SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

JR MPC | **JEE MAINS MODEL WT-03** | **Date:- 02-08-2020**

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

IMPORTANT INSTUCTIONS:-

JEE MAIN MODEL

MATHEMATICS

Section	Question type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 1 – 20)	Questions with Single Answer Type	4	-1	20	80
Sec – II(Q.N : 21 – 25)	Questions with Numerical Answer Type (+/ - Decimal Numbers)	4	0	5	20
Total				25	100

PHYSICS

Section	Question type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 26 – 45)	Questions with Single Answer Type	4	-1	20	80
Sec – II(Q.N : 46 – 50)	Questions with Numerical Answer Type (+/ - Decimal Numbers)	4	0	5	20
Total				25	100

CHEMISTRY

Section	Question type	+Ve Marks	- Ve Marks	No.of Qs	Total marks
Sec – I(Q.N : 51 – 70)	Questions with Single Answer Type	4	-1	20	80
Sec – II(Q.N : 71 – 75)	Questions with Numerical Answer Type (+/ - Decimal Numbers)	4	0	5	20
Total				25	100

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: trigonometry ratios and compound angles ex 6.2**
Maths B: Locus and transformation of axis upto ex 2.1

1. $\sin\theta_1+\sin\theta_2+\sin\theta_3=3\Rightarrow \cos\theta_1+\cos\theta_2+\cos\theta_3=$

1) 0 2) 1 3) 2 4) 3

2. $\cos 255^0+\sin 165^0=$

1) 2 2) 0 3) 1 4) $\sqrt{\frac{3}{2}}$

3. **In** $\Delta ABC, \tan(A-B-C)=$

1) $\sin 2A$ 2) 1 3) $\tan 2A$ 4) $-\tan 2A$

4. **If** $2\sin x+5\cos y+7\sin z=14$ *then* $7\tan\frac{x}{2}+4\cos y-6\cos z=$

1) 4 2) -3 3) 11 4) 5

5. **If** $5\cos\theta+7\sin\theta=7$ *then* $7\cos\theta-5\sin\theta=$

1) 5 2) 7 3) -7 4) -5

6. $\cos x+\sec x=2\Rightarrow \cos^m x+\sec^m x=$

1) -1 2) 0 3) 1 4) 2

7. $\sin A, \cos A, \tan A$ **are in G.P** $\Rightarrow \cot^6 A-\cot^2 A=$

1) 2 2) 1 3) 0 4) -1

8. $a=\sin 1^0, b=\sin 1\Rightarrow$

1) $a=b$ 2) $a<b$ 3) $a>b$ 4) $a=2b$

9. **In a triangle ABC,** $3\cos A+2=0\Rightarrow$ **quadratic Equation whose roots are** $\sin A, \tan A$ *is*

1) $6x^2-\sqrt{5}x-5=0$ 2) $6x^2+\sqrt{5}x+5=0$ 3) $6x^2-\sqrt{5}x+5=0$ 4) $6x^2+\sqrt{5}x-5=0$

10. **If** $\sin\theta+\cos\theta=a$, *then* $\sin^4\theta+\cos^4\theta=$

1) $1-\frac{1}{2}\left(a^2+1\right)^2$ 2) $1-\frac{1}{2}\left(a^2-1\right)^2$ 3) $1+\frac{1}{2}\left(a^2+1\right)^2$ 4) $1+\frac{1}{2}\left(a^2-1\right)^2$

11. **If** $P=(1,0)Q=(-1,0)$ *and* $R=(2,0)$ **the locus of a point S such that** $QS^2+SR^2=2SP^2$ **is**

1) $x=\frac{-2}{3}$ 2) $x=\frac{3}{2}$ 3) $x=\frac{2}{3}$ 4) $x=\frac{-3}{2}$

12. **If** $(p,q),(a\cos\theta,a\sin\theta),(b\sin\theta,-b\cos\theta)$ **are vertices of a triangle where** θ **is the parameter then the locus of the centroid of the triangle is**

1) $(3x-p)^2+(3y-q)^2=a^2+b^2$ 2) $x^2+y^2=9(a+b)^2$

3) $9x^2+9y^2=p^2+q^2$ 4) $9x^29y^2=p^2+q^2+(a+b)^2$

13. **The locus of a point which is collinear with the point** $(3,4)$ *and* $(-4,3)$

1) $2x+3y-12=0$ 2) $2x+3y+12=0$ 3) $2x+3y-20=0$ 4) $x-7y+25=0$

14. **The locus of the point represented by** $x=t^2+t+1, y=t^2-t+1$ is

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

3) $x^2-2xy+y^2+2x+2y+4=0$ 4) $x^2-2xy-y^2+2x+2y-4=0$

15. **The base of a triangle lies along the line** $x = a$ **and be of length** a. **The area of triangle is** a^2 **the locus of the third vertex is**

1) $x + a = 0$ 2) $x - a = 0$ 3) $x = 0$ 4) $2x = a$

16. **If** A= (6, 0) **and** B (0, 4) **and** 'O' **is origin then the locus of** P **such that area** $\Delta POB = 2(area\ of\ \Delta POA)$

1) $x^2 - 3y^3 = 0$ 2) $x^2 + 3y^2 = 0$ 3) $x^2 - 9y^2 = 0$ 4) $x^2 - 4y^2 = 0$

17. **If** A (4,0) , B(-4,0) **and** PA+PB = 10 **then the equation of the locus of** P **is**

1) $\frac{x^2}{25} + \frac{y^2}{16} = 1$ 2) $\frac{x^2}{25} + \frac{y^2}{9} = 1$ 3) $\frac{x^2}{16} + \frac{y^2}{9} = 1$ 4) $\frac{y^2}{25} + \frac{x^2}{9} = 1$

18. **The point to which the origin should be translated in order to make the first degree terms missing in the equation** $2xy + 4x - 2y + 7 = 0$ **is**

1) (2,-1) 2) (-1, 2) 3) (1,-2) 4) (-2, 1)

19. **If** $(\cos\alpha, \cos\beta)$ **are the new co-ordinates of point P when the axes are translated to the point** (1, 1) **then the original co-ordinated are**

1) $\left(2\cos^2\frac{\alpha}{2}, 2\cos^2\frac{\beta}{2}\right)$ 2) $\left(2\cos^2\frac{\alpha}{2}, 2\sin^2\frac{\beta}{2}\right)$

3) $\left(2\sin^2\frac{\alpha}{2}, 2\sin^2\frac{\beta}{2}\right)$ 4) $\left(-2\cos^2\frac{\alpha}{2}, 2\cos^2\frac{\beta}{2}\right)$

20. **The transformed equation of** $x^2 - y^2 + 2x + 4y = 0$ **when the origin is shifted to the point** (-1, 2) **is**

1) $x^2 + 2y^2 = 1$ 2) $x^2 + 3y^2 = 1$ 3) $x^2 - y^2 + 3 = 0$ 4) $4x^2 + 9y^2 = 36$

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.
Marking scheme: +4 for correct answer, 0 in all other cases.

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21. $3\left[\sin^4\left(\frac{3\pi}{2} - \alpha\right) + \sin^4(3\pi - \alpha)\right] + 2\left[\sin^6\left(\frac{\pi}{2} + \alpha\right) + \sin^6(5\pi - \alpha)\right] =$ _____

22. **If** $\sin(\alpha + \beta) = 1; \sin(\alpha - \beta) = \frac{1}{2}$ then $\tan(\alpha + 2\beta).\tan(2\alpha + \beta) =$ _____ $(\alpha, \beta\ acut)$.

23. $f(x) = x^3 - 2x^2 + 3x - 5 \Rightarrow f\left[\sin\left(\frac{5\pi}{2}\right)\right] + f\left[\sin\left(\frac{3\pi}{2}\right)\right] =$ _____

24. **If the equation to the locus of point equidistant from the point** (-2, 3), (6,-5) **is** $ax + by + c = 0$ **when** a>o **then the value of** a+b+c **is**

25. **If** (7, 5) **are coordinates of a point P in the new system when the origin is shifted to (-5, 3) then the original coordinates of P are** (a, b) **then the value of** $a + \frac{2}{3}b$ **is**

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.

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PHYSICS

***Syllabus*-Motion in a straight line, Vertical projection of a body from the ground Applications of vertical projection from the top of a tower, Motion in a plane, Scalar, vector, representation of a vector types of vectors Null vector, unit vector position vector, Addition and subtraction of vectors and its applications, Resolutions of a vector and its applications triangle law of vectors, polygon law of vectors and its applications**

26. Two identical balls are shot upwards one after at an interval of 2 sec along the same vertical line with same initial velocity of 40 m/s. the height at which the balls coincide is

1) 50m 2) 75m 3) 100m 4) 125m

27. A freely falling body covers 44.1 m in the last second of its journey. The total distance travelled by the body is ($g = 9.8 m/s^2$)

1) 88.2m 2) 66.2m 3) 108.3m 4) 122.5m

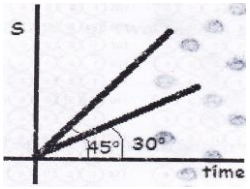
28. If the distance travelled by a freely falling body in the last second of its journey is equal to the distance travelled in the first two seconds the time of decent of the body is

1) 5 s 2) 1.5 s 3) 2.5s 4) 3s

29. Two balls are dropped simultaneously from two points separated by a vertical height of 6m the distance of separation between them after next two seconds is

1) 9m 2) 6m 3) 12m 4) 0m

30. The displacement – time graphs of two moving particles make angle of 30^0 and 45^0 with the x – axis the ratio of the two velocities is



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

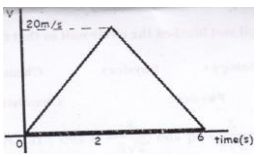
31. A body is thrown vertically up reaches a maximum height of 78.4m after what time it will reach the ground from the maximum height

1) 5 s 2) 8 s 3) 3 s 4) 4 s

32. A body dropped freely has covered $\left(\frac{16}{25}\right)^{th}$ of the total distance in the last sec. its total time of fall is

1) 2.5 s 2) 5s 3) 7.5 s 4) 1 s

33. For the velocity – time graph shown in the figure what is the distance travelled by the body in 6 sec



1) 60 m/s 2) 30 m/s 3) 45 m/s 4) 50 m/s

34. A ball is projected vertically upwards with a velocity of 25 m/s from bottom of a tower. A boy standing at the top of a tower is unable to catch the ball when it passes him in the upward directions. But the ball again reaches him after 3 sec when it is falling. Now the boy catches it. Then the height of the tower is ($g = 10 ms^{-2}$)

1) 5 m 2) 10m 3) 15m 4) 20m

35. An object falls from a bridge that is 45m above the water. It falls directly into a small boat moving with constant velocity that was 12 m from the point of impact when the object was released. The speed of the boat is (g = 10 ms^{-2})

1)3 m/s 2) 4 m/s 3) 5 m/s 4) 6 m/s

36. A balloon is rising vertically with a velocity of 9.8 m/s A packet is dropped from it when it is at a height of 39.2 m. time taken by the packet to reach the ground is

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

37. A person is a lift which ascends up with acceleration 10ms^{-2} drops a stone from a height 10m. The time of decent is (g = 10 ms^{-2})

1) 1 s 2) 2 s 3) 1.5 s 4) 0.5 s

38. The maximum and minimum resultants of two forces are in the ratio 4: 3. The forces are in the ratio

1) 7:1 2) 1:5 3) 4:7 4) 3:7

39. The resultant of two forces '1' and 'p' is perpendicular to '1' and equal two '1', then the value of 'p' is

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

40. If three vectors $\vec{P},\vec{Q}$ *and* $\vec{R}$ are related as $\vec{P}-\vec{Q}=\vec{R}$ *and* $P-Q=R$, the angle between $\vec{P}$ *and* $\vec{Q}$ *is*

1) 0^0 2) 30^0 3) 60^0 4) 90^0

41. An aero plane is heading towards north-east at a speed of 141.4 m/s. The north ward component of its velocity is

1) 141.4 m/s 2) 100 m/s 3) 0 m/s 4) 50 m/s

42. If $\vec{A}=3i-4j$ *and* $\vec{B}=-i-4j$, calculate the direction of $\vec{A}+\vec{B}$

1) $\tan^{-1}$ (4) with + x-axis in clockwise 2) $\tan^{-1}$ (4) with - x-axis in clockwise
3) $\tan^{-1}$ (4) with + x-axis in anti - clockwise 4) $\tan^{-1}$ (4) with - x-axis in anti - clockwise

43. The direction cosines of a vector 'A' are $\cos\alpha=\frac{4}{5\sqrt{2}},\cos\beta=\frac{5}{5\sqrt{2}}$ *and* $\cos\gamma=\frac{3}{5\sqrt{2}},$ then the vector 'A' is

1) 4**i** + **j** + 3**k** 2) 4**i** + 5**j** + 3**k** 3) 4**i** - 5**j** - 3**k** 4) 4**i** - 3**j** + **k**

44. If a vector is 2i – 3j + 4k its components in YZ and ZX planes are

1) $\sqrt{13}$ *And* 5 2) 5 *and* $2\sqrt{5}$ 3) $2\sqrt{5}$ *and* $\sqrt{13}$ 4) $\sqrt{13}$ *and* $\sqrt{29}$

45. If the vertical component of a vector is 60 units and the vector makes an angle 60^0 with the horizontal then its horizontal component is

1) $10\sqrt{3}$ 2) $20\sqrt{3}$ 3) $30\sqrt{3}$ 4) $40\sqrt{3}$

SECTION- II

(Numerical Value Answer Type)

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46. A ball dropped from a height takes 0.2 sec to cross the last 6m distance before hitting the ground total time of fall (g = 10 ms^{-2}) _____

47. Water drops fall from a tap of height 1.6m at regular intervals. If the first drop touches the ground, the fifth drop detaches from the tap. Then time taken by the first drop to reach the ground is _____

48. If the ratio of distances travelled by freely falling body in the last and last but one second of its motion is 7:5, then the velocity with which the body strikes the ground is _____

49. Two stones are thrown vertically upwards with the same velocity of 49 ms^{-1} . If they are thrown one after the other with a time lapse of 3 sec, height at which they collide is _____

50. A ball is dropped from a bridge 122.5m above a river. After two sec a second ball is thrown down after it what must be its initial velocity so that both the stones hit the water at the same time _____

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.

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CHEMISTRY

SYLLABUS: **- ELECTRO MAGNETIC SPECTRUM TO HEISENBERG'S UNCERTANITY PRICIPLE AND ITS SIGNIFICANCE**

51. The ionization energy of H atom is X KJ. The energy required for the electron to jump from n=2 to n=3 will be.

1) 5x 2) $\frac{36x}{5}$ 3) $\frac{5x}{36}$ 4) $\frac{9x}{4}$

52. Which one of the following transition of a electrons in hydrogen atom emits radiation of the lowest wave length.

1) $n_2 = \infty \; to \; n_1 = 2$ 2) $n_2 = 4 \; to \; n_1 = 3$

3) $n_2 = 2 \; to \; n_1 = 1$ 4) $n_2 = 5 \; to \; n_1 = 3$

53. The wave length of a spectral line emitted by hydrogen atom in the lyman series is $^{15}/_{16}$ R cm. what is the value of n_2

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

54. Each hydrogen atom is excited by giving 10.2 ev The maximum number of spectral lines in the emission is equal to

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

55. To which of the following is Bohr's theory applicable I) He^+ **II)** Li^{+2} **III)** Tritium **IV)** Be^{+2} **The correct combination is**

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

56. According to Bohr's theory when ever electron drops from a higher energy level to lower energy level the frequency of radiation emitted is related to the energy changes as

1) $\lambda = \frac{h}{mv}$ 2) $mvr = \frac{nh}{2\pi}$ 3) $\upsilon = \frac{\Delta E}{h}$ 4) $\upsilon = \frac{h}{\Delta E}$

57. The wave number of first line of Balmer series of H – atom is 15,200 cm^{-1} the wave number of first Balmer line of Li^{2+} list ion is

1) 15200 cm^{-1} 2) 60800 cm^{-1} 3) 76000 cm^{-1} 4) 136800 cm^{-1}

58. The radius of second Bohr orbit, interms of Bohr radius a_0 in Li^{2+} is

1) $\frac{2a_o}{3}$ 2) $\frac{4a_o}{9}$ 3) $\frac{4a_o}{3}$ 4) $\frac{2a_0}{9}$

59. If E is the kinetic energy of particle then correct expression for de-broglie wave length of the particle is

1) $\lambda = \frac{h}{2ME}$ 2) $\lambda = \sqrt{\frac{h}{2ME}}$ 3) $\lambda = \frac{h}{\sqrt{2ME}}$ 4) $\lambda = \frac{\sqrt{2ME}}{h}$

60. If moving with equal speeds the longest wave length of the following matter wave is that for

1) Electron 2) $\propto -particle$ 3) Proton 4) Neutron

61. Calculate the wave length (in nm) associated with proton moving at 1.0×10^3 ml sec the mass of proton is 1.67×10^{-27} kg and h is 6.63×10^{-34} JS

1)0.032nm 2) 2.5nm 3) 14.0 nm 4) 0.4 nm

62. The uncertainty in the position of an electron and proton is equal the ratio of the uncertainties in the velocity of of electron and proton is

1) 10^3:1 2) 1:1836 3) 3672:1 4) 1836:1

63. A ball of mass 200gm is moving with velocity of $10ms^{-1}$ if the error in measurement of velocity is 0.1% the uncertainty in its position is

1) $3.3x10^{-31}$m 2) $3.3x10^{-27}$m 3) $5.3x10^{-25}$ m 4) $2.64x10^{-32}$m

64. The mass of an electron is m, its charge and it is accelerated from rest through a potential difference v. the velocity of electron will be calculated by formula.

1) $\sqrt{v/m}$ 2) $\sqrt{ev/m}$ 3) $\sqrt{2ev/m}$ 4) none of these

65. The momentum of particle wave length $1A^o$ is

1) $6.625x10^{-27}$gcm S^{-1} 2) $6.625x10^{-19}$g cm S^{-1}

3) $6.625x10^{-16}$g cm S^{-1} 4) $6.625x10^{-23}$g cm S^{-1}

66. Which of the following is responsible to rule out the existence of definite paths (or) trajectories of electrons?

1) Pauli's exclusion principle 2) Heisenberg's uncertainty Principle

3) Hund's rule 4) Aufbau principle

67. If a suitable photon is employed to locate an electron (mass = $9.11x10^{-31}$ kg) in an atom with in a distance of 10.98 nm. The uncertainty involved in the measurement of its velocity in ms^{-1}

1) $\frac{1.6565X10^6}{\pi}$ 2) $\frac{1.6565X10^4}{\pi}$ 3) $\frac{1.6565X10^{-8}}{\pi}$ 4) $\frac{1.6565X10^8}{\pi}$

68. If the uncertainty in velocities of two particles A and B with mass $1.0x10^{-27}$ kg and $1.0x10^{-31}$ kg respectively is the same, the ratio of uncertainty in the position of A and B is

1) 1000:1 2) 10000: 1 3) 1: 1000 4) 1: 10000

69. If the de Broglie wave length of electron in n^{th} Bohr orbit in a hydrogenic atom is equal to $1.5\pi a_o$ (a_o is Bohr radius) then the value of n/z is

1) 0.75 2) 0.40 3) 1.0 4) 1.50

70. The wave length of a microscope particle of mass $9.1x10^{-31}$ kg is 182nm its kinetic energy in Joules is

1) $7.28x10^{-23}$ 2) $7.28x10^{-24}$ 3) $3.24x10^{-23}$ 4) $3.64x10^{-24}$

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. The difference between n^{th} and $(n+1)^{th}$ Bohr radius of hydrogen atom is equal to its (n-1) Bohr radius. The value of 'n' is

72. Uncertainty in the position of an electron in meters (m=$9.1x10^{-31}$kg) moving with velocity of 300 m/s accurate upto 0.001% will be

73. The energy of separation of an electron in a hydrogen like atom in excited state is 3.4 ev. the debroglie wave length (in A^o) associated with electron is (given radius of first orbit of H – atom is $0.53A^o$)

74. The two particles A and B have de Broglie wave length I nm and 5 nm respectively. It mass of 'A' is 4 times that of mass of B the value of ratio of KE of A and B would be.

75. a particle 'A' moving with a certain velocity has a de Broglie wave length of $1A^o$ It particle B has mass 25% of that A and velocity 75% of that of A, the debroglie wave length of B will be __ A^o