SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

SR MPC | **JEE MAINS MODEL WT-09** | **Date: 26-07-2020**

Time: 3 Hours | **Max. Marks: 300 M**

SECTION – I
(SINGLE CORRECT ANSWER TYPE)

This section contains 20 multiple choice questions. Each question has 4 options (A), (B), (C) and (D) for its answer, out of which **ONLY ONE** option can be correct.

Marking scheme: +4 for correct answer, 0 if not attempted and -1 if not correct.

MATHEMATICS

Syllabus: 10-07-2020 TO 24-07-2020. Combinations, Circles up to 1.2 Exercise

1. $^nC_{r-1}=330,{}^nC_r=462,{}^nC_{r+1}=462\Rightarrow r=$

A) 3 B) 4 C) 5 D) 6

2. A committee of 12 members is to formed from 9 women and 8 men. The number of committees in which the women are in majority is

A) 2720 B) 2702 C) 2270 D) 2278

3. In denotes the number of triangles that can be formed with the vertices of a regular polygon of m sides. If $T_{m+1}-T_m=15$, then m =

A) 3 B) 6 C) 9 D) 12

4. The number of ways of dividing 15 books into 3 groups of 3, 4, 8 books respectively is

A) $\frac{15!}{2!3!4!8!}$ B) $\frac{15!}{(3!)^2\,4!8!}$ C) $\frac{15!}{4!8!}$ D) $15C_3.{}^4C_4.{}^8C_8$

5. A man invities 10 friends to a party and places 5 at one table and 5 at another table, the tables being round. The number of ways in which he can arrange the friends is

A) $(4!)^2$ B) $^{10}C_5(4!)^2$ C) $^{10}C_5(5!)^2$ D) 4!

6. The number of many one functions from $A=\{1,2,3\}$ to $B=\{a,b,c,d\}$ is

A) 64 B) 24 C) 40 D) 0

7. The number of positive divisors of 768 is

A) 17 B) 18 C) 19 D) 20

8. If there are 5 periods in each working day of a school, then the number of ways that you can arrange 4 subjects during the working day is

A) 220 B) 240 C) 260 D) 280

9. The number of 5 letter word that can be formed by using the letters of the word SARANAM is

A) 1120 B) 6720 C) 480 D) 720

10. The number of quadratic expressions with which coefficients drawn from the set $\{0,1,2,3\}$ is

A) 27 B) 36 C) 48 D) 64

11. Equation of the circle which touches the lines $4x+3y-5=0$, $4x+3y+15=0$ **and having centre on the line** $3x+2y+4=0$ **is**

A) $x^2+y^2+4x-2y+1=0$ B) $x^2+y^2-4x+2y+1=0$

C) $x^2+y^2+4x-2y-11=0$ D) $x^2+y^2-4x+2y-11=0$

12. If $(x,3)$ **and** $(3,5)$ **are the ends of the diameter of a circle with centre at** $(2,y)$ **then** (x,y)

A) $(1,4)$ B) $(4,1)$ C) $(8,2)$ D) $(2,8)$

13. The equation of the circle passing through $(2,0)$ **and** $(0,4)$ **and having the minimum radius is**

A) $x^2+y^2=4$ B) $x^2+y^2-2x+4y=0$

C) $x^2+y^2-x-2y=0$ D) $x^2+y^2-2x-4y=0$

14. If the power of $(2,1)$ with respect to the circle $2x^2+2y^2-8x-6y+k=0$ is positive if

A) $0<k<12$ B) $-12<k<12$ C) $k>12$ D) $k<12$

15. The equation of the circle concentric with the circle $x^2+y^2-6x+12y+15=0$ and of double its area is

A) $x^2+y^2-6x+12y-15=0$ B) $x^2+y^2-6x+12y-30=0$

C) $x^2+y^2+x+6y+1=0$ D) $2x^2+2y^2+x+3y-20=0$

16. The equation of the circle which passes through the origin and makes intercepts of lengths 4 and 8 on the x- and y- axis respectively are

A) $x^2+y^2\pm4x\pm8y=0$ B) $x^2+y^2\pm2x\pm4y=0$

C) $x^2+y^2\pm8x\pm16y=0$ D) $x^2+y^2\pm x\pm y=0$

17. The condition that the pair of tangents drawn from (g,f) to the circle $x^2+y^2+2gx+2fy+c=0$ may be at right angles is

A) $g^2+f^2+c=0$ B) $g^2+f^2+2c=0$ C) $g^2+f^2=c$ D) $g^2+f^2=2c$

18. If the length of the tangent from (h,k) to the circle $x^2+y^2=16$ is twice the length of the tangent from the same point to the circle $x^2+y^2+2x+2y=0$, then

A) $h^2+k^2+4h+4k+16=0$ B) $h^2+k^2+3h+3k=0$

C) $3h^2+3k^2+8h+8k+16=0$ D) $3h^2+3k^2+4h+4k+16=0$

19. The point on the circle $x^2+y^2-6x+4y-12=0$ which is at maximum distance from the point $(-9,7)$ is

A) $(-1,1)$ B) $(7,-5)$ C) $(0,-6)$ D) $(0,2)$

20. The equation of the circle touching the axes at $(a,0)$ and $(0,a)$ is

A) $x^2+y^2-2ax-2ay+a^2=0$ B) $x^2+y^2+2ax+2ay=0$

C) $x^2+y^2-ax-ay=0$ D) $x^2+y^2+ax-ay=0$

SECTION- II
(Numerical Value Answer Type)

This section contains 5 questions. The answer to each question is a Numerical values comprising of positive or negative decimal numbers.
Marking scheme: +4 for correct answer, 0 in all other cases.

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21. Find the number of ways in which 5 distinct balls can be distributed in three different boxes in no box remains empty.
22. Total number of four digit odd numbers that can be formed using 0, 1, 2, 3, 5, 7 are (with out repetition).
23. If the points (0,0), (2,0), (0,4),(1,k) are concyclic then $k^2-4k=$_____
24. If the line $y=2x+c$ is a tangent to the circle $x^2+y^2=5$, then a value of c is_____
25. For the circle $ax^2+y^2+bx+dy+2=0$ centre is (1, 2) then $2b+3d=$ _____

SECTION – I
(SINGLE CORRECT ANSWER TYPE)

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PHYSICS

Syllabus: CURRENT ELECTRICITY (10-07-2020 TO 24-07-2020).

26. A current (I) flows through a uniform wire of diameter (d) when the mean drift velocity is V. The same current will flow through a wire of diameter d/2 made of the same material if the mean drift velocity of the electron is

A) V/4 B) V/2 C) 4V D) 2V

27. A steady current is passing through a linear conductor of non-uniform cross-section. The current density in the conductor is

A) independent of area of cross-section B) directly proportional to area of cross-section
C) inversely proportional to area of cross-section
D) inversely proportional to the square root of area of cross-section

28. The resistance of wire is 20Ω. The wire is stretched to three times its length. Then the resistance will now be___

A) 6.67Ω B) 60Ω C) 120Ω D) 180Ω

29. The resistance of a semi-conductors

A) increases with increase of temperature B) decreases with increase of temperature
C) does not charge with charge of temperature
D) first decreases and then increases with increase of temperature

30. A hollow copper tube of 5 m length has got external diameter equal to 10 cm and the walls are 5 mm thick. If specific resistance of copper is 1.7×10^{-8} ohm $\times$ metre. Calculate the resistance of the tube.

A) $5.77\times10^{5}\Omega$ B) $5.77\times10^{-5}\Omega$ C) $5.77\times10^{-7}\Omega$ D) $5.77\times10^{7}\Omega$

31. A negligibly small current is passed through a wire of length 15 m and uniform cross-section $6.0\times10^{-7}m^2$. The measured resistance of the wire is 5.0Ω. The resistivity of the material is

A) $1.8\times10^{-6}\Omega-m$ B) $0.2\times10^{-6}\Omega-m$ C) $0.6\times10^{-6}\Omega-m$ D) $0.9\times10^{-6}\Omega-m$

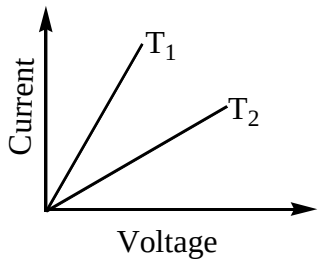
32. The resistance of a wire of length 20 cm is 5Ω. It is stretched uniformly to a length of 40 cm. The resistance now becomes:

A) 5Ω B) 10Ω C) 20Ω D) 200Ω

33. Two wires of the same material having radii in the ratio 1:2, carry currents in the ratio 4:1. The ratio of drift velocities of electrons in them is

A) 1:16 B) 16:1 C) 1:4 D) 4:1

34. The current in a metallic conductor is plotted against voltage at two different temperatures T_1 and T_2. Which is correct



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

35. A storage battery is connected to a charger for charging with a voltage of 12.5 Volts. The internal resistance of the storage battery is 1 Ω. When the charging current is 0.5A, the emf of the storage battery is

A) 13 Volts B) 12.5 Volts C) 12 Volts D) 11.5 Volts

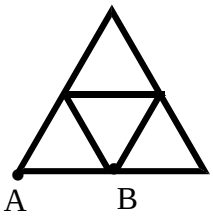
36. The terminal voltage across a battery of emf E can be

A) 0 B) > E C) <E D) All of above

37. A piece of copper wire having a resistance R is cut into 10 pieces of equal length. These pieces are connected in parallel. The effective resistance of the combination will be

A) R/100 B) R/10 C) 10 R D) 100 R

38. In the diagram resistance between any two junctions is R. Equivalent resistance across terminals A and B is



A) $\frac{11R}{7}$ B) $\frac{18R}{11}$ C) $\frac{7R}{11}$ D) $\frac{11R}{18}$

39. Power generated across a uniform wire connected across a supply is H. If the wire is cut into n equal parts and all the parts are connected in parallel across the same supply, the total power generated in the wire is

A) $\frac{H}{n^2}$ B) n^2H C) nH D) $\frac{H}{n}$

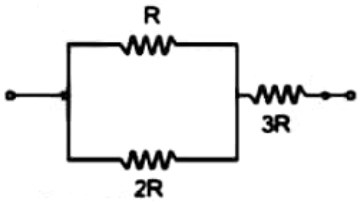
40. If the length of the filament of a heater is reduced by 10%, the power of the heater will

A) increase by about 9% B) increase by about 11%
C) increase by about 19% D) decrease by about 10%

41. If the current in a electric bulb drops by 2% then the power decreases by

A) 1% B) 2% C) 4% D) 16%

42. The ratio of powers dissipated respectively in R and 3R, as shown is



A) 9 B) 27/4 C) 4/9 D) 4/27

43. The electric current in a discharge tube containing a gas is due to

A) electron only B) positive ions only
C) negative ion and positive ions both C) electrons and positive ions both

44. A metallic block has no potential difference applied across it. Then the mean velocity of free electron is

A) proportional to T B) proportional to $\sqrt{T}$
C) Zero D) finite but independent of temperature

45. In order to increase the resistance of a given wire of uniform cross section to four times its value, a fraction of its length is stretched uniformly till the full length of the wire becomes $\frac{3}{2}$ times the original length what is the value of this fraction?

A) $\frac{1}{4}$ B) $\frac{1}{8}$ C) $\frac{1}{16}$ D) $\frac{1}{6}$

SECTION-II
(Numerical Value Answer Type)

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46. How many electrons per second pass through a section of wire carrying a current of 0.7 A _____$\times 10^8$.
47. A current of 3.6 A flows through an automobile headlight. How many coulombs of charge flow through the headlight in 3.0 h_____ $\times 10^3 C$.

48. A current of 7.5A is maintained in wire for 45s. In this time. How much charge _____ C.
49. A current of 7.5A is maintained in wire for 45s. In this time. How many electrons flow through the wire_____ $\times 10^{21}$.
50. When a wire carries a current of 1.20A, the drift velocity is $1.20\times10^{-4} m/s$. What is the drift velocity when the current is 6.00A_____ $\times 10^{-4} m/\sec$.

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CHEMISTRY

Syllabus: SOLID STATES (10-07-2020 TO 24-07-2020).

51. The correct relation between angles of the edge of acrystal belonging to a cubic system is
A) $\alpha=\beta=\gamma=90^0$ B) $\alpha=\beta=\gamma\neq90^0$ C) $\alpha=\beta=90^0;\gamma=120^0$ D) $\alpha\neq\beta\neq\gamma\neq90^0$

52. The name given to ABCABCABC_____ type of arrangement is
A) cubic close – packed arrangement B) hexagonal close – packed arrangement
C) tetrahedral arrangement D) None of these

53. Due to Frenkel defect, the density of crystal:
A) increases B) decreases C) halved D) does not change

54. Non stoichiometric solid among the following
A) MgO B) CaO C) Na_2O D) TiO

55. A solid has a structure in which W atoms are located at the corners of the unit cell, O atoms are located at the cube edge and Na atoms at the cube centres. The formula of the compound is
A) $Na_2\ WO_3$ B) $NaWO_3$ C) $Na_2W_2O_4$ D) Na_2WO_6

56. A metal has a body – centred cubic lattice and the length of the unit cell is 3A. If the density is 10 gm/cc. Caliculate its atomic weight.
A) 27 B) 81 C) 40.5 D) 162

57. The number of unit cells in 58.5 g of NaCl is nearly
A) 6×10^{20} B) 3×10^{22} C) 1.5×10^{23} D) 0.5×10^{24}

58. In a close packed lattice containing 'n' particles, the number of tetrahedral and octahedral voids respectively
A) n, 2n B) n, n C) 2n, n D) 2n, 2n

59. The 8:8 type of packing is present in
A) *NaCl* B) *KCl* C) *CsCl* D) MgF_2

60. The packing fraction in a simple cubic cell of crystals is:
A) $\frac{\pi}{6}$ B) $\frac{\sqrt{3}}{8}\pi$ C) $\frac{1}{2\sqrt{2}}\pi$ D) $\frac{\sqrt{2}}{6}\pi$

61. A body centred cubic solid is made up of two elements A and B. Atom of A occupy two corners of the cube. If the remaining position in the cell are occupied by the atoms of B, the formula of the compound
A) AB_2 B) AB_3 C) AB_7 D) A_3B_2

62. The concentration of cation vacancies when NaCl is doped with 10^{-3} mole % of $SrCl_2$
A) 6.023×10^{20} B) 6.023×10^{23} C) 6.023×10^{21} D) 6.023×10^{18}

63. Which of the following compounds is likely to show both Frenkel and Schottky defects in its crystalline form?
A) *CsCl* B) *KBr* C) *AgBr* D) *ZnS*

64. CsCl crystallizes in body centred cubic lattice. If 'a' is its edge length then which of the following expressions is correct?

A) $r_{c_s^+} + r_{cl^-} = 3a$ B) $r_{c_s^+} + r_{cl^-} = \frac{3a}{2}$ C) $r_{c_s^+} + r_{cl^-} = \frac{\sqrt{3}}{2}a$ D) $r_{c_s^+} + r_{cl^-} = \sqrt{3}a$

65. Which of the following exists as covalent crystals in solid state?

A) Iodine B) Silicon C) Sulphur D) Phosphorus

66. The packing efficiency of simple cubic (sc). Body centred cubic (bcc) and cubic close packing (ccp) lattices follow the order

A) bcc < ccp < sc B) ccp < bcc < sc C) sc < ccp < bcc D) sc < bcc < ccp

67. The $\frac{r^+}{r^-}$ ratio of KF is 0.98. The type of structure in KF is

A) NaCl B) ZnS C) graphite D) CsCl

68. Frenkel defect arise due to

A) displacement of a cation to interstitial position
B) the absence of a negative ion from the lattice point
C) the presence of an extra positive ion in the lattice site
D) The absence of a pair of cation and anion from the lattice site

69. Among solids, the highest melting point is exhibited by

A) covalent solids B) Ionic solids C) Pseudo solids D) Molecular solids

70. Which one of the following statements is not correct?

A) schottky defect in ionic solids does not change the density of the crystal
B) Packing efficiency is the percentage of total space filled by the particles
C) In body centered cubic unitcell, the relationship between atomic radius (r) and the edge length (a) is, $r = \frac{\sqrt{3}}{4}a$
D) Photovoltaic cell is used for conversion of light energy into electrical energy

SECTION-II
(Numerical Value Answer Type)

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71. Potassium crystallizes in a bcc lattice, hence the coordination number of potassium in potassium metal is_____
72. Aluminium has f.c.c. structure. The length of the unit cell is 404 pm. If the density of the metal is 2.7 g cm^{-3}, the molar mass of Al atom is _____ g mol^{-1}.
73. Copper crystallizes in a f.c.c. lattice, the length of the unit cell is 3.63A^0. The radius of Cu – atom is _____A^0.
74. Sodium metal crystallizes in a body centred cubic lattice with the cell edge, 'a'= 4.29A^0. The radius of the Na-atom will be _____A^0.
75. A substance forms f.c.c. crystal structure. Its density is 1.984 gm cm^{-3} and the length of the edge of the unit cell is 630 pm. Calculate the molar mass._____.

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INCOMING SR MPC | **JEE MAINS MODEL WT-09** | **Date: 26-07-2020**

Time: 3 Hours | **Max. Marks: 300 M**

KEY SHEET

MATHEMATICS

1) C	2) B	3) B	4) D	5) B	6) C	7) B	8) B	9) C	10) C
11) A	12) A	13) D	14) C	15) A	16) A	17) A	18) C	19) B	20) C
21) 150	22) 192	23) 1	24) 5	25) -16					

PHYSICS

26) C	27) C	28) D	29) B	30) B	31) B	32) C	33) B	34) B	35) C
36) D	37) A	38) D	39) B	40) B	41) C	42) D	43) D	44) C	45) B
46) 4.37	47) 38.88	48) 337.5	49) 2.1	50) 6.00					

CHEMISTRY

51) A	52) A	53) D	54) D	55) B	56) B	57) C	58) C	59) C	60) A
61) C	62) D	63) C	64) C	65) B	66) D	67) D	68) A	69) A	70) A
71) 8	72) 26.80	73) 1.28	74) 1.85	75) 75.01					

HINTS & SOLUTIONS

1. $\frac{{}^{n}C_{r}}{{}^{n}C_{r-1}} = \frac{462}{330} \Rightarrow 5n = 12r - 5$ .....(1)

   ${}^{n}C_{r} = {}^{n}C_{r+1} \Rightarrow n = 2r + 1$.....(2)

   Solving (1) and (2), $r = 5$

2. A committee of 12 members is to be formed when coomen are in majority.

   Case-1: 9 women and 3 men

   $\therefore$ Number of ways

   $= {}^{9}C_{9} \times {}^{8}C_{3} = 1 \times \frac{8 \times 7 \times 6}{3 \times 2 \times 1} = 56$

   Case – II: 8 women and 4 men

   $\therefore$ Number of ways $= {}^{9}C_{8} \times {}^{8}C_{4} = 630$

   Case – III: 7 women and 5 men

   $\therefore$ Number of ways $= {}^{9}C_{7} \times {}^{8}C_{5} = 2016$

   $\therefore$ Required number of ways

   $= 56 + 630 + 2016 = 2702$

3. $T_{m+1}-T_m=15$

$m={}^{1}C_3-{}^{m}C_3=15$

$\frac{(m+1)m(m-1)}{6}-\frac{n(m-1)(m-2)}{6}=15$

$m(m-1)(3)=15\times 6$

$m(m-1)=6\times 5, m=6$

4. $\frac{15!}{3!4!8!}=\frac{15!}{12!3!}\frac{12!}{4!8!}\frac{8!}{8!(8-8)!}$

$={}^{15}C_3.{}^{12}C_4.{}^{8}C_3$

5. ${}^{10}C_5(5-1)!\ {}^{5}C_5(5-1)!$

6. Let $n(A)=a, n(B)=b$

The no. of many to one functions from A to B is

$b^a-{}^{b}p_a=4^3-{}^{4}p_3=64-24=40$

7. $768=8\times 96=2^8\times 3^1=$ Number of divisors $=(a_1+1)$

$(a_2+1).....(a_k+1)=9\times 2=18$

8. ${}^{4}C_1.\frac{5!}{2!}$

(Select one subject, repeat it two times in 5 periods)

9. i) All are diff $=5!=110$

ii) 2 are same & 3 are diff $=\frac{{}^{4}C_3\times 5!}{2}=240$

iii) 3 are same & 2 are diff $=\frac{{}^{4}C_2\times 5!}{3}=120$

Total = 480

10. ax^2+bx+c

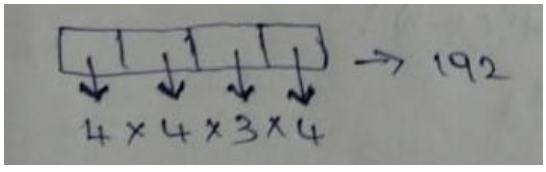
A	b	c
1	0	0
2	1	1
3	2	2
	3	3

$3\times 4\times 4=48$

21. The number of ways is

$3^5-{}^{3}C_1\times(3-1)^5+{}^{3}C_2(3-2)^5=243-96+3=150$

22.



PHYSICS

26. Given that $v_a = v_i$ $v_a = ?$

We know that

$I = neAv_d$

$\Rightarrow V_e \propto \frac{1}{A} \propto \frac{1}{\frac{\pi d^2}{4}} \propto \frac{1}{d^2}$

$\frac{V_{d_1}}{V_{d_2}} = \frac{(d/2)^2}{d^2} = \frac{1}{4}$

$V_{d_2} - 4V$.

27. $j = \frac{i}{A}$ current density inversely proportional to area of cross section.

28. During stretching volume is constant

$Al = A'(3l)$

$\Rightarrow A' = \frac{A}{3}$

$\frac{R'}{R} = \frac{\rho 3l}{A'\frac{\rho l}{A}}$, $R' = \frac{3A}{A'} \times R$

Put A' and R from above

$R' = R_{new} = 9R = 180\Omega$

29. $R \downarrow$ (Resistance decreases which increase of temperature)

30. Given that I=5m, d= 10cm, = 0.1m,

$R = \frac{\rho^1}{A} = \frac{17 \times 10^{-8} \times 5}{\frac{\pi \times 0.095^2}{4}} = 5.7 \times 10^{-5}\Omega$

31. Given that $I = 15m, A = 6.0 \times 10^{-7} m^2$.

$R = 5\Omega, \rho = ?$

$\rho = \frac{RA}{I} = \frac{5 \times 6 \times 10^{-7}}{15} = 0.2 \times 10^{-6}\Omega m$

32. Given that $I_1 = 20cm, R_1 = 5\Omega$,

$I_2 = 40\ cm, R_2 = ?$

During stretching volume of wire is constant

$20A = 40A' \Rightarrow A' = A/2$

We know that $R = \frac{\rho I}{A}$

$\frac{R_2}{R_1} = \frac{I_2}{I_1} \times \frac{A}{A'} = \frac{40}{20} \times \frac{A}{\frac{A}{2}}$

$R_2 = 20\Omega$

33. We no that $I = neAv_d$

$V_d = \frac{I}{neA} \propto \frac{I}{r^2}$

$\frac{V_{d_1}}{V_{d_2}} = \left(\frac{I_1}{I_2}\right)\left(\frac{r_2}{r_1}\right)^2 = \left(\frac{4}{1}\right)\left(\frac{2}{1}\right)^2 = 16$

34. $R = \frac{V}{I} \Rightarrow \frac{I}{V} = \frac{1}{R}$

$\tan\theta = 1/R = W + \theta$

$\because \theta_1 > \theta_2$

$\Rightarrow R_1 < R_2 \qquad \Rightarrow T_1 < T_2$

$\because T \uparrow R \uparrow$

35. $E + ir = 12.5\ volt$

$E + (0.5 \times 1) = 12.5$

$E = 12\ volt$

36. $E - ir = 0$

$E - ir = V$ (Discharging)

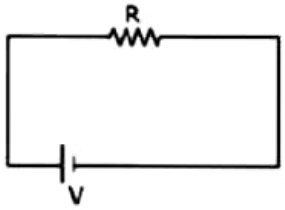
$E + ir = V$ (Charging)

37. $\frac{1}{R_{eq}} = \frac{10}{R} + \frac{10}{R} + ...10\ times$

$R_{eq} - R/100$

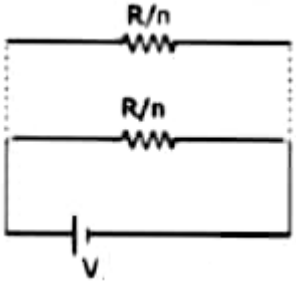
38. Req. $= \frac{11R}{18}$

39.



Initially $H = \frac{v^2}{R}$

Now after cutting



Power in one branch $= \frac{V^2}{R/n} = \frac{nV^2}{R}$

Total power $= \frac{nV^2}{R} + \frac{nV^2}{R} + ... = \frac{n^2V^2}{R}$.

40. $P = \frac{V^2}{R} \quad R = \frac{\rho l}{A}$

$P' = \frac{V^2}{0.9R} \quad R' = \frac{\rho(l - 0.1l)}{A}$

$P' = \frac{1.11V^2}{R}, R' = 0.9\frac{\rho l}{A}$

$R' = \frac{0.9\rho l}{A}$

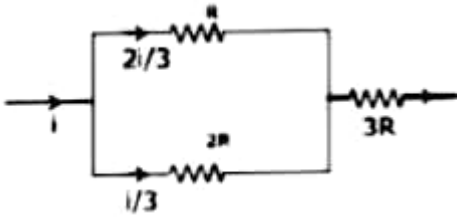
$P' = \left(1 + \frac{11}{100}\right)P$

P' increase by 11 %.

41. $I_L = 98I$

$$P_L\% \downarrow = \frac{I^2R - (0.981)^2 R}{I^2R} = 4\%$$

42.



$$P_1 = \frac{V^2}{R} = I^2R = \frac{4I^2R}{9}$$

$$P_2 = I^2 \times 3R$$

$$\frac{P_1}{P_2} = \frac{4}{27}.$$

43. Conceptual
44. Due to random motion
O e; $V_{mean} = 0$
45. Conceptual

CHEMISTRY

55. Number of 'W' atoms $= 8 \times \frac{1}{8} = 1$

Number of 'O' atoms $= 12 \times \frac{1}{4} = 3$

Number of 'Na' atoms = 1

Na : W : O = 1: 1: 3

Formula of compound is $NaWO_3$

56. $$d = \frac{ZM}{a^3 \times N}$$

$$M = \frac{d \times a^3 \times N}{Z}$$

$$M = \frac{10 \times \left(3 \times 10^{-8}\right)^3 \times 6.023 \times 10^{23}}{2}$$

$$M = 81.31$$

57. 234 gm $NaCl \rightarrow 6 \times 10^{23}$ unit cells

58.5 gm $NaCl \rightarrow ?$

$$= \frac{6 \times 10^{23} \times 58.5}{234}$$

$$= 1.5 \times 10^{23}$$

61. Number of 'A' atoms $= 2 \times \frac{1}{8} = \frac{1}{4}$

Number of 'B' atoms $= 6 \times \frac{1}{8} + 1 = \frac{14}{8}$

$$A : B = \frac{1}{4} : \frac{14}{8} = \frac{1}{4} : \frac{7}{4} = 1 : 7$$

Formula of the compound is : AB_7

62. The concentration of cation vacancies

$$= \frac{10^{-3}}{100} \times 6.023 \times 10^{23}$$

$$= 10^{-5} \times 6.023 \times 10^{23}$$

$$= 6.023 \times 10^{18}$$

73. $4r = a\sqrt{2}$

$$r = \frac{a\sqrt{2}}{4}$$

$$r = \frac{3.63 \times 1.414}{4}$$

$$r = 1.283205\,.$$

74. $4r = \sqrt{3}a$

$$r = \frac{\sqrt{3}a}{4} = \frac{1.732 \times 4.29}{4}$$

$$r = \frac{7.4302}{4} = 1.857$$

75. $d = \frac{ZM}{a^3 \times N}\,.$