SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

SR MPC | **JEE MAINS MODEL WT-11** | **Date: 09-08-2020**

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 (1), (2), (3) and (4) 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:* MATHS-A: Combination complete, MATHS-B: Circles Ex: 1.1, 1.2 and 1.3**

1. **'n' bit strings are made by filling the digits 0 or 1. The number of strings in which there are exactly K zeros with no two 'O' s consecutive is**

A) ${}^{(n-k)}C_k$ B) ${}^{(n-k+1)}C_k$ C) ${}^{(n-k-1)}C_k$ D) ${}^{(n+k)}C_k$

2. **There are 10 intermediate stations on a railway line between 2 stations. The number of ways that a train can be made to stop at 3 of these intermediate stations no two of these halting stations being consecutive is**

A) 56 B) 126 C) 20 D) 120

3. **The number of ways of selecting 10 balls out of an unlimited number of white, red, blue and green balls is**

A) 286 B) 280 C) 120 D) 720

4. **If** $A=\{1,2,3,4,5\}$, $B=\{a_1,a_2,a_3,a_4,a_5\}$ **then the number of one-one functions that can be formed from A to B so that the image of 'i' not equal to ai for any** $i=1,2,3,4,5$ **is**

A) 44 B) 32 C) 28 D) 20

5. **If a set A has 5 elements, then the number of ways of selecting two subsets P and Q from A such that P and Q are mutually disjoint is**

A) 64 B) 128 C) 243 D) 729

6. **In the prime factorization of** $37!=2^{a_2}.3^{a_3}.5^{a_5}.....37^{a_{37}}$ **then ratio** $a_3:a_5=$

A) 3 : 5 B) 17 : 8 C) 5 : 3 D) 8 : 21

7. **Given five line segments of length 2, 3, 4, 5, 6 units. Then the number of triangles that can be formed by joining these lines is**

A) ${}^5C_3-3$ B) ${}^5C_3-1$ C) ${}^5C_3$ D) ${}^5C_3-2$

8. **In how many ways can the following prizes be distributed among 30 students of a class. First and second prizes in mathematics, first and second prizes in physics and first prize in chemistry.**

A) $30\times2\times2\times1$ B) 30^5 C) $30^3 29^2$ D) $30^2 29^3$

9. **If a denotes the number of permutations of (X + 2) things taken all at a time, b the number of permutations of X things taken 1L at a time and c the number of permutations (X – 11) things taken all at a time such that a = 182 bc, then the value of X is**

A) 15 B) 12 C) 10 D) 18

10. **The position vector of P,** $\overline{OP}=X\bar{i}+Y\bar{j}+Z\bar{k}$ **where** $X,Y,Z\in N$ **and** $\bar{a}=\bar{i}+\bar{j}+\bar{k}$**. If** $\overline{OP}.\bar{a}=18$ **then the number of possible positions of P is**

A) 272 B) 306 C) 153 D) 136

11. **The circle concentric with** $x^2+y^2+4x+6y+3=0$ **and radius 2 is**

A) $x^2+y^2+4x+6y-9=0$ B) $x^2+y^2+4x+6y+9=0$

C) $x^2+y^2-4x-6y+9=0$ D) $x^2+y^2=4$

12. If the centroid of an equilateral triangle is (1, 1) and one of its vertices is (– 1, 2). Then equation of its circumcircle is

A) $x^2+y^2-2x-2y-3=0$ B) $x^2+y^2+2x-2y+3=0$

C) $x^2+y^2-4x-6y+9=0$ D) $x^2+y^2+x-y+5=0$

13. Centre and radius of the circle with segment of the line $x+y=1$ cut off by co-ordinate axes as diameter is

A) $\left(\frac{1}{2},\frac{1}{2}\right),\frac{1}{\sqrt{2}}$ B) $\left(-\frac{1}{2},-\frac{1}{2}\right),\frac{1}{\sqrt{2}}$ C) $\left(\frac{1}{2},-\frac{1}{2}\right),\frac{1}{\sqrt{2}}$ D) $\left(-\frac{1}{2},\frac{1}{2}\right),\frac{1}{\sqrt{2}}$

14. The shortest distance from (– 2, 14) to the circle $x^2+y^2-6x-4y-12=0$

A) 4 B) 6 C) 8 D) 10

15. If the points (0, 0), (2, 0), (0, – 2) and (k, – 2) are concyclic then k =

A) -2 B) 0 C) 1 D) 2

16. The locus of a point from which the length of tangent to the circle $x^2+y^2-2x-4y+4=0$ is 3 units

A) $x^2+y^2-2x-4y-9=0$ B) $x^2+y^2-2x-4y-5=0$

C) $x^2+y^2-2x-4y-4=0$ D) $x^2+y^2-2x-4y-6=0$

17. The line $4y-3x+\lambda=0$ touches the circle $x^2+y^2-4x-8y-5=0$ then $\lambda=$

A) 29 B) 10 C) -35 D) 35

18. Slopes of tangents through (7, 1) to the circle $x^2+y^2=25$. Satisfy the equation

A) $12m^2+7m+12=0$ B) $12m^2-7m+12=0$ C) $12m^2+7m-12=0$ D) $12m^2-7m-12=0$

19. The circle passing through (t, 1), (1, t) and (t, t) for all values of t also passes through

A) $(0,0)$ B) $(1,1)$ C) $(1,-1)$ D) $(-1,-1)$

20. If a chord of circle $x^2+y^2=8$ makes equal intercepts of length 'a' on the co-ordinate axes then $|a|<$

A) 2 B) 4 C) $2\sqrt{2}$ D) 8

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.

21. The number of all 3×3 matrices A, with entries from the set $\{-1,0,1\}$ such that the sum of the diagonal elements of AA^T is 3, is _____

22. The number of 4 letter words (with or without meaning) that can be formed from the eleven letters of the word 'EXAMINATION' is

23. At an election, a voter may vote for any number of candidates, not greater than the number to be elected. There are 10 candidates and 4 are to be elected. If a voter for at least one candidate, then the number of ways in which he can vote is

24. If a circle is inscribed in a square of side 10, so that the circle touches the four sides of the square internally then the radius of the circle is _____

25. The power of (1, 1) with respect to the circle $x^2+y^2-4x+3y+k=0$ is 3 then k = _____

SECTION – I
(SINGLE CORRECT ANSWER TYPE)

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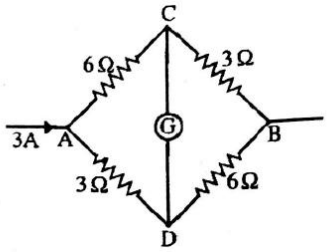
PHYSICS

SYLLABUS: ***Current electricity form Kirchhoff's to end of the chapter.***

26. In the given circuit current through the galvanometer



A) No current flows B) current flows from C to D
C) current flows from D to C D) None of the above

27. Two unknown resistances X and Y are connected to left and right gaps of meter bridge and the balancing point is obtained at 80 cm from left. When a $10\,\Omega$ resistance is connected in parallel to X, the balancing point is 50 cm from left. The values of X and Y respectively are

A) $40\,\Omega, 9\,\Omega$ B) $30\,\Omega, 7.5\,\Omega$ C) $20\,\Omega, 6\,\Omega$ D) $10\,\Omega, 3\,\Omega$

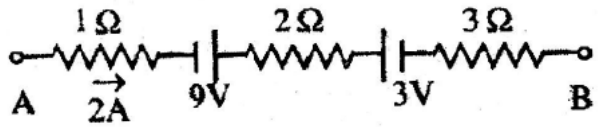
28. In a potentiometer experiment, the balancing with a cell is at length 240cm. On shunting the cell with a resistance of $2\,\Omega$, the balancing length becomes 120cm. The internal resistance of the cell is

A) $1\,\Omega$ B) $0.5\,\Omega$ C) $4\,\Omega$ D) $2\,\Omega$

29. The balancing length for a cell is 560 cm in potentiometer experiment. When an external resistance of $10\,\Omega$ is connected in parallel to the cell, the balancing length changes by 60 cm. The internal resistance of the cell in ohm is

A) 1.6 B) 1.4 C) 1.2 D) 0.12

30. P.D between A and B in the given branch of circuit is



A) 6V B) 12V C) 9V D) 0V

31. In a Wheat stone's bridge, three resistances P, Q and R are connected in the three arms and 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) $\frac{P}{Q}=\frac{R(S_1+S_2)}{S_1S_2}$ C) $\frac{P}{Q}=\frac{R(S_1+S_2)}{2S_1S_2}$ D) $\frac{P}{Q}=\frac{R}{S_1+S_2}$

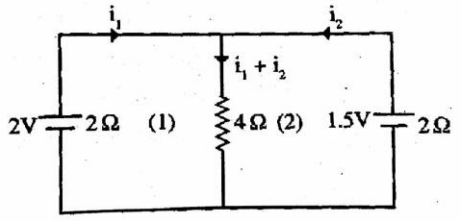
32. The balancing point in a meter bridge is 44 cm. If the resistances in the gaps are interchanged, the new balancing point is

A) 44 cm B) 56 cm C) 50 cm D) 22 cm

33. In a potentiometer experiment two cells of emf's E_1 and E_2 balances for a length of 800 cm when they are in series. If the terminals of the cell of E_2 is reversed, then the balancing length is 200 cm. If $E_1 > E_2$, the ratio of $E_1 : E_2$ is

A) 4 : 1 B) 2 : 1 C) 5 : 3 D) 3 : 2

34. The current in the given circuit



A) 0.5 A B) 0.4 A C) 0.35 A D) 0.06 A

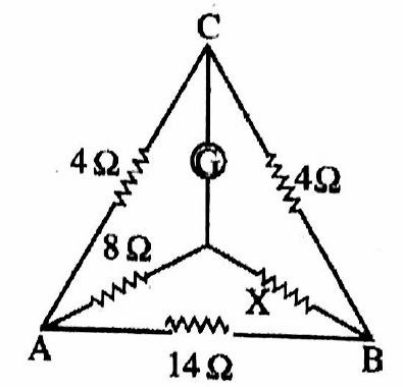
35. When two resistances P and Q are kept in the left and right gaps of a meter bridge, the null point is obtained at 60cm. If P is shunted by a resistance equal to half of its value, the shift in null point is

A) 10 cm to the left B) 10 cm to the right C) 26.7 cm to the left D) 26.7 cm to the right

36. A 1Ω resistance is in series with an ideal ammeter which is balanced by 75 cm of potentiometer wire. A standard cell of 1.02 V is balanced by 50 cm. The ammeter shows a reading of 1.5 A. The error in the ammeter reading is

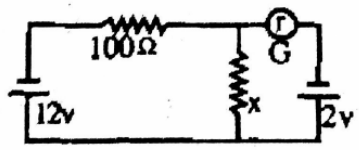
A) 0.002 A B) 0.03 A C) 1.01 A D) no error

37. If the reading of Galvanometer is zero, effective resistance between A and B is nearly $(in\ \Omega)$



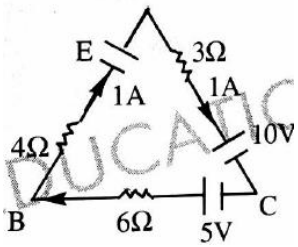
A) 3.9 B) 7 C) 14 D) 28

38. In the given circuit, if the Galvanometer shows zero reading, then X = _____ ohms



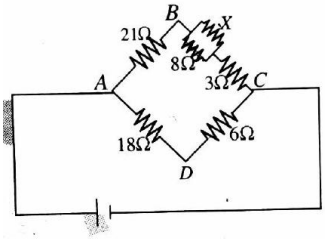
A) 20 B) 30 C) 50 D) $100\ \Omega$

39. Find E for the given loop



A) – 24V B) 18 V C) 4 V D) 0 V

40. In the circuit shown in the figure, the value of resistance X, When potential difference between the point B and D is zero will be:



A) $9\ \Omega$ B) $8\ \Omega$ C) $6\ \Omega$ D) $4\ \Omega$

41. When unknown resistance and a resistance of 4Ω are used in the left and right gaps of a meter bridge, the balance point is 50 cm, the shift in the balance point if a 4Ω resistance is now connected parallel to the resistor in right gap

A) $\frac{100}{3}cm$ B) $\frac{50}{3}cm$ C) $\frac{300}{3}cm$ D) $\frac{400}{5}cm$

42. The resistivity of a potentiometer wire is, if the area of cross section of the wire is $4cm^2$ the current flowing in the circuit is 1A, the potential gradient is 7.5 v/m

A) $3\times10^{-3}\Omega-m$ B) $2\times10^{-6}\Omega-m$ C) $4\times10^{-2}\Omega-m$ D) $5\times10^{-5}\Omega-m$

43. A potentiometer wire of length L and a resistance r are connected in series with a battery of e.m.f E_o and resistance r_1. An unknown e.m.f E is balanced at a length *l* of the potentiometer wire. The e.m.f E will be given by

A) $\frac{LE_o r}{(r+r_1)l}$ B) $\frac{LE_o r}{lr_1}$ C) $\frac{E_o r}{r+r_1}.\frac{l}{L}$ D) $\frac{E_o l}{L}$

44. When a conducting wire is connected in the right gap and known resistance in the left gap, the balancing length is 60 cm. The balancing length becomes 42.4 cm. When the wire is stretched so that its length increases by

A) 10% B) 20% C) 25% D) 42.7%

45. In an experiment with potentiometer to measure the internal resistance of a cell, when the cell is shunted by 5Ω, the null point is obtained at 2m. When cell is shunted by 20Ω the null point is obtained at 3m. The internal resistance of cell is

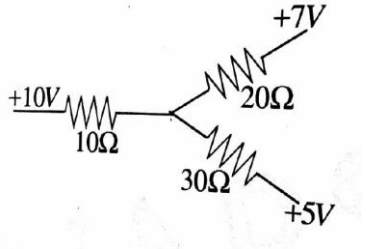
A) 2Ω B) 4Ω C) 6Ω D) 8Ω

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.

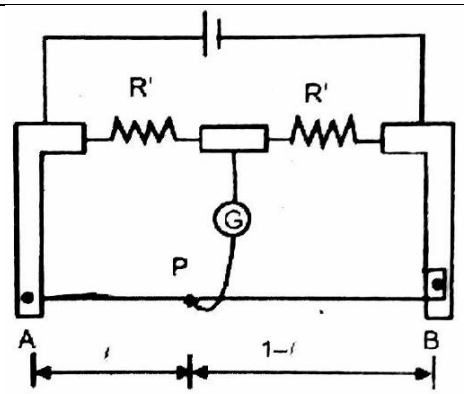
46. The current through 10Ω resistor in the figure is approximately



47. A potentiometer wire has a length of 1.8 m and a resistance of 10Ω. It is connected in series with a cell of emf 2V, internal resistance 5Ω and a resistance box with resistance 323Ω unplugged in it. Determine the potential drop per mm length of the box $\left(in\ \frac{\mu V}{mm}\right)$

48. In an experiment with a meter bridge, a resistance coil in the left gap and a standard resistor in the right gap are connected. The balancing point found to be 0.42 m when the coil is immersed in melting ice. When the coil is immersed in boiling water, the balancing is 0.50 m. The temperature coefficient of resistance of the material is $n\times10^{-3}/C^0$, then $n=$ _____

49. In a meter bridge, the wire of length 1m has a non-uniform cross section such that the variation $\frac{dR}{dl}$ of its resistance R with the length *l* is $\frac{dR}{dl}\alpha\frac{1}{\sqrt{l}}$. Two equal resistances are connected as shown in the figure. The galvanometer has zero deflection when the jockey is at point P. What is the length AP in m is



50. A potentiometer has a wire of 100 cm length and its resistance is 10Ω. It is connected in series with a resistance of 40Ω and a battery of emf 2V and negligible internal resistance. If a source of unknown emf connected in the secondary is balanced by 40 cm length of potentiometer wire, the value of E is in V

SECTION – I
(SINGLE CORRECT ANSWER TYPE)

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CHEMISTRY

***SYLLABUS:* Solid State: Electrical & Magnetic Properties, Surface Chemistry: Adsorption, Catalysis**

51. A crystal of Fe_3O_4 is
A) paramagnetic B) diamagnetic C) ferromagnetic D) None of these

52. Which arrangement of electron decides ferrimagnetism?
A) ↑↑↑↑↑ B) ↑↓↑↓ C) ↑↑↑↓↓ D) None of these

53. Which substance shows anti-ferromagnetism?
A) ZrO_2 B) CdO C) CrO_2 D) Mn_2O_3

54. The oxide which shows metallic conduction is
A) ReO_3 B) VO C) CrO_2 D) All of these

55. An insulator oxide is
A) CuO B) CoO C) Fe_2O_3 D) All of these

56. Of the elements Sr, Zr, Mo, Cd and Sb; all of which are in V period, the paramagnetics are:
A) Sr, Cd and Sb B) Zr, Mo and Cd C) Sr, Zr and Cd D) Zr, Mo and Sb

57. The oxide that possesses electrical conductivity is
A) V_2O_5 B) CrO_2 C) NiO D) MnO

58. All the substance becomes diamagnetic at
A) 4K B) 10K C) 20K D) 25K

59. The resistance of mercury becomes almost zero at:
A) 4K B) 10K C) 20K D) 25K

60. Crystals which are good conductor of electricity and heat are known as:
A) Ionic crystals B) Covalent crystals C) Metallic crystals D) Molecular crystals

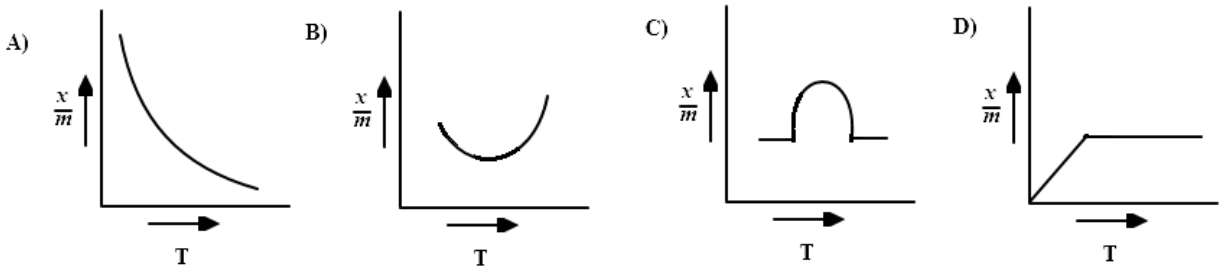
61. Adsorption is accompanied by:
A) decrease in entropy of the system B) decrease in entholpy of the system
C) $T\Delta S$ for the process is negative D) all of these

62. Which is correct in case of Vander Waal's adsorption
A) High temperature, low pressure B) Low temperature, high pressure
C) Low temperature, low pressure D) High temperature, high pressure

63. Adsorption of gases on solid surface is generally exothermic because
A) enthalpy is positive B) entropy decreases C) entropy increases D) free energy increases

64. According to Freundlich isotherm, which of the following is correct?
A) $\frac{x}{m}\alpha p^{1}$
B) $\frac{x}{m}\alpha p^{1/n}$
C) $\frac{x}{m}\alpha p^{o}$
D) All the above are correct for different ranges of pressure

65. Which plot is the adsorption isobar for chemisorption where x is the amount of gas adsorbed on mass m (at constant pressure) at temperature T?



66. Which acts as a promoter for nickel in the hyrogenation of oils
A) Cu B) Mo C) Fe D) pt

67. Which acts a poison for pd-charcoal in Lindlar's catalyst?
A) $BaSO_4$ B) Quinoline C) Both A and B D) None of these

68. Identify the correct statement regarding enzymes
A) Enzymes are specific biological catalysts that posses well defined active sites
B) Enzymes are normally hydrogenation catalyst that are very specific in their action
C) Enzymes are specific biological catalyst that cannot be poisoned
D) Enzymes are specific biologiical catalysts that can normally fucntion at very high temp (T=1000K)

69. The function of negative catalyst is:
A) to remove the active intermediate from the reaction
B) to terminate the chain reaction
C) both A and B
D) None of these

70. In which process, a catalyst is not used?
A) Deacon's process B) Solvay's process C) Ostward's process D) Contact process

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. Each question has 4 options (1), (2), (3) and (4) for its answer, out of which **ONLY ONE** option can be correct.
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71. 50 ml of 0.1 M acetic acid is shaken with 0.5 gm of activated charcoal. The concentration of solution has fallen to 0.05 M. The "X/m" value in Freundlich equation could be _____

72. The mass adsorbed per gram of adsorbed O_2 having pressure 10 atm at 400 K if placed in contact with solid surface is 2g in one liter vessel. The pressure of O_2 after adsorption becomes 2 atm. Assume no change in temperature and $R = 0.08 L - atm\ K^{-1}\ mol^{-1}$ _____

73. How many of the given catalyst can be used in the manufacture of H_2SO_4 ?
I) Oxides of nitrogen II) V_2O_5 III) Platinesed asbestos IV) Ni

74. In an adsorption experiment a graph between $\log\left(\frac{x}{m}\right)$ versus log P is found to be linear with a slop of 45°. The intercept on $\log\left(\frac{x}{m}\right)$ axis was found to 0.3010 the amount of the gas adsorbed per gram to charcoal under a pressure of 0.5 atm will be _____

75. How many of the statements are correct when H_2 is adsorbed on Ni surface.

I) ΔH adsorption is found to be negative

II) ΔS adsorption is negative

III) H-H bond breaks because of large heat

IV) H-H bond breaking requires lot of heat

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SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

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

KEY SHEET

MATHEMATICS

1) **B**	2) **A**	3) **A**	4) **A**	5) **C**	6) **B**	7) **A**	8) **C**	9) **B**	10) **D**
11) **B**	12) **A**	13) **A**	14) **C**	15) **D**	16) **B**	17) **C**	18) **D**	19) **B**	20) **B**
21) **672**	22) **2454**	23) **385**	24) **5**	25) **2**					

PHYSICS

26) **C**	27) **B**	28) **D**	29) **C**	30) **A**	31) **B**	32) **B**	33) **C**	34) **C**	35) **C**
36) **B**	37) **A**	38) **A**	39) **B**	40) **B**	41) **B**	42) **A**	43) **C**	44) **D**	45) **B**
46) **0.17**	47) **32.9**	48) **3.88**	49) **0.25**	50) **0.16**					

CHEMISTRY

51) **C**	52) **C**	53) **D**	54) **D**	55) **D**	56) **D**	57) **B**	58) **A**	59) **A**	60) **C**
61) **A**	62) **B**	63) **B**	64) **D**	65) **C**	66) **A**	67) **C**	68) **B**	69) **C**	70) **B**
71) **0.3**	72) **4**	73) **3**	74) **1**	75) **3**					

HINTS & SOLUTIONS

MATHEMATICS

1. First arrange n-k 1's in $\frac{(n-k)!}{(n-k)!}=1$ ways. Now there are $n-k+1$ they are filled by 'K' zeros in

   $\frac{n-k+1_{PK}}{k!}=n-k+1_{C_K}$

2. $n-r+1_{C_3} \qquad n=10, l=3$

3. Number of Non – negative integral solutions $=n+r-1_{Cr-1}$

4. Dearrangement $5_{P_5}\left[1-\frac{1}{16}+\frac{1}{26}-\frac{1}{36}+\frac{1}{46}-\frac{1}{56}\right]$

5. $x\notin P, x\notin Q \Rightarrow x\notin P\cap Q$

   $x\in P, x\notin Q \Rightarrow x\notin P\cap Q$

   $x\notin P, x\in Q \Rightarrow x\notin P\cap Q$

   $\frac{3}{x_1}\times\frac{3}{x_2}\times\frac{3}{x_3}\times\frac{3}{x_4}\times\frac{3}{x_5}=3^5$

6. $a_3=\left[\frac{37}{3}\right]+\left[\frac{37}{3^2}\right]+\left[\frac{37}{3^3}\right]=12+4+1=17$

   $a_5=\left[\frac{37}{5}\right]+\left[\frac{37}{5^2}\right]=7+1=8$

   $a_3:a_5=17:8$

7. Sum of two sides in a dice is greater than third side

8. $30\times29\times30\times29\times30$

   $=30^3\times29^2$

9. $a=(x+2)!$

   $b=x_{P_{11}}$

   $c=(x-11)!$

   Simplify

10. Number of positive integer solutions $=n-1_{C_{r-1}}$

    $n=18,\ r=3$

11. Equation of circle concentric with $x^2+y^2+4x+6y+3=0$ is

    $x^2+y^2+4x+6y+k=0$

    $r=2$

    $\sqrt{4+9-k}=2$

    $13-k=4$

    $k=9$

12. $r=SA=GA$

13. Verify

14. $CP-r$

15. Equation of circle $(x-2)(x-0)+(y-0)(y+2)=0$

    $x^2+y^2-2x+4y=0$

16. $\sqrt{S_{11}}=3$

17. $r=d$

18. $y=mx\pm r\sqrt{1+m^2}$ and substitute (7, 1)

19. $t=0$

20. r > d

21. Transpose of $A.A^T = 3$
22. 2N, 2A, 2I, E, X, M, T, O
    Cons (i) all the different $8_{P_4} = 1680$
    Cons (ii) 2 similar 2 different $3_{C_1} = 7_{C_2} \times \frac{4!}{2!} = 756$
    Cons (iii) 2 similar 2 similar $3_{C_2} \times \frac{4!}{2!2!} = 18$
    Total = 1680 + 756 + 18 = 2454
23. $10_{C_1} + 10_{C_2} + 10_{C_3} + 10_{C_4} = 385$
24. 2r = 10
25. $S_{11} = 3$

PHYSICS

26. From Wheatstone's bridge current flows from D to C
27. $\frac{X}{R} = \frac{l}{100-l}$
28. $r = \left(\frac{l_1 - l_2}{l_2}\right)R$
29. $r = \left(\frac{l_1 - l_2}{l_2}\right)R$
30. Use sign conventions of Kirchoff's second law $\sum V = 0$
31. $\frac{P}{Q} = \frac{R}{S}$
32. $\frac{X}{R} = \frac{l}{100-l}$
33. $\frac{E_1 + E_2}{E_1 - E_2} = \frac{l_1}{l_2}$
34. Use Kirchoff's Laws
35. $\frac{X}{R} = \frac{l}{100-l}$
36. $E = V \times l_b$
    $E = \frac{1.02}{50} \times 75$
    $IR = 1.530$
    $I \times 1 = 1.530$
    $\text{Error} = 1.530 - 1.5 = 0.03$
37. $\frac{P}{Q} = \frac{R}{S}$
38. $V_{across100} = iR \Rightarrow 10 = i \times 100$
    $i = 0.1A$
    $V_{acrossx} = iX$
    $2 = 0.1.X$
    $X = 20\Omega$
39. Use Kirchoff's loop law
40. $\frac{P}{Q} = \frac{R}{S}$
41. $\frac{X}{R} = \frac{l}{100-l}$
42. $\frac{V}{l} = \left(\frac{E}{R+r+Rs}\right)\frac{R}{L}$
43. $\frac{V}{l} = \left(\frac{E}{R+r+Rs}\right)\frac{R}{L}$
44. $\frac{X}{R} = \frac{l}{100-l}$
    Where $R \alpha l^2$
45. $r = \left(\frac{l_1 - l_2}{l_2}\right)R$
46. Use Kirchoff's laws
47. $\frac{V}{l} = \left(\frac{E}{R+r+Rs}\right)\frac{R}{L}$
48. Let 'r' be the resistance unplugged in the box
    Total resistance $r = 5 + r'$
    $r = 5 + 323 = 328\,\Omega$
    Terminal P.D across wire AB
    $V = \frac{ER}{R+r} = \frac{2 \times 10}{10 + 328} = 0.0592$
    Potential gradient across wire
    $\frac{V}{L} = \frac{0.0592}{1.8} = 0.0329\,V/m$
    $= \frac{0.0329}{10^3\,mm}$
    $= 32.9 \times 10^{-6}\,V/mm$
    $= 32.9\mu V/mm$
49. $dR = K\frac{dl}{\sqrt{l}}$
    K is Proportionality constant
    $\int_0^l K\frac{dl}{\sqrt{l}} = \int_l^1 K\frac{dl}{\sqrt{l}}$
    $\left(2\sqrt{l}\right)_0^l = \left(2\sqrt{l}\right)_l^1$

$4\sqrt{l}=2$

$l=\frac{1}{4}=0.25\,m$

50. $\frac{V}{l}=\left(\frac{E}{R+r+Rs}\right)\frac{R}{L}$

CHEMISTRY

51. Conceptual
52. Conceptual
53. Conceptual
54. Conceptual
55. Conceptual
56. Conceptual
57. CrO_2 is metallic conductor, V_2O_5, NiO and MnO are insulators.
58. Conceptual
59. Most of the metals have their transition temperature (i.e., the temperature at which a substance starts to behave as superconductor) in the range of 2-5K
60.
61. Conceptual
62. Physical or Vander Waal's adsorption is more pronounced at low T and high P.
63. Conceptual
64. According to Freundlich adsorption isotherm

    $\frac{x}{m}=kp^{1/n}$

    1/n can have values between 0 to 1 over different ranges of pressure
65. Chemical adsorption first increases, then decreases to attain constantly with rise in temperature.
66. Conceptual
67. Either $BaSO_4$ or Quinoline are used to reduce the activity of pd-charcoal. The catalyst pd-charcoal/$BaSO_4$ or Quinoline is used to hydrogenate alkyne to alkene only

    $CH\equiv CH+H_2\xrightarrow[Catalyst]{Lindlar's}CH_2=CH_2$
68. Conceptual
69. Conceptual
70. Conceptual
71. Mass of Acetic acid adsorbed by 0.5 gms of charcoal

    $=\frac{60(0.1-0.05)50}{1000}$

    = 0.15 gms

    $\therefore\frac{x}{m}=\frac{0.15}{0.5}=0.3\,gms$
72. Mass of O_2 adsorbed

    $=\frac{PVM}{RT}=\frac{(10-2)\times1\times32}{400\times0.0821}=8g$

    $\frac{x}{m}=\frac{8}{2}=4$
73. (I, II & IV) are correct
74. $\frac{x}{m}=Kp^{1/n}$

    $\log\frac{x}{m}=\log K+\frac{1}{n}\log p$

    Plot of $\log\frac{x}{m}$ versus log pT is linear with

    slope $=\frac{1}{n}$ and intercept = log K

    Thus $\frac{1}{n}=\tan\theta=\tan45^{o}=1$ *i.e*, $n=1$

    logK = 0.3010, K = Antilog 0.30100 = 2

    At P = 0.5 atm

    $\frac{x}{m}=kp^{1/n},\frac{x}{m}=2\times(0.5)^{1},\frac{x}{m}=1$
75. I, II and III are correct

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