MELUHA INTERNATIONAL SCHOOL

HYDERABAD

SR MPC | **JEE MAINS MODEL** | **Date: 10-04-2020**

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

SECTION – I
(SINGLE CORRECT ANSWER TYPE)

This section contains 50 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.

MATHS

SYLLSBUS: BINOMIAL THEORM, SEQUENCE AND SERIES, CONIC SECTION (PARABOLA, HYPERBOLA & ELLIPSE)

1. **The positive integer just greater than** $(1+0.0001)^{10000}$ **is**

1) 4 2) 5 3) 2 4) 3

2. **The term independent of** x **in the expansion of** $(1+x)^n\left(1+\frac{1}{x}\right)^n$ **is**

1) $C_0^2+2C_1^2+....+(n+1)C_n^2$ 2) $(C_0+C_1+....+C_n)^2$

3) $C_0^2+C_1^2+....+C_n^2$ 4) $C_1^2+C_2^2+....+C_n^2$

3. **If** $(1+x)^n=C_0+C_1x+C_2x^2+.....+C_nx^n$ **then the value of** $C_0+2C_1+3C_2+.....+(n+1)C_n$ **will be**

1) $(n+2)2^{n-1}$ 2) $(n+1)2^n$ 3) $(n+1)2^{n-1}$ 4) $(n+2)2^n$

4. **If** a_1,a_2,a_3,a_4 **are the coefficients of any four consecutive terms in the expansion** $(1+x)^n$**; then** $\frac{a_1}{a_1+a_2}+\frac{a_3}{a_3+a_4}=$

1) $\frac{a_2}{a_2+a_3}$ 2) $\frac{1}{2}\frac{a_2}{a_2+a_3}$ 3) $\frac{2a_2}{a_2+a_3}$ 4) $\frac{2a_3}{a_2+a_3}$

5. **The number of integral terms in the expansion of** $\left(5^{\frac{1}{2}}+7^{\frac{1}{6}}\right)^{642}$ **is**

1) 106 2) 108 3) 103 4) 109

6. $\sum_{0\le i<}\sum_{j\le n}{}^{10}C_i\,{}^{10}C_j=$

1) $\frac{2^{20}-{}^{20}C_{10}}{2}$ 2) $2^{20}-{}^{20}C_{10}$ 3) $\frac{2^{20}+{}^{20}C_{10}}{2}$ 4) 2^{20}

7. **Let** $a=3^{\frac{1}{223}}+1$ **and for all** $n\ge 3$, **let** $f(n)={}^nC_0a^{n-1}-{}^nC_1a^{n-2}+{}^nC_2a^{n-3}\_.....+(-1)^{n-1}.{}^nC_{n-1}a^0$. **If the value of** $f(2007)+f(2008)=3^k$ **where** $K\in N$, **then the value of K is**

1) 3 2) 6 3) 9 4) 12

8. **The largest real value of x such that** $\sum_{k=0}^{4}\left(\frac{3^{4-k}}{(4-k)!}\right)\left(\frac{x^k}{k!}\right)=\frac{32}{3}$

1) 1 2) 2 3) 3 4) 4

9. **Let m be the smallest positive integer such that the coefficient of** x^2 **in the expansion of** $(1+x)^2+(1+x)^3+.....+(1+x)^{49}+(1+mx)^{50}$ **is** $(3n+1)^{51}C_3$ **for some positive integer n. Then the value of n is**

1) 2 2) 3 3) 4 4) 5

10. If the digits at ten's and hundred's places in $(11)^{2016}$ are x and y respectively, then the ordered pair (x, y) is equal to

1) $(1,8)$ 2) $(1,6)$ 3) $(6,1)$ 4) $(8,1)$

11. The length of the normal chord of the parabola $y^2 = 4x$ which makes an angle of $\frac{\pi}{4}$ with the axes of x is

1) 8 2) $8\sqrt{2}$ 3) 4 4) $4\sqrt{2}$

12. The shortest distance between the parabolas $2y^2 = 2x - 1$ and $2x^2 = 2y - 1$ is

1) $2\sqrt{2}$ 2) $\frac{1}{2\sqrt{2}}$ 3) 4 4) $\sqrt{\frac{36}{5}}$

13. If the line $y - \sqrt{3}x + 3 = 0$ cuts the parabola $y^2 = x + 2$ at P and Q then AP.AQ is equal to $A = (\sqrt{3}, 0)$

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

14. If the parabola $y = ax^2 - 6x + b$ passes through $(0,2)$ and has its tangents at $x = \frac{3}{2}$ parallel to the $x-$ axis then

1) $a = 2, b = \pm 2$ 2) $a = 2, b = 2$ 3) $a = -2, b = 2$ 4) $a = -2, b = -2$

15. Radius of a circle that passes through the origin and touches the parabola $y^2 = 4ax$ at $(a, 2a)$ is

1) $\frac{5}{\sqrt{2}}a$ 2) $2\sqrt{2}a$ 3) $\sqrt{\frac{5}{2}}a$ 4) $\frac{3}{\sqrt{2}}a$

16. A focal chord perpendicular to major axis of the ellipse $9x^2 + 5y^2 = 45$ cuts the curve at P and Q then length of PQ is

1) $\frac{10}{3}$ 2) $\frac{18}{\sqrt{5}}$ 3) 6 4) $2\sqrt{5}$

17. The eccentricity of an ellipse is $\frac{\sqrt{3}}{2}$ its length of latus rectum is

1) $\frac{1}{2}$ (length of major axis) 2) $\frac{1}{3}$ (length of major axis)

3) $\frac{1}{4}$ (length of major axis) 4) $\frac{2}{3}$ (length of major axis)

18. The locus of point of intersection of perpendicular tangents to the ellipse $\frac{(x-1)^2}{16} + \frac{(y-2)^2}{9} = 1$ is

1) $(x-1)^2 + (y-2)^2 = 25$ 2) $(x-1)^2 + (y-2)^2 = 7$

3) $(x+1)^2 + (y+2)^2 = 25$ 4) $(x+1)^2 + (y+2)^2 = 7$

19. **If $x+y\sqrt{2}=2\sqrt{2}$ is a tangent to the ellipse $x^2+2y^2=4$ then the eccentric angle of the point of contact is**

1) $\frac{\pi}{6}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{3}$ 4) $\frac{\pi}{2}$

20. **$(-4,1),(6,1)$ are vertices of an ellipse and one of the foci lies on $x-2y=2$ then eccentricity is**

1) $\frac{3}{5}$ 2) $\frac{4}{5}$ 3) $\frac{2}{5}$ 4) $\frac{1}{5}$

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. **Cube root of 217 is _____**

22. **In the expansion of $(1+x)^m(1-x)^n$, the coefficient of x and x^2 are 3 and -6 respectively, then m is _____**

23. **The coefficient of x^9 in the expansion of $(1+x)(1+x^2)(1+x^3).....(1+x^{100})$ is _____**

24. **Tangents are drawn from the point $(-1,0)$ to the $y^2=4x$ the length that these tangents with intercept on the line $x=2$ is K is $[K]=$ when $[.]$ G.I.F**

25. **A right angled ΔABC is inscribed in parabola $y^2=4x$ where A is vertex and $\angle BAC=\frac{\pi}{2}$ if $AB=\sqrt{5}$ then area of ΔABC.**

PHYSICS
SECTION – I
(SINGLE CORRECT ANSWER TYPE)

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SYLLABUS : MOVING CHARGES AND MAGNETISM, MAGNETISM AND MATTER EMI & ALTERNATING CURRENT

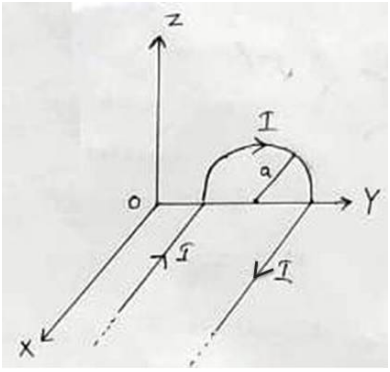
26. **A current of 5A is passed through a straight wire of length 6cm; then magnitude induction at a point 5cm from either end of the wire is**

1) 0.25 gauss 2) 0.125 gauss 3) 0.15 gauss D) 0.30 gauss

27. **An electron of mass m is accelerated through a potential difference of V and then it enters a magnetic field of induction B normal to the lines. Then the radius of the circular path is**

1) $\sqrt{\frac{2eV}{m}}$ 2) $\sqrt{\frac{2Vm}{eB^2}}$ 3) $\sqrt{\frac{2Vm}{eB}}$ D) $\sqrt{\frac{2Vm}{e^2B}}$

28. A long wire bent as shown in the figure carries current I. If the radius of the semicircular portion is a, the magnetic induction at the centre is 'O'



1) $\frac{\mu_0 I}{4a}$ 2) $\frac{\mu_0}{4\pi a}\sqrt{\pi^2+4}$ 3) $\frac{\mu_0 I}{4a}+\frac{\mu_0 I}{2\pi a}$ D) $\frac{\mu_0}{4\pi a}\sqrt{\pi^2-4}$

29. The deflection of a galvanometer falls to $\frac{1}{10^{th}}$ when a resistance of $5\,\Omega$ is connected in parallel with it. If an additional resistance of $2\,\Omega$ is connected in parallel to the galvanometer, the deflection is

1) $\frac{1}{6^{th}}$ 2) $\frac{1}{16^{th}}$ 3) $\frac{2}{65^{th}}$ D) $\frac{3}{36^{th}}$

30. A proton enters a region of uniform magnetic field 0.5T with a velocity of u at an angle of 45° with B. If P is the pitch of helical path followed the radius of helix is

1) $\frac{P}{2\pi}$ 2) $\frac{2\pi}{P}$ 3) $\frac{\pi}{P}$ D) $\frac{P}{\pi}$

31. The magnitude of magnetic field required to accelerate protons $\left(m=1.67\times10^{-27}\,kg\right)$ in a cyclotron that is operated at an oscillator frequency of 12 MHz is approximately

1) 0.8 T 2) 1.6 T 3) 2.0 T D) 3.2 T

32. Two similar coils of radius R are lying concentrically with their planes at right angles to each other. The currents flowing in them are I and 2I respectively. The resultant magnetic field induction at the centre will be

1) $\frac{\mu_0 I}{2R}$ 2) $\frac{\mu_0 I}{R}$ 3) $\frac{\sqrt{5}\mu_0 I}{2R}$ D) $\frac{3\mu_0 I}{2R}$

33. A compass needle which is allowed to move in a horizontal plane is taken to a geomagnetic pole. It:

1) will stay in north – south direction only
2) will stay in east – west direction only
3) will become rigid showing no movement
D) will stay in any position

34. A magnet of magnetic moment $50\,\hat{i}\ \ Am^2$ is placed along the x-axis in a magnetic field $\vec{B}=\left(0.5\,\hat{i}\ +3.0\,\hat{j}\ \right)T$. The torque acting on the magnet is

1) $175\,\hat{K}\ \ N-m$ 2) $150\,\hat{K}\ \ N-m$ 3) $75\,\hat{K}\ \ N-m$ D) $25\sqrt{37}\ \hat{K}\ \ N-m$

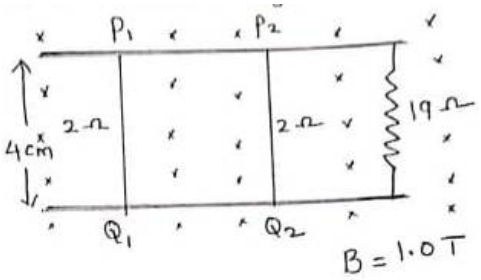
35. The magnetic induction and the intensity of magnetic field inside an iron core of an electromagnet are $1\,Wbm^{-2}$ and $150\ Am^{-1}$ respectively. The relative permeability of iron is: $\left(\mu_0=4\pi\times10^{-7}\ Henry/m\right)$.

1) $\frac{10^6}{4\pi}$ 2) $\frac{10^6}{6\pi}$ 3) $\frac{10^5}{4\pi}$ D) $\frac{10^5}{6\pi}$

36. The magnetic field at the point of intersection of diagonals of a square wire loop of side L carrying a current I is:

1) $\frac{\mu_0 I}{\pi L}$ 2) $\frac{2\mu_0 I}{\pi L}$ 3) $\frac{\sqrt{2}\mu_0 I}{\pi L}$ D) $\frac{2\sqrt{2}\mu_0 I}{\pi L}$

37. As shown in the figure, the wires P_1Q_1 and P_2Q_2 are made to slide on the rails with the same speed 5 cm/s. The electric current in the 19Ω resister if both the wires move towards right is:

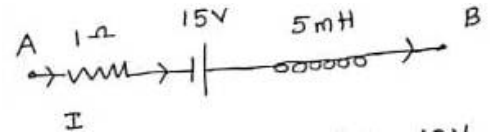


1) 0.1 mA 2) 0.2 mA 3) 0.3 mA D) 0.4 mA

38. The flux linked with a coil is 0.8 Wb when a 2A current is flowing through it. If this current begins to increase at the rate of 400 A/s, then the magnitude of induced emf in the coil will be:

1) 20 V 2) 40 V 3) 80 V D) 160 V

39. The network shown in the figure is a part of a complete circuit. What is the potential difference $V_B - V_A$, when current I is 5A and is decreasing at a rate of $10^3 AS^{-1}$



1) -15 V 2) 15 V 3) -10 V D) +10 V

40. An inductance of $\frac{200}{\pi}$mH, a capacitance of $\frac{10^{-3}}{\pi}$F and a resistance of 10Ω are connected in series with an AC source of 220 V, 50 Hz. The phase angle of the circuit is [in radians]

1) $\pm\frac{\pi}{4}$ 2) $\pm\frac{\pi}{2}$ 3) $\pm\frac{\pi}{3}$ D) 0

41. In an A.C circuit, the instantaneous values of emf and current are $E = 200\sin wt\ V$ and $i = \sin\left(wt + \frac{\pi}{3}\right)A$, then the average power consumed in Watts is:

1) 200 2) 100 3) 0 D) 50

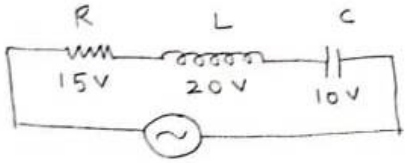
42. In a series resonant LCR circuit, the voltage across R is 100 V and $R = 1k\Omega$ with $c = 2\mu F$. The resonant frequency ω is 200 rad/s. At resonance, the voltage across L is:

1) 2.5×10^{-2}V 2) 40 V 3) 250 V D) 400 V

43. A coil has an inductance of 0.7H and is joined in series with a resistance of 220Ω. When an alternating emf of 220 V at 50 Hz is applied to it, then the watt less component of the current in the circuit is:

1) 5 A 2) 0.5 A 3) 0.7 A D) 7 A

44. In the circuit below, the value of resistance is 60Ω, then the value of capacitive reactance is:



1) 4Ω 2) 40Ω 3) 10Ω D) 1Ω

45. A series LCR circuit has $L = 1H$, $C = 1\mu F$ and $R = 100\Omega$, the Q-factor of the circuit is:

1) 10 2) 1 3) 0.1 D) 100

SECTION- II
(Numerical Value Answer Type)

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46. **A straight, horizontal wire of mass 10 mg and length 1.0m carries a current of 2.0 A. The minimum magnetic field should be applied in the region, so that the magnetic fore on the wire balance its weight is** $Y\times10^{-5}\text{T}$. **The value of Y is _____**

47. **An electron of mass** $0.90\times10^{-30}\text{kg}$ **under the action of a magnetic field moves in a circle of 2.0 cm radius of a speed of** $3.0\times10^{6}\text{ms}^{-1}$. **If a proton of mass** $1.8\times10^{-27}\text{kg}$ **was to move in a circle of same radius in the same magnetic field, then its speed is _____** $\times10^{3}\text{ms}^{-1}$.

48. **A circular loop of one turn carries a current of 5.00 A. If the magnetic field at the centre is 0.200 mT, then the radius of the loop is _____** $\times10^{-2}\text{m}$.

49. **A long straight wire carrying current** $i=10A$ **lies along Y-axis. The magnetic field at** $\text{P}(3\text{cm}, 2\text{cm}, 4\text{cm})$ **is _____** $\times10^{-3}\text{T}$.

50. **A magnet freely suspended in a vibration – magnetometer 40 oscillations per minute at place A and 20 oscillations per minute at place B. If the horizontal component of the earth's magnetic field at A is** $36\times10^{-6}\text{T}$, **then its value of B is _____** $\times10^{-6}\text{T}$.

CHEMISTRY

SECTION – I
(SINGLE CORRECT ANSWER TYPE)

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Syllabus: ELECTRO CHEMISTRY, d & f-BLOCK ELEMENTS, SURFACE CHEMISTRY, COORDINATION COMPOUNDS

51. **The electric charge required for electrode deposition of one gram–equivalent of a substance is**

1) one ampere for second
2) 96500 coulombs per second
3) one ampere for one hour
4) charge on one mole of electron

52. **Which of the following aqueous solution produces metal after electrolysis?**

1) $K_2Cr_2O_7$ 2) $KMnO_4$ 3) CH_3COONa 4) $CuCl_2$

53. **An electrolysis of a oxytungsten complex ion using 10A for 40 min produced 0.838g of tungsten. What is the charge on tungsten in the material? (Atomic weight of W = 184)**

1)6 2)2 3)4 4)1

54. E^o for $Cl_{2(g)}+2e^{\odot}\longrightarrow 2Cl^{\odot}_{(aq)}$ **is 1.36 v ;** E^o for $Cl^{\odot}_{(aq)}\longrightarrow \frac{1}{2}Cl_{2_{(g)}}+e^{\odot}$ **is**

1) 1.36 v 2) – 1.36 v 3) – 0.68 v 4) 0.68 v

55. Consider the following equations for a cell reaction $A+B \rightleftharpoons C+D\ ;\mathrm{E}^{o}=x\,volt, k(aq)=k_1$

$2A+2B \rightleftharpoons 2C+2D\ ;\mathrm{E}^{o}=y\,volt, k(aq)=k_2$ **then**

1) x = y, $k_1 = k_2$ 2) x = 2y, $k_1 = 2k_2$ 3) x = y, $k_1^2 = k_2$ 4) x^2 = y, $k_1^2 = k_2$

56. The relation among conductance (G), specific conductance (k) and cell constant (l/A) is.

1) $G = K\frac{l}{A}$ 2) $G = K\frac{A}{l}$ 3) $GK = \frac{l}{A}$ 4) $G = KAl$

57. Λ^{∞}_{AgCl} **can be obtained.**

1)by extra plotation of the graph Λ and $\sqrt{C}$ to zero concentration

2) by known values of Λ^{∞} of $AgNO_3$, HCl and HNO_3

3) both (1) and (2) 4) None of these

58. The conductivity of a strong electrolyte.

1) Increases on dilution 2) decreases on dilution

3) does not change with dilutuion 4) depends upon density of electrolyte

On dilution, no of ions decreases in per unit volume.

59. Which of the following is arranged in increasing order of ionic mobility?

1) $1^{\odot} < Br^{\odot} < Cl^{\odot} < F^{\odot}$ 2) $F^{\odot} < Cl^{\odot} < Br^{\odot} < 1^{\odot}$

3) $F^{\odot} < I^{\odot} < Cl^{\odot} < Br^{\odot}$ 4) $F^{\odot} < Cl^{\odot} < I^{\odot} < Br^{\odot}$

60. The electric conductance of Salt solution in water depends on the

1) size of its molecules 2) shape of its molecules

3)size of solvent molecules 4) extent of its ionization

61. Surface tension of lyophilic sols is

1)lower than water 2)more than water 3)equal to water 4) none of these

62. Hardy-schulze law states that

1) Solution must have higher gold number

2) Disperse phase and dispersion medium must be of the same sign

3) Micelles coagulate in presence of surfactants

4) The ions carrying more opposite charge to that of sol particles are effective in coagulation

63. Given below are a few electrolytes, indicates which one among them will bring about the coagulation of a gold sol quickest and in the least of concentration?

1) NaCl 2) $MgSO_4$ 3) $Al_2(SO_4)_3$ 4) $K_3[Fe(CN)_6]$

64. The formation of colloid from suspension is called

1)peptisation 2)condensation 3)sedimentation 4) fragmentation

65. Artificial rain is caused by spraying

1) Opposite charged colloidal dust over a cloud

2) Same charged colloidal dust over a cloud 3) both 4) none of these

66. Select the correct statement for $Cr.6NH_3.Cl_3$ and $Cr.5NH_3.Cl_3$

1) In both complex compounds secondary valency is satisfied by only NH_3

2) In both complex compounds Cl^- are satisfying only primary valancy

3) In both complex compounds primary valency is satisfied by only Cl^-

4) In both complex compounds all Cl^- are ionizable.

67. The degeneracy of *d*– orbital is lost under

(I) Strong field ligand **(II) Weak field ligand**

(III) Mixed field ligand **(IV) Chelated field ligand**

1) I, II and IV 2) I and II 3) I, II, III and IV 4) I, II and III

68. In which complex, dz^2 orbital of inner shell is not used in the hybridization of central metal cation

1) $Fe(CO)_5$ 2) $[Cu(NH_3)_5]^{2+}$ 3) $[Co(NH_3)_6]^{2+}$ 4) $[IF_6]^{3-}$

69. Which complex compound has highest value of C.F.S.E?

1) $K_2[PtCl_4]$ 2) $K_2[Pt(NH_3)_2Cl_4]$ 3) $K_4[Pt(NH_3)_2Cl_2]$ 4) $[Pt(NH_3)_4]Cl_2$

70. The oxidation number, coordination number and magnetic moment in the following complex is

$[Cr(C_2O_4)_2(NH_3)_2]$

1) O.N = +3, CN = 6, M.M = $\sqrt{15}$ B.M 2) O.N = +1, CN = 6, M.M = $\sqrt{15}$ B.M

3) O.N = +3, CN = 6, M.M = $\sqrt{3}$ B.M 4) O.N = +6, CN = 6, M.M = $\sqrt{24}$ B.M

SECTION- II
(Numerical Value Answer Type)

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71. Calculate the magnetic moment of a high – spin octahedral complex that has six electrons in 3d orbitals?

72. How many p bonds are present in ferrocene?

73. 100ml of 0.15M solution of $COCl_3.XNH_3$ has treated with excess of $AgNO_3$ solution and 0.03 moles of AgCl was obtained, then find out value of *x*.

74. Find out the total number of inner orbital diamagnetic complexes.

$[Fe(CN)_6]^{3-}$, $[Co(H_2O)_6]^{2+}$, $[Cr(en)_3]^{3+}$, $[Fe(CN)_6]^{4-}$, $[CO(H_2O)_6]^{3+}$

$[Cr(CN)_6]^{3-}$, $[Pt_2Cl_6]^{2-}$, $[Ni(H_2O)_6]^{2+}$, $[Cr(CO)_6]$

75. How many electrons are required for reduction of $C_6H_5NO_2$ into $C_6H_5NH_2$?