RANKRIDGE IIT JEE/NEET JUNIOR COLLEGE (LONGTERM)

TELANGANA

STREAM: JR MPC
Time: 3:00 Hours

WEEKEND TEST-09

Date: 18-08-2025
Max Marks: 300

SYLLABUS

MATHEMATICS : Locus and change of axes
PHYSICS : Friction+Circular motion
CHEMISTRY : VBT, VSEPR THEORY Hybridization sp, sp2, sp3

MATHEMATICS

(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 in all other cases

1. The ends of hypotenuse of a right angled triangle are (a,0), (-a,0) then the locus of third vertex is

(A) $x^2-y^2=a^2$ (B) $x^2+y^2=a^2$
(C) $x^2+y^2+a^2=0$ (D) $x^2-y^2+a^2=0$

2. A straight line of length 9 units slides with its ends A, B always on x and y axes respectively. Locus of centroid ΔOAB is

(A) $x^2+y^2=3$ (B) $x^2+y^2=9$
(C) $x^2+y^2=1$ (D) $x^2+y^2=8$

3. The locus of point of intersection of the lines $y+mx=\sqrt{a^2m^2+b^2}$ and $my-x=\sqrt{a^2+b^2m^2}$ is

(A) $x^2+y^2=\frac{1}{a^2}+\frac{1}{b^2}$
(B) $x^2+y^2=a^2+b^2$
(C) $x^2-y^2=a^2-b^2$
(D) $\frac{1}{x^2}+\frac{1}{y^2}=a^2-b^2$

4. A(0,4), B(0,-4) are two points. The locus of P which moves such that $|PA-PB|=6$ is

(A) $9x^2-7y^2+63=0$
(B) $9x^2+7y^2-63=0$
(C) $9x^2+7y^2+63=0$
(D) $9x^2-7y^2-63=0$

5. If the roots of the equation $(x_1^2-a^2)m^2-2x_1y_1m+y_1^2+b^2=0$ are the slopes of two perpendicular lines intersecting at $P(x_1,y_1)$, then the locus of P is

(A) $x^2+y^2=a^2+b^2$
(B) $x^2+y^2=a^2-b^2$
(C) $x^2-y^2=a^2+b^2$
(D) $x^2-y^2=a^2-b^2$

6. $A=(2,5), B(4,-11)$ and the locus of 'C' is $9x+7y+4=0$ then the locus of the centroid of ΔABC is

(A) $27x+21y-8=0$
(B) $3x+4y-2=0$
(C) $24x+22y-6=0$
(D) $5x+3y-7=0$

7. Vertices of a variable triangle are (5,12), $(13\cos\theta,13\sin\theta)$ and $(13\sin\theta,-13\cos\theta)$, where $\theta\in R$. Locus of it's orthocenter is

(A) $x^2+y^2+6x+8y-25=0$
(B) $x^2+y^2-10x-24y-169=0$
(C) $x^2+y^2+10x-24y-169=0$
(D) $x^2+y^2+10x+24y+169=0$

8. Given $P=(1,0)$ and $Q=(-1,0)$ and R is a variable point on one side of the line

PQ such that $\angle RPQ - \angle RQP = \frac{\pi}{4}$. The locus of the point R is

(A) $x^2 + y^2 + 2xy = 1$

(B) $x^2 + y^2 - 2xy = 1$

(C) $x^2 - y^2 - 2xy = 1$

(D) $x^2 - y^2 + 2xy = 1$

9.

	List-I		List-II
A.	The locus of the point $(a\sec\theta, b\tan\theta)$ is	1.	$x^2 - y^2 = a^2$
B.	The locus of the point $(2t, 2/t)$ is	2.	$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$
C.	The locus of the $(a\sec\theta, a\tan\theta)$ is	3.	$xy = 4$
		4.	$x^2 + y^2 - ax + by = 0$

	A	B	C		A	B	C
(A)	3	2	1	(B)	2	3	1
(C)	3	1	2	(D)	2	4	1

10. When the axes are translated to the point (5,-2) then the transformed form of the equation $xy + 2x - 5y - 11 = 0$ is

(A) $\frac{X}{Y} = 1$ (B) $\frac{Y}{X} = 1$

(C) $XY = 1$ (D) $XY^2 = 2$

11. If the distance between the two given points is 2 units and the points are transferred by shifting the origin to (2,2), then the distance between the points in their new position is

(A) 2 (B) 5

(C) 6 (D) 7

12. If the origin is shifted to the point (-1,2) without changing the direction of axes, the equation $x^2 - y^2 + 2x + 4y = 0$ becomes

(A) $X^2 + Y^2 + 3 = 0$

(B) $X^2 + Y^2 - 3 = 0$

(C) $X^2 - Y^2 + 3 = 0$

(D) $X^2 - Y^2 - 3 = 0$

13. The point to which origin is shifted in order to miss the first degree terms in $2x^2 + 5xy + 3y^2 + 6x + 7y + 1 = 0$ is

(A) (2,1) (B) (1,-2)

(C) (2,-1) (D) (1,2)

14. If the axes are rotated through an angle 30^0, the coordinates of $(2\sqrt{3}, -3)$ in the new system are

(A) $\left(\frac{3}{2}, \frac{-5}{2}\right)$ (B) $\left(\frac{-\sqrt{3}}{2}, \frac{5}{2}\right)$

(C) $\left(\frac{3}{2}, \frac{-5\sqrt{3}}{2}\right)$ (D) $\left(3\sqrt{2}, \frac{-5\sqrt{3}}{2}\right)$

15. If the axes are rotated through an angle 180^0 then the equation $2x - 3y + 4 = 0$ becomes

(A) $2X - 3Y - 4 = 0$

(B) $2X + 3Y - 4 = 0$

(C) $3X - 2Y + 4 = 0$

(D) $3X + 2Y + 4 = 0$

16. If the equation $4x^2 + 2\sqrt{3}xy + 2y^2 - 1 = 0$ becomes $5X^2 + Y^2 = 1$, when the axes are rotated through an angle θ, then θ is

(A) 15^0 (B) 30^0

(C) 45^0 (D) 60^0

17. When the origin is shifted to a suitable point, the equation $2x^2 + y^2 - 4x + 4y = 0$ transformed as $2X^2 + Y^2 - 8X + 8Y + 18 = 0$. The point to which origin was shifted is

(A) (1,2) (B) (1,-2)

(C) (-1,2) (D) (-1,-2)

18. Let L be the line $2x + y - 2 = 0$. The axes are rotated by 45^0 in clockwise direction then the intercepts made by the line L on the new axes are respectively

(A) $1, \sqrt{2}$ (B) $\sqrt{2}, 1$

(C) $2\sqrt{2}, \frac{2\sqrt{2}}{3}$ (D) $\frac{2\sqrt{2}}{3}, 2\sqrt{2}$

19. The point (4,1) undergoes the following two transformations successively
(i) reflection about the line y = x
(ii) translation through a distance 2 units along the positive direction of x-axis. The final position of the point is

(A) (3,4) (B) (4,3)
(C) (-3,-4) (D) (0,4)

20. The angle of rotation of axes so that $\sqrt{3}xy - y + 1 = 0$ transformed as $y = kx$ is

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$
(C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

(NUMERICAL VALUE TYPE)

Section-II contains 5 Numerical Value Type questions.
Marking scheme: +4 for correct answer, 0 if not attempt and -1 in all other cases

21. On shifting the origin to a particular point, the equation $x^2 + y^2 - 4x - 6y - 12 = 0$ transforms to $X^2 + Y^2 = K$. Then K =

22. The acute angle θ through which the coordinate axes should be rotated for the point $A(2,4)$ to attain the new abscissa 4 is given by $\tan\theta = \frac{k}{4}$ then k =

23. If $x^2 = ky$ is the transformed equation of $x^2 - 4y + 6x + 15 = 0$ when the origin is shifted to the point (α, β) by the translation of axes, then $2\alpha + 3\beta^2$ =

24. The locus of the point $(\cos\theta + \sin\theta, \cos\theta - \sin\theta)$, where $0 \le \theta < 2\pi$ is $(x^2 - y^2)^2 = ky$. Then k =

25. If (h,k) be the point to which the origin has to be shifted in order to get the transformed equation of $3y^2 - 4x + 6y + 17 = 0$ as $y^2 = 4ax$, then $h^2 + k^2$ =

PHYSICS

(SINGLE CORRECT ANSWER TYPE)

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26. A block of mass 2 kg is placed on the floor. The coefficient of static friction is 0.4. If a force of 2.4 N is applied on the block parallel to the floor, the force of friction between the block and floor ($g = 10\ m/s^2$) is
(A) 2.8 N (B) 4 N
(C) 2 N (D) Zero

27. Brakes are applied to a car moving with disengaged engine, bringing it to a halt after 2s. Its velocity at the moment when the breaks are applied if the coefficient of friction between the road and the tyres is 0.4 is
(A) $3.92 ms^{-1}$ (B) $7.84 ms^{-1}$
(C) $11.2 ms^{-1}$ (D) $19.6 ms^{-1}$

28. A force of 150N produces an acceleration of $2 ms^{-2}$ in a body and a force of 200N produces an acceleration of $3 ms^{-2}$. The mass of the body and the coefficient of kinetic friction are
(A) 50kg; 0.1 (B) 25kg; 0.1
(C) 50kg; 0.5 (D) 50kg; 0.2

29. A horizontal jet of water coming out of a pipe of area of cross-section $20 cm^2$ hits a vertical wall with a velocity of $10 ms^{-1}$ and rebounds with the same speed. The force exerted by water on the wall is,
(A) 12 N (B) 10 N
(C) 400 N (D) 200 N

30. six forces lying in a plane and forming angles of 60° relative to one another are applied to the centre of a homogeneous sphere with a mass m=6kg. These forces are radially outward and consecutively 1N, 2N, 3N, 4N, 5N and 6N. The acceleration of the sphere is
(A) 0 (B) $1/2 m/s^2$
(C) $1 m/s^2$ (D) $2 m/s^2$

31. A horizontal force "F" produces an acceleration of $6 m/s^2$ on a block resting on a smooth horizontal surface. The same force produces an acceleration of $3 m/s^2$ on a second block resting on a smooth horizontal surface. If the two blocks are tied together and the same force acts, the acceleration produced will be
(A) $9 m/s^2$ (B) $2 m/s^2$
(C) $4 m/s^2$ (D) $1/2 m/s^2$

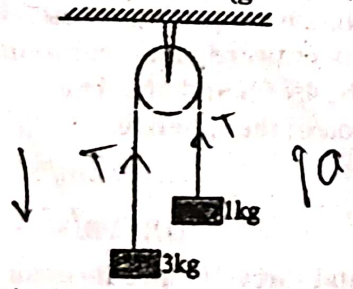
32. A stream of water flowing horizontally with a speed of $15ms^{-1}$ pushes out of a tube of cross sectional area $10^{-2}m^2$ and hits a vertical wall near by what is the force exerted on the wall by the impact of water assuming. that it does not rebound? (Density of water=1000 kg m^3)
(A) 1250N (B) 2250N
(C) 4500N (D) 2550N

33. An impulse is supplied to a moving object with the force at an angle120° with the velocity vector. The angle between the impulse vector and the change in momentum vector is
(A) 120° (B) 0°
(C) 60° (D) 240°

34. A rope of length 10m and linear density 0.5kg/m is lying length wise on a smooth horizontal floor. It is pulled by a force of 25 N. The tension in the rope at a point 6m away from the point of application is
(A) 20 N (B) 15 N
(C) 10 N (D) 5 N

35. A 40 N block is supported by two ropes. One rope is horizontal and the other makes an angle of 30° with the ceiling. The tension in the rope attached to the ceiling is approximately :
(A) 80 N (B) 40 N
(C) 34.6 N (D) 46.2 N

36. Two masses are connected by a weightless cord passing over a frictionless pulley (see fig). The tension in the cord connecting the masses will be (g = 10 m/s^2)

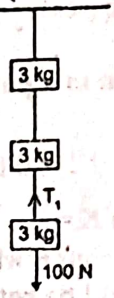


(A) 20 N (B) 15 N
(C) 37.5 N (D) 40 N

37. A bomb of mass 6 kg initially at rest explodes in to three identical fragments. One of the fragments moves with a velocity of $10\sqrt{3}\hat{i}\,m/s$, another fragment moves with a velocity of $10\,j\,m/s$, then the third fragment moves with a velocity of magnitude.
(A) 30 m/s (B) 20 m/s
(C) 15 m/s (D) 5 m/s

38. A shell is fired from the ground at an angle θ with horizontal with a velocity 'v'. At its highest point it breaks into two equal fragments. If one fragment comes back through its initial line of motion with same speed, then the speed of the second fragment will be
(A) $3v\cos\theta$ (B) $3v\cos\theta/2$
(C) $2v\cos\theta$ (D) $\sqrt{3}v\cos\theta/2$

39. Three blocks of equal masses (each 3kg) are suspended by weightless strings as shown. If applied force is 100N, then T_1 is equal to $(g = 10m/s^2)$



(A) 130N (B) 190N
(C) 100N (D) 160N

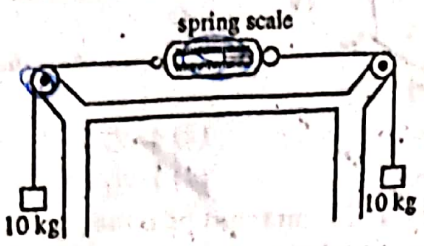
40. A man of mass m is on the floor of a lift then match the following

	LIST-I		LIST-II
a.	lift is moving up with acceleration a	e.	apparent weight is greater than
b.	lift is moving down with acceleration a	f.	apparent weight is zero
c.	lift is moving with uniform velocity equal to true weight	g.	apparent weight is equal to true weight
d.	lift is freely falling less than true weight	h.	apparent weight is less than true weight

(A) a – e, b – h, c – g, d – f,
(B) a – f, b – h, c – g, d – e,
(C) a – e, b – g, c – h, d – f,
(D) a – g, b – f, c – e, d – h,

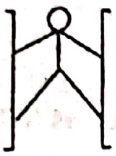
41. Two blocks A and B of masses 2kg and 3kg are connected by a light string as shown in the figure and placed on a horizontal surface. μ between all surfaces is 0.1 and g = 10 ms^{-2}. The acceleration of the system is, when the force applied F = 45N
(A) 6 (B) 7
(C) 8 (D) 0

42. Two 10 kg bodies are attached to a spring balance as shown in figure. The reading of the balance will be



(A) 20 kg-wt (B) 10 kg-wt
(C) Zero (D) 5 kg-wt

43. A man of mass 40 kg is at rest between the walls as shown in the figure. If 'μ' between the man and the walls is 0.8, find the normal reaction exerted by the walls on the man. ($g=10ms^{-2}$)



(A) 100 N (B) 250 N
(C) 80 N (D) 50 N

44. An eraser weighing 2N is pressed against the black board with a force of 5N. If the coefficient of friction is 0.4. How much force parallel to the black board is required to slide the eraser upwards
(A) 2N (B) 2.8 N
(C) 4N (D) 4.8 N

45. A 15kg mass is accelerated from rest with a force of 100N. As it moves faster, friction and air resistance create an oppositely directed retarding force given by $F_R = A + BV$. Where $A = 25N$ and $B = 0.5\frac{N}{m/s}$ At what velocity does the acceleration equal to one half of the initial acceleration?
(A) $25ms^{-1}$ (B) $50\ ms^{-1}$
(C) $75ms^{-1}$ (D) $100\ ms^{-1}$

NUMERICAL VALUE TYPE)

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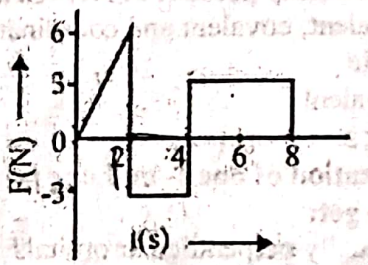
46. A heavy uniform chain lies on horizontal table top. If the coefficient of friction between the chain and the table surface is 0.25, the maximum percentage of the length of the chain that can hang over one edge of the table is 22 %.

47. A vehicle of mass 10kg is moving with a velocity of $5ms^{-1}$. To stop it in 1/10 sec the required force in opposite direction is

48. A ball of mass 2 kg is thrown vertically upwards by applying a force by hand. If the hand moves 0.2m while applying the force and the ball goes up to 2m height further, find the magnitude of the force. $(g=10ms^{-2})$

49. A bullet of mass 10 gm moving with a horizontal velocity 100m/s passes through a wooden block of mass 100 gm. The block is resting on a smooth horizontal floor. After passing through the block the velocity of the bullet is 10m/s. the velocity of the emerging bullet with respect to the block is ____.

50. The force F acting on a particle of mass m is indicated by the force-time graph shown below. The change in momentum of the particle over the time interval from zero to 8 s is



CHEMISTRY

(SINGLE CORRECT ANSWER TYPE)

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51. Most favourable conditions for electrovalent bonding are:
(A) low ionisation potential of one atom and high electron affinity of the other atom
(B) high electron affinity and high ionisation potential of both the atoms
(C) low electron affinity and low ionisation potential of both the atoms
(D) high ionisation potential of one atom and low electron affinity of the other atom

52. Dissolution of ionic solid in water is possible when
(A) $\Delta H_{lattice} > \Delta H_{hydration}$
(B) $\Delta H_{lattice} = \Delta H_{hydration}$
(C) $\Delta H_{hydration} : \Delta H_{lattice} = 2:1$
(D) $\Delta H_{hydration} > \Delta H_{lattice}$

53. The bond between carbon atom (A) and carbon atom (B) in compound, $N \equiv \underset{A}{C}-\underset{B}{C}H = CH_2$ involves the hybrid as:
(A) sp and sp^2 (B) sp^2 and sp^3
(C) sp and sp^3 (D) sp and sp

54. The sigma and π -bonds present in benzene ring are:
(A) three sigma three pi
(B) six sigma and three pi
(C) six pi and three sigma
(D) twelve sigma and three pi

55. Among the following compounds, the one that is polar and has the central atom with sp^2 hybridisation is:
(A) SiF_4 (B) BF_3
(C) $HClO_2$ (D) H_2CO_3

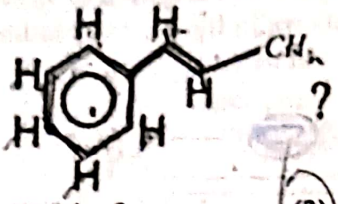
56. The types of bonds present in NH4Cl are:
(A) electrovalent, covalent and coordinate
(B) only ionic
(C) only covalent
(D) covalent and coordinate

57. On hybridization of one s- and one p-orbitals, we get:
(A) two mutually perpendicular orbitals
(B) two orbitals at 180°
(C) four orbitals directed tetrahedrally
(D) three orbitals in the plane

58. Coordinate linkage is formed:
(A) by transfer of one electron from one atom to another
(B) by the loss of one electron each from both the atoms
(C) by sharing of one electron from each atom
(D) when contribution of one electron pair is made by one atom and both the atoms share equally

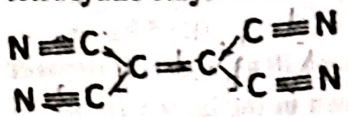
59. The strength of sigma bonds formed by axial overlap of s- or p-orbitals of 2nd shell of participating atoms decreases as:
(A) s - s > p - s > p – p
(B) s - s > p - p > s - p
(C) p-s > s - s > p - p
(D) p - p > s - p > s - s

60. How many bonds are there in



(1) $14\sigma, 8\pi$ (2) $18\sigma, 4\pi$
(3) $14\sigma, 2\pi$ (4) $19\sigma, 4\pi$

61. The ratio of sigma and pi-bonds in tetracyano ethylene is:



(A) 2:1 (B) 1:2
(C) 1:3 (D) 1:1

62. The geometry of the molecule with 25% s-character in hybrid orbital is:
(A) plane triangular (B) linear
(C) tetrahedral (D) octahedral

63. BCl_3 is a planar molecule whereas NCl_3 is pyramidal because:
(A) nitrogen atom is smaller than boron atom
(B) BCl_3 has no lone pair of electrons whereas NCl_3 has a lone pair of electrons
(C) N-Cl bond is more covalent than B-Cl bond
(D) B-Cl bond is more polar than N-Cl bond

64. The shape of ClF_3 according to VSEPR model is:
(A) planar triangle (B) pyramidal
(C) tetrahedral (D) T-Shape

65. In which of the following molecules, the central atom does not have sp^3-hybridization?
(A) CH_4 (B) SF_4
(C) BF_3^- (D) NH_3^+

66. Which of the following overlap is the strongest?
(A) 2p-2p (B) 3p-3p
(C) 5p-5p (D) $\pi(5p-5p)$

67. Octet rule is not followed in
(A) SF_6 (B) PF_5
(C) $BeCl_2$ (D) All the three

68. Which one of the following is the correct set with reference to molecular formula, hybridisation of central atom and shape of the molecule?
(A) $CO_2, sp^2, bent$ (B) $H_2O, sp^2, bent$
(C) $BeCl_2, sp, linear$
(D) $H_2O, sp^3, linear$

69. Match the following List-I with List-II

	List-I		List-II
A.	NaCl	1.	Covalent bond
B.	CH_4	2.	Ionic bond
C.	NH_4^+	3.	Metallic bond
D.	Cu metal	4.	Covalent and dative bond

The correct match is

	A	B	C	D
(A)	2	1	4	3
(B)	2	4	1	3
(C)	2	3	1	4
(D)	1	2	3	4

70. The pair having similar geometry is

(A) BF_3, NH_3 (B) H_2O, C_2H_2

(C) CO_2, SO_2 (D) NH_3, PH_3

(NUMERICAL VALUE TYPE)

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71. Total number of lone pair of electrons on Xe in $XeOF_4$ is 1.

72. The number of sigma bonds in ethane formed by the overlap of sp^3 and s orbitals is 6.

73. The number of hybrid orbitals in a molecule of decane are 10.

74. The number of sigma bonds in a molecule of cyanogen are 3.

75. The number of electron pairs present in the valence shell of central atom in SF_6 molecule are 6.

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BEST OF LUCK