be the distances between successive atoms located along the edge, the face-diagonal, the body diagonal respectively in a unit cell.Their order is given by:

(a) $d_e < d_{fd} < d_{bd}$
(b) $d_{fd} > d_{bd} > d_e$
(c) $d_{fd} > d_e > d_{bd}$
(d) $d_{bd} > d_e > d_{fd}$

39. In zinc blende structure the coordination number of Zn^{2+} ion is

(a) 2
(b) 4
(c) 6
(d) 8

40. Strontium chloride has a fluorite structure, which of the following statement is true for the structure of strontium chloride?

(a) The strontium ions are in a body-centered cubic arrangement
(b) The strontium ions are in a face-centered cubic arrangement
(c) Each chloride ion is at the center of a cube of 8 strontium ions
(d) Each strontium ion is at the center of a tetrahedron of 4 chloride ions

41. Given an alloy of Cu, Ag and Au in which Cu atoms constitute the CCP arrangement.If the hypothetical formula of the alloy is Cu_4Ag_3Au . What are the probable locations of Ag and Au atoms.

(a) Ag - all Tetrahedral voids; Au - all Octahedral voids
(b) Ag - $3/8$th Tetrahedral voids; Au - $1/4$th Octahedral voids
(c) $Ag - 1/2$ Octahedral voids; $Au - 1/2$ Tetrahedral voids
(d) Ag - all Octahedral voids; Au - all tetrahedral voids

42. $NaCl$ shows Schottky defects and $AgCl$ Frenkel defects. Their electrical conductivity is due to :

(a) Motion of ions and not the motion of electrons
(b) Motion of electrons and not the motion of ions
(c) Lower co-ordination number of $NaCl$
(d) Higher co-ordination number of $AgCl$

43. Zinc Oxide, white in colour at room temperature, acquires yellow colour on heating due to:

(a) Zn being a transition element
(b) Paramagnetic nature of the compound
(c) Trapping of electrons at the site vacated by Oxide ions
(d) Both (a) & (b)

44. An element X (At. wt. $= 80g/mol$) having fce structure, calculate no. of unit cells in $8gm$ of X :

(a) $0.4 \times N_A$
(b) $0.1 \times N_A$
(c) $4 \times N_A$
(d) $N_A/40$

45. Which of the following solids are not correctly matched with the bonds found between the constituent particles:

(a) Solid CO_2 : Vanderwaal's
(b) Graphite : Covalent and Vanderwaal
(c) Grey Cast Iron : Ionic
(d) Metal alloys : Ions-delocalised electrons

46. In an ionic solid $r^{(+)} = 1.6$Å and $r^{(-)} = 1.864$Å . Use the radius ratio rule to determine the edge length of the cubic unit cell in Å.

47. A compound AB has a rock type structure with $A : B = 1 : 1$. The formula weight of AB is 6.023 y amu and the closest $A - B$ distance is $y^{1/3}$ nm. Determine the density of lattice in $\mathrm{kg/m^3}$

48. A molecule A_2B (mol. wt. 166.4) occupies triclinic lattice with $a = 5$Å, $b = 8$Å and $c = 4$Å. If density of AB_2 is $5.2 \mathrm{gcm}^{-3}$ calculate the number of molecules present in one unit cell —

49. The radius of Ag^+ ion is $126\mathrm{pm}$ while that of I^- ion is $216\mathrm{pm}$. The co-ordination number of Ag in AgI is

50. The coordination number of a metal crystallized in a B.C.C. structure is

51. If $\cos^{-1}\left(\frac{x}{a}\right) + \cos^{-1}\left(\frac{y}{b}\right) = \alpha$, then $\frac{x^2}{a^2} - \frac{2xy}{ab}\cos\alpha + \frac{y^2}{b^2} =$

(a) $\sin^2\alpha$
(b) $\cos^2\alpha$
(c) $\tan^2\alpha$
(d) $\cot^2\alpha$

52. $2\left(\tan^{-1}1 + \tan^{-1}2 + \tan^{-1}3\right)$ is equal to

(a) $\pi/4$
(b) $\pi/2$
(c) π
(d) 2π

53. If $\tan^{-1}\frac{\sqrt{1-x^2}-1}{x} = 4$, then

(a) $x = \tan 2$
(b) $x = \tan 4$
(c) $x = \tan(1/4)$
(d) $x = \tan 8$

54. The values of x satisfying $\tan\left(\sec^{-1}x\right) = \sin\left(\cos^{-1}\frac{1}{\sqrt{5}}\right)$ is/are

(a) $\frac{\sqrt{5}}{3}$
(b) $\frac{3}{\sqrt{5}}$
(c) $-\frac{\sqrt{5}}{3}$
(d) $-\frac{3}{\sqrt{5}}$

55. Which of the following is negative

(a) $\cos\left(\tan^{-1}(\tan 4)\right)$
(b) $\sin\left(\cot^{-1}(\cot 4)\right)$
(c) $\tan\left(\cos^{-1}(\cos 5)\right)$
(d) $\cot\left(\sin^{-1}(\sin 4)\right)$

56. Which of the following identities does not hold?

(a) $\sin^{-1}x = \cot^{-1}\left[\frac{\sqrt{(1-x^2)}}{x}\right]; 0 < x \le 1$
(b) $\sin^{-1}x = \cot^{-1}\left[\frac{\sqrt{(1-x^2)}}{x}\right]; -1 \le x < 0$
(c) $\sin^{-1}x = \cos^{-1}\sqrt{(1-x^2)}; 0 \le x \le 1$
(d) $\sin^{-1}x = 1 - \sin^{-1}(-x); -1 \le x \le 1$

57. If $\frac{1}{\sqrt{2}} < x < 1$ then $\cos^{-1}x + \cos^{-1}\left(\frac{x+\sqrt{1-x^2}}{\sqrt{2}}\right)$ is equal to

(a) $2\cos^{-1}x - \frac{\pi}{4}$
(b) $2\cos^{-1}x$
(c) $\frac{\pi}{4}$
(d) 0

58. Set of values of x satisfying $\cos^{-1}\sqrt{x} > \sin^{-1}\sqrt{x}$

(a) $\left(0, \frac{1}{2}\right)$
(b) $\left[0, \frac{1}{2}\right)$
(c) $\left(\frac{1}{2}, 1\right)$
(d) $\left(\frac{1}{2}, 1\right]$

59. Which one of the following is correct?

(a) $\tan 1 > \tan^{-1}$
(b) $\tan 1 < \tan^{-1} 1$
(c) $\tan 1 = \tan^{-1} 1$
(d) None of these

60. If $\cos^{-1} x + \cos^{-1} y + \cos^{-1} z = \pi$, then

(a) $x^2 + y^2 + z^2 + xyz = 0$
(b) $x^2 + y^2 + z^2 + 2xyz = 0$
(c) $x^2 + y^2 + z^2 + xyz = 1$
(d) $x^2 + y^2 + z^2 + 2xyz = 1$

61. The value of $\sin\left(2.\sin^{-1}.8\right)$ is

(a) 0.64
(b) 0.36
(c) 0.96
(d) 0.84

62. $3\sin^{-1}\frac{2x}{1+x^2} - 4\cos^{-1}\frac{1-x^2}{1+x^2} + 2\tan^{-1}\frac{2x}{1-x^2} = \frac{\pi}{3}$ then principal $x =$

(a) $\sqrt{3}$
(b) $\frac{1}{\sqrt{3}}$
(c) 1
(d) None of these

63. $\sin^{-1}\sin 22 + \cos^{-1}\cos 33 + \tan^{-1}\tan 44 =$

(a) $55 - 17\pi$
(b) $16\pi - 48$
(c) $45 - 18\pi$
(d) None of these

64. $\cos^{-1}\left\{\frac{1}{2}x^2 + \sqrt{1-x^2}\sqrt{1-\frac{x^2}{4}}\right\} = \cos^{-1}\frac{x}{2} - \cos^{-1} x$ holds if –

(a) $|x| \le 1$
(b) $x \in R$
(c) $0 \le x \le 1$
(d) $-1 \le x \le 0$

65. If minimum value of $\left(\sin^{-1} x\right)^2 + \left(\cos^{-1} x\right)^2$ is $\frac{\pi^2}{k}$, then the value of k is

(a) 4
(b) 6
(c) 8
(d) None of these

66. All x satisfying the inequality $\left(\cot^{-1} x\right)^2 - 7\left(\cot^{-1} x\right) + 10 > 0$, lie in the interval:

(a) $(-\infty, \cot 5) \cup (\cot 4, \cot 2)$
(b) $(\cot 5, \cot 4)$
(c) $(\cot 2, \infty)$
(d) $(-\infty, \cot 5) \cup (\cot 2, \infty)$

67. Considering only the principal values of inverse functions, the set $A = \left\{x : \tan^{-1}(2x) + \tan^{-1}(3x) = \frac{\pi}{4}\right\}$

(a) is an empty set
(b) Contains more than two elements
(c) Contains two elements
(d) is a singleton

68. The value of $\sin^{-1}\left(\frac{12}{13}\right) - \sin^{-1}\left(\frac{3}{5}\right)$ is equal to :

(a) $\pi - \sin^{-1}\left(\frac{63}{65}\right)$
(b) $\pi - \cos^{-1}\left(\frac{33}{65}\right)$
(c) $\frac{\pi}{2} - \sin^{-1}\left(\frac{56}{65}\right)$
(d) $\frac{\pi}{2} - \cos^{-1}\left(\frac{9}{65}\right)$

69. If $\cos^{-1} x - \cos^{-1} \frac{y}{2} = \alpha$ where $-1 \le x \le 1, -2 \le y \le 2$, $x \le \frac{y}{2}$ then for all $x, y, 4x^2 - 4xy\cos\alpha + y^2$ is equal to

(a) $4\sin^2\alpha - 2x^2y^2$
(b) $4\cos^2\alpha + 2x^2y^2$
(c) $4\sin^2\alpha$
(d) $2\sin^2\alpha$

70. If $\alpha = \sin^{-1}\left(\frac{4}{5}\right), \beta = \cot^{-1}(3),$ where $0 < \alpha, \beta < \frac{\pi}{2},$ then $\alpha - \beta$ is equal to :

(a) $\sin^{-1}\left(\frac{9}{5\sqrt{10}}\right)$
(b) $\tan^{-1}\left(\frac{9}{14}\right)$
(c) $\cos^{-1}\left(\frac{9}{5\sqrt{10}}\right)$
(d) $\tan^{-1}\left(\frac{9}{5\sqrt{10}}\right)$

71. $\tan^{-1} \mathrm{n}, \tan^{-1}(\mathrm{n}+1)$ and $\tan^{-1}(\mathrm{n}+2), \mathrm{n} \in \mathrm{N},$ are angles of a triangle if n .....

72. If $\sin^{-1}(\sin 5) > x^2 - 4x,$ then the number of possible integral values of x is .....

73. Greatest value of $\tan^{-1}\left(\frac{1-x}{1+x}\right) \forall x \in [0,1]$ is $\frac{\pi}{k}$ then k equals

74. If $\sum_{i=1}^{10} \cos^{-1} x_i = 0$ then $\sum_{i=1}^{10} x_i$ is

75. If the range of m for which the equation $\operatorname{cosec}^{-1} \mathrm{x} = \mathrm{mx}$ has exactly two solutions is $\left(0, \frac{\lambda\pi}{10}\right]$ then λ is equal to