Ravi Maths Tuition Centre

Time : 180 Mins **KINEMATICS' 1** **Marks : 546**

1. If the body is moving in a circle of radius r with a constant speed v, its angular velocity is:
   a) $\frac{v^2}{r}$ b) vr c) $\frac{v}{r}$ d) $\frac{r}{v}$
2. If a particle moves in a circle describing equal angles in equal times, its velocity vector:
   a) Remains constant b) Changes in magnitude c) Changes in direction
   d) Changes both in magnitude and direction
3. If the velocity of a particle is $u = At + Bt^2$, where A and B are constants, then the distance travelled by it between 1 s and 2 s :
   a) A/2 + B/3 b) 3/2A + 4B c) 3A + 7B d) 3/2A + 7/3B
4. A particle of unit mass undergoes one dimensional motion such that its velocity varies according to $u(x) = \beta x^{-2n}$, where β and n are constants and x is the position of the particle. The acceleration of the particle as a function of x is given by:
   a) $-2\beta^2x^{2n+1}$ b) $-2n\beta^2e^{-4n+1}$ c) $-2n\beta^2x^{2n-1}$ d) $-2n\beta^2x^{-4n-1}$
5. A stone falls freely under gravity. It covers distances h_1, h_2 and h_3 in the first 5 seconds, the next 5 seconds and the next 5 seconds respectively. The relation between h_1, h_2 and h_3 is :
   a) $h_1 = 2h_2 = 3h_3$ b) $h_1 = \frac{h_2}{3} = \frac{h_3}{5}$ c) $h_2 = 3h_1$ and $h_3 = 3h_2$ d) h1 = h_2 = h_3
6. A particle covers half of its total distance with speed u_1 and the rest half distance with speed u_2 Its average speed during the complete journey is :
   a) $\frac{v_1v_2}{v_1+v_2}$ b) $\frac{2v_1v_2}{v_1+v_2}$ c) $\frac{2v_1v_2^2}{v_1^2+v_2^2}$ d) $\frac{v_1+v_2}{2}$
7. A boy standing at the top of a tower of 20m height drops a stone. Assume g = 10 m / s^2 , the velocity with which it hits the ground is :
   a) 10.0 m/s b) 20.0 m/s c) 40.0 m/s d) 5.0 m/s
8. A man of 50 kg mass is standing in a gravity free space at height of 10m above the floor. He throws a stone of 0.5 kg mass downwards with speed of 2 m/s. When the stone reaches the floor the distance of the man above the floor will be :
   a) 9.9 m b) 10.1 m c) 10.0 m d) 20 m
9. A bus is moving with a speed of 10 m/s on a straight road. A scooterist wishes to overtake the bus in 100s. If the bus is at a distance of 1 km from the scooterist, with what speed should the scooterist chase the bus?
   a) 40 m/s b) 25 m/s c) 10 m/s d) 20 m/s
10. A particle starts its motion from rest under the action of a constant force. If the distance covered in first 10 seconds is S_1 and that covered in the first 20 seconds is S_2, then
    _____
    a) $S_2 = 3S_1$ b) $S_2 = 4S_1$ c) $S_2 = S_1$ d) $S_2 = 2S_1$

11. The distance travelled by a particle starting from rest and moving with an acceleration $\frac{4}{3}$ m /s^2 in the third second is :
    a) 6 m b) 4 m c) $\frac{10}{3}$ m d) $\frac{19}{3}m$
12. A particle is moving in a straight line with a constant acceleration. It changes its velocity from 10 m/s to 20 m/s, while passing through a distance 135m in t seconds. The value of t is :
    a) 10 b) 1.8 c) 12 d) 9
13. A particle moves along a straight line OX. At a time t (in second) the distance x (in meters) of the particle is given by x = 40 + 12t - t^3. How long would the particle travel before coming to rest?
    a) 24 m b) 40 m c) 56 m d) 16 m
14. Two bodies are standing at the ends A and B of a ground where AB = a. The boy at B starts running in a direction perpendicular to AB with velocity u_1. The boy at A starts running simultaneously with velocity u and catches the other boy in a time t, where t is:
    a) $\frac{a}{\sqrt{v^2 v_1^2}}$ b) $\sqrt{\frac{a^2}{v^2 - v_1^2}}$ c) $\frac{a}{v - v_1}$ d) $\frac{a}{v + v_1}$
15. The displacement x of a particle varies with time t, x = ae$^{-\alpha t}$ + be$^{\beta t}$, where a, b, α and β positive constants. The velocity of the particle will :
    a) go on decreasing with time b) be independent of α and β c) drop to zero when α = β
    d) go on increasing with time
16. A police jeep is chasing with, velocity of 45km/h thief in another jeep moving with velocity 153 km/h. Police fires a bullet with muzzle velocity of 180 m/s. The velocity, it will strike the jeep of the thief is:
    a) 150 m/s b) 27 m/s c) 450 m/s d) 250 m/s
17. A body falls from a height h = 200 m at New Delhi. The ratio of distance travelled in each 2 s during t = 0 to t = 6 seconds of the journey is :
    a) 1 : 4 : 9 b) 1 : 2 : 4 c) 1 : 3 : 5 d) 1 : 2 : 3
18. The acceleration due to gravity on the planet A is 9 times the acceleration due to gravity on planet B. A man jumps to a height of 2m on the surface of A. What is the height of jump by the same person on the planet B?
    a) 18 m b) 6 m c) $\frac{2}{3}m$ d) 219 m
19. The displacement of a particle is given by y = a + bt + ct^2 - dt^4. The initial velocity and acceleration are respectively:
    a) b, -4d b) -b,2c c) b,2c d) 2c,-4d
20. From the top of a tower, a particle is thrown vertically downwards with a velocity of 10 m/s The ratio of the distance, covered by it in the 3rd and 2nd second is (Take g = 10 m/s^2) :
    a) 5 : 7 b) 7: 5 c) 3 : 6 d) 6 : 3
21. The displacement of a particle, moving in a straight line, is given by s = 2t^2+2t+4 where s is in metres and t in seconds. The acceleration of the particle is:
    a) 2m/s^2 b) 4 m/s^2 c) 6 m/s^2 d) 8 m/s^2
22. Which of the following is a one dimensional motion?
    a) Landing of an aircraft b) Earth revolving around the sun
    c) Motion of wheels of a moving train d) Train running on a straight track

23. A 150 m long train is moving with a uniform velocity of 45 km/h. The time taken by the train to cross a bridge of length 850 meters is :
    a) 56 sec b) 68 sec c) 80 sec d) 92 sec
24. A particle is constrained to move on a straight line path. It returns to the starting point after 10 sec. The total distance covered by the particle during this time is 30 m. Which of the following statements about the motion of the particle is false?
    a) Displacement of the particle is zero b) Average speed of the particle is 3 m/s
    c) Displacement of the particle is 30 m d) Both (a) and (b)
25. The relation $3t = \sqrt{3x} + 6$ describes the displacement of a particle in one direction where x is in metres and t in sec. The displacement, when velocity is zero, is :
    a) 24 metres b) 12 metres c) 5 metres d) Zero
26. A car moving with a speed of 40 km/h can be stopped by applying brakes after atleast 2 m. If the same car is moving with a speed of 80 km/h, what is the minimum stopping distance?
    a) 8 m b) 2 m c) 4 m d) 6 m
27. The position x of a particle varies with time t as $x = at^2 - bt^3$. The acceleration of the particle will be zero at time t equal to :
    a) $\frac{a}{b}$ b) $\frac{2a}{3b}$ c) $\frac{a}{3b}$ d) Zero
28. A particle experiences a constant acceleration for 20 sec after starting from rest. If it travels a distance S_1 in the first 10 see and a distance S_2 in the next 10 sec, then
    a) $S_1 = S_2$ b) $S1 = \frac{S_2}{3}$ c) $S1 = \frac{S_2}{2}$ d) $S1 = \frac{S_2}{4}$
29. The coordinates of a moving particle at any time are given by $x = at^2$ and $y = at^2$. The speed of the particle at any moment is :
    a) 2t (a+b) b) $2t\sqrt{a^2 - b^2}$ c) $t\sqrt{a^2 - b^2}$ d) $2t\sqrt{a^2 - b^2}$
30. If a car at rest accelerates uniformly to a speed of 144km/h in 20 s. Then it covers a distance of
    a) 20 m b) 400 m c) 1440 m d) 2880 m
31. A truck and a car are moving with equal velocity. On applying the brakes both will stop after certain distance, then
    a) Truck will cover less distance before rest b) Car will cover less distance before rest
    c) Both will cover equal distance d) None
32. A ball is dropped on the floor from a height of 10m. It rebounds to a height of 2.5 m. If the ball is in contact with the floor for 0.01 sec, the average acceleration during contact is :
    a) 2100 $\frac{m}{sec^2}$ downwards b) 2100 $\frac{m}{sec^2}$ upwards c) 1400 $\frac{m}{sec^2}$ d) 700 $\frac{m}{sec^2}$
33. A stone dropped from the top of the tower touches the ground in 2 sec. The height of the tower is about:
    a) 25 m b) 40 m c) 20 m d) 160 m
34. A body dropped from a height h with an initial speed zero, strikes the ground with a velocity 3 km/h. Another body of .same mass is dropped from the same height h with an initial speed -u = 4 km/h. Find the final velocity of second body with which it strikes the ground:
    a) 3 km/h b) 4 km/h c) 5 km/h d) 12 km/h

35. Water drops fall at regular intervals from a tap which is 5m above the ground. The third drop is leaving the tap at the instant the first drop touches the ground. How far above the ground is the second drop at that instant:
    a) 2.50 m b) 3.75 m c) 4.00 m d) 1.25 m
36. Three different objects of mass m_1, m_2, m_3 are allowed to fall from rest and from the same point O along three different frictionless paths. The speeds of the three objects on reaching the ground will be in the ratio of :
    a) $m_1 : m : m_3$ b) $m_1 : 2m_2 : m_3$ c) 1 : 1 : 1 d) $\frac{1}{m_1} : \frac{1}{m_2} : \frac{1}{m_3}$
37. A particle moves along a straight line such that its displacement at any time 't' is given by s = $(t^3 - 6t^2+3t+4)$ meters. The velocity when the acceleration is zero is :
    a) 3 m/s b) - 12 m/s c) 42 m/s d) -9 m/s
38. A body starts from rest. What is the ratio of the distance travelled by the body during the 4^{th} and 3^{rd} second.
    a) 7/5 b) 5/7 c) 7/3 d) 3/7
39. A train of 150 meter long is going towards north direction at speed of 10m/s. A parrot flies at the speed of 5m/s towards south direction parallel to the railway track. The time taken by the parrot to cross the train is :
    a) 12 sec b) 8 sec c) 15 sec d) 10 sec
40. A bus travelling the first one third distance at a speed of 10 km/h, the next one third at 20 km/h and the last one-third at 60 km/h. The average speed of the bus is:
    a) 9 km/h b) 16 km/h c) 18 km/h d) 48 km/h
41. The displacement-time graph for two particles A and B are straight lines inclined at angles of 30^0 and 600 with the time axis. The ratio of velocities 60^0 with the time axis. The ratio of velocities of $u_A : u_B$ is :
    a) 1 : 2 b) 1 : $\sqrt{3}$ c) $\sqrt{3}$: 1 d) 1 : 3
42. An athlete completes one round of a circular track of radius R in 40 sec. What will be his displacement at the end of 2 min. 20 sec?
    a) Zero b) 2R c) 2πT d) 7πR
43. A body is released from a great height and falls freely towards the earth. Another body is released from the same height exactly one second later. The separation between the two bodies, two seconds after the release of me second body is :
    a) 4.9 m b) 9.8 m c) 19.6 m d) 24.5 m
44. A car moving on a horizontal road may be thrown out of the road in taking a turn :
    a) By the gravitational force b) Due to lack of sufficient centripetal force
    c) Due to rolling frictional force between tyre and road d) Due to the reaction of the ground
45. Certain neutron stars are believed to be rotating at about 1 rev/sec. If such a star has a radius of 20km, the acceleration of an object on the equator of the star will be :
    a) 20 x 10^8 m/sec^2 b) 8 x 10^5 m/sec^2 c) 120 x 10^5 m/sec^2 d) 4 x 10^8 m/sec^2
46. A particle P is moving in a circle of radius 'a' with a uniform speed u. C is the centre of the circle and AB is a diameter. When passing through B the angular velocity of P about A and C are in the ratio :
    a) 1 : 1 b) 1 : 2 c) 2 : 1 d) 4 : 1

47. A cyclist taking turn bends inwards while a car passenger taking same turn is thrown outwards. The reason is :
    a) Car is heavier than cycle b) Car has four wheels while cycle has only two
    c) Difference in the speed of the two
    d)
    Cyclist has to counteract the centrifugal force while in the case of car only the passenger is thrown by this force

48. The relation between time t and distance x is $t = \alpha x^2 + \beta x$, where α and β are constants. The retardation is (v is the velocity) :
    a) $2\alpha\beta v^3$ b) $2\beta^2 v^3$ c) $2\alpha v^3$ d) $2\beta v^3$

49. An electron starting from rest has a velocity that increases linearly with the time that is $\upsilon = kt$, where k=2 m/sec^2. The distance travelled in the first 3 seconds will be :
    a) 9 m b) 16 m c) 27 m d) 36 m

50. A point moves with uniform acceleration and υ_1 , υ_2 and υ_3 denote the average velocities in the three successive intervals of time t_1, t_2, and t_3. Which of the following relations is correct?
    a) $(\upsilon_1-\upsilon_2) : (\upsilon 2 - \upsilon 3) = (t_1-t_2) : (t_2+t_3)$ b) $(\upsilon_1-\upsilon_2) : (\upsilon 2 - \upsilon 3) = (t_1+t_2) : (t_2+t_3)$
    c) $(\upsilon_1-\upsilon_2) : (\upsilon 2 - \upsilon 3) = (t_1-t_2) : (t_1 t_3)$ d) $(\upsilon_1-\upsilon_2) : (\upsilon 2 - \upsilon 3) = (t_1-t_2) : (t_2-t_3)$

51. The initial velocity of a particle is u (at t = 0) and the acceleration is given by at. Which of the following relation is valid:
    a) $\upsilon = u + at^2$ b) $\upsilon = u + at^2/2$ c) $\upsilon = u + at$ d) $\upsilon = u$

52. An object is projected upwards with a velocity of 100 m/s. It will strike the ground after (approximately)
    a) 10 s b) 20 s c) 15 s d) 5 s

53. Tworacing cars of masses m_1 and m_2 are moving in circles of radii r_l and r_2 respectively. Their speeds are such that each makes a complete circle in the same duration of time t. The ratio of the angular speed of the first to the second car is :
    a) $m_1 : m_2$ b) $r_1 : r_2$ c) 1 : 1 d) $m_1 r_1 : m_2 r_2$

54. Body of mass m is moving in a circle of radius r with a constant speed υ. The force on the body is $\frac{mv^2}{r}$ and is directed towards the centre. What is the work done by this force in moving the body over half the circumference of the circle :
    a) $\frac{mv^2}{\pi r}$ b) Zero c) $\frac{mv^2}{r^2}$ d) $\frac{\pi r^2}{mv^2}$

55. A stone of mass m is tied to a string of length 1and rotated in a circle with a constant speed υ. If the string is released, the stone flies:
    a) Radially outward b) Radially inward c) Tangentially outward
    d) With an acceleration $\frac{mv^2}{l}$

56. A motor cyclist going round in a circular track at constant speed has :
    a) Constant linear velocity b) Constant acceleration c) Constant angular velocity
    d) Constant force

57. The initial velocity of the particle is 10 m/sec and its retardation is $\frac{1}{5}$ x g. The distance moved by particle in 5th second of its motion is :
    a) 1 m b) 19 m c) 50 m d) 75 m

58. The displacement x of a particle along a straight line at time t is given by $x = a_0 + a_1t + a_2t^2$ .The acceleration of the particle is :
    a) a_o b) a_1 c) $2a_2$ d) a_2
59. Two bodies of different masses m_a and m_b are dropped from two different heights a and b. The ratio of the time taken by the two to cover these distances are :
    a) a : b b) b : a c) $\sqrt{a} : \sqrt{b}$ d) $a^2 : b^2$
60. A stone is just released from the window of a train moving along a horizontal straight track. The stone will hit the ground following a :
    a) Straight path b) Circular path c) Parabolic path d) Hyperbolic path
61. A toy car with charge q moves on a frictionless horizontal plane surface under the influence of a uniform electric field E. Due to the force qE, its velocity increases from 0 to 6 m/s in one second duration. At that instant the direction of the field is reversed. The car continues to move for two more seconds under the influence of this field. The average velocity and the average speed of the toy car between 0 to 3 seconds are respectively.
    a) 2 m/s, 4 m/s b) 1m/s, 3 m/s c) 1 m/s, 3.5m/s d) 1.5m/s, 3 m/s
62. Preeti reached the metro station and found that the escalator was not working. She walked up the stationary escalator in time t_1. On other days, if she remains stationary on the moving escalator, then the escalator takes her up in time t_2. The time taken by her to walk up on the moving escalator will be:
    a) $\frac{t_1+t_2}{2}$ b) $\frac{t_1t_2}{t_1-t_2}$ c) $\frac{t_1t_2}{t_1+t_2}$ d) t_1-t_2
63. Particle moves so that its position vector is given by vector $\vec{r}$ =cosω t $\hat{x}$ +sin ω t$\hat{y}$ where ω is a constant. Which of the following is true?
    a) Velocity is perpendicular to vector rand acceleration is directed towards the origin.
    b) Velocity is perpendicular to vector rand acceleration is directed away from the origin.
    c) Velocity and acceleration both are perpendicular to vector r
    d) Velocity and acceleration both are parallel to vector r
64. A ship A is moving westward with a speed of 10 km/h and a ship B 100 km south of A, is moving northwards with a speed of 10 km/h. The time after which the distance between them becomes shortest is:
    a) $10\sqrt{2}$ h b) 0 h c) 5 h d) 5 $\sqrt{2}$ h
65. A projectile is fired from the surface of the earth with a velocity of 5 m/s and angle 9 with the horizontal. Another projectile fired from another planet with a velocity of 3 m/s at the same angle follows a trajectory which is identical with the trajectory of the projectile fired from the earth. The value of the acceleration due to gravity on the planet is (in m/sz) (given g = 9.8 m/sz)
    a) 3.5 b) 5.9 c) 16.3 d) 110.8
66. A projectile is fired at an angle of 45° with the horizontal. Elevation angle of the projectile at its highest point as seen from the point of projection is:
    a) 60° b) $\tan^{-1}\frac{1}{2}$ c) tan-1 $\frac{\sqrt{3}}{2}$ d) 45°
67. A particle has initial velocity and acceleration $2\hat{i} + 4\hat{j}$ and $0.4\hat{i} + 3\hat{j}$ respectively. Its speed after 10 s is:
    a) 7 unit b) 7 $\sqrt{2}$ unit c) 8.5 unit d) 10 unit

68. A ball is dropped from a high rise platform at t=0 starting from rest. After 6 seconds another ball is thrown downwards from the same platform with a speed v. The two balls meet at t=18s. What is the value of v? (g=10m/s^2)
    a) 75 m/s b) 55 m/s c) 40 m/s d) 60 m/s

69. If a vector $2\hat{i} + 3\hat{j} + 8\hat{k}$ is perpendicular to the vector $4\hat{i} + 4\hat{j} + \alpha\hat{k}$. Then the value of l is :
    a) -1 b) 1/2 c) -1/2 d) 1

70. The angle between the vectors A and B is 9. The value of the triple product A.(BxA) is :
    a) A^2B b) Zero c) $A^2B \sin\theta$ d) $A^2B \cos\theta$

71. Astone ties·to the end of a string 1mlong is whirled in a horizontal circle with a constant speed. If the stone makes 22 revolutions in 44 seconds, what is the magnitude and direction of acceleration of the stone :
    a) π^2/4ms^{-2} and direction along the radius towards the centre
    b) π^2ms^{-2} and direction along the radius away from the centre
    c) π^2ms^{-2} and direction along the radius towards the centre
    d) π^2ms^{-2} and direction along the tangent to the circle

72. If a_r and a_t represent radial and tangential accelerations, the motion of a particle will be uniformly circular if:
    a) a_r=0 and a_t=0 b) a_r=0 but a_t≠0 c) a_r≠0 but a_t=0 d) a_r≠0 and a_t≠0

73. The vector sum of two forces is perpendicular to their vector differences. In that case, the forces
    a) Are equal to each other in magnitude b) Are not equal to each other in magnitude
    c) Cannot be predicted d) Are equal to each other

74. One car moving on a straight road covers one third of the distance with 20 km/hr and the rest with 60 km/hr. The average speed is :
    a) 40 km/hr b) 8 0km/hr c) $46\frac{2}{3}$ km/hr d) 36 km/hr

75. A boat crosses a river with a velocity of 8 km/h. If the resulting velocity of boat is 10 km/h then the velocity of river water is :
    a) 4 km/h b) 6 km/h c) 8 km/h d) 10 km/h

76. Two particles of mass M and m are moving in a circle of radii Rand T. If their time-periods are same, what will be the ratio of their linear velocities?
    a) MR: mr b) M: m c) R: r d) 1 : 1

77. If $|\vec{A} + \vec{B}| = |\vec{A}| + |\vec{B}|$ then angle between $\vec{A}$ and $\vec{B}$ will be:
    a) 90° b) 120° c) 0° d) 60°

78. What is the value of linear velocity, if $\vec{\omega} = 3\hat{i} - 2\hat{j} + 3\hat{k}$ and $\vec{r} = 5\hat{i} - 6\hat{j} + 6\hat{k}$
    a) $6\hat{i} - 2\hat{j} + 3\hat{k}$ b) $4\hat{i} - 13\hat{j} + 6\hat{k}$ c) $4\hat{i} - 13\hat{j} + 6\hat{k}$ d) $-18\hat{i} - 13\hat{j} + 2\hat{k}$

79. Two bodies of mass 10 kg and S kg moving in concentric orbits of radii Rand r such that their periods are the same. Then the ratio between their centripetal acceleration is :
    a) $\frac{R}{r}$ b) $\frac{r}{R}$ c) $\frac{R^2}{r^2}$ d) $\frac{r^2}{R^2}$

80. A particle moves with a velocity $6\hat{i} - 4\hat{j} + 3\hat{k}$ m/s under the influence of a constant force $\vec{F} = 20\hat{i} + 15\hat{j} - 5\hat{k}$. The instantaneous power applied to the particle is :
a) 35 J/s b) 45 J/s c) 25 J/s d) 195 J/s

81. The maximum speed of a car on a road turn of radius 30 m, if the coefficient of friction between the tyres and the road is 0.4, will be :
a) 10.84m/sec b) 9.84m/sec c) 8.84m/sec d) 6.84m/sec

82. If a unit vectoris represented by 0.5$\hat{i}$ + 0.8$\hat{j}$ + c$\hat{k}$ then the value of 'c' is :
a) 1 b) $\sqrt{0.11}$ c) $\sqrt{0.01}$ d) $\sqrt{0.39}$

83. Aperson aiming to reach the exactly opposite point on the bank of a stream is swimming with a speed of 0.5m/s at an angle of 120° with the direction of flow of water. The speed of water in the stream is :
a) 1 m/s b) 0.4 m/s c) 0.25 m/s d) 0.433 m/s

84. A 500kg car takes a round turn of radius 50m with a velocity of 36 km/hr. The centripetal force is :
a) 250 N b) 750 N c) 1000 N d) 1200 N

85. Aboat is moving with a velocity 3$\hat{i}$ +4$\hat{j}$ with respect to ground. The water in the river is moving with a velocity 3$\hat{i}$ +4$\hat{j}$ with respect to ground. The relative velocity of the boat with respect to water is:
a) 8$\hat{j}$ b) 6$\hat{i}$-8$\hat{j}$ c) 6$\hat{i}$+8$\hat{j}$ d) $5\sqrt{2}$

86. A particle is moving in a horizontal circle with constant speed. It has constant:
a) Velocity b) Acceleration c) Kinetic energy d) Displacement

87. The magnitude of vector A, B and C are respectively 12, 5 and 13 units and A + B = C, then the angle between A and B is :
a) 0 b) π c) π/2 d) π/4

88. A bullet is fired from a canon with velocity 500 m/s. If the angle of projection is 15°andg =10 m/s^2. Then the range is :
a) 25 x 10^{3}m b) 12.5 X 10^{3}m c) 50 X 10^{2}m d) 25 x 10^{2}m

89. An airplane is flying horizontally with a velocity of 600 km/h at a height of 1960 m. When it is vertically at a point A on the ground, a bomb is released from it. The bomb strikes the ground at point B. The distance AB is :
a) 1200 m b) 0.33 km c) 3.33 km d) 33 km

90. A particle moves in a circular orbit under the action of a central attractive force inversely proportional to the distance 'r'. The speed of the particle is:
a) Proportional to r^2 b) Independent of r c) Proportional to r d) Proportional to 1/ r

91. The torque of the force $\vec{F} = (2\hat{i} - 3\hat{j} + 4\hat{k})N$ acting at the point $\vec{r} = (3\hat{i} + 2\hat{j} + 3\hat{k})m$ about the origin be:
a) $6\hat{i} - 6\hat{j} + 12\hat{k}$ b) $17\hat{i} - 6\hat{j} - 13\hat{k}$ c) $-6\hat{i} + 6\hat{j} - 12\hat{k}$ d) $-17\hat{i} + 6\hat{j} + 13\hat{k}$

92. A particle of mass m is describing a circular path of radius r with uniform speed. If L is the angular momentum of the particle about the axis of the circle, the kinetic energy of the particle is given by:
a) L^2/mr^2 b) L^2/2mr^2 c) 2L^2/mr^2 d) mr^{2}L

93. If the sum of two unit vectors is a unit vector, then magnitude of difference is :
    a) $\sqrt{2}$ b) $\sqrt{3}$ c) $1\sqrt{2}$ d) $\sqrt{5}$
94. A body is whirled in a horizontal circle of radius 20 cm. It has angular velocity of 10 rad/s. What is its linear velocity at any point on circular path :
    a) 10 m/s b) 2 m/s c) 20 m/s d) 0.2 m/s
95. A boy aims a gun at a bird from a point, at a horizontal distance of 100m. If the gun can impart a velocity of 500 m/s to the bullet At what height above the bird must he aim his gun in order to hit it (take g = 10m/s^2)
    a) 20 cm b) 10 cm c) 50 cm d) 100 cm
96. The position vector of a particle is $\vec{r} = (a\ cos\ \omega\ t)\hat{i} + (a\ sin\ \omega\ t)\hat{j}$. The velocity of the particle is:
    a) Parallel to the position vector b) Perpendicular to the position vector
    c) Directed towards the origin d) Directed away from the origin
97. Five equal forces of 10 N each are applied at one point and all are lying in one plane. If the angles between them are equal, the resultant force will be:
    a) zero b) 10 N c) 20 N d) $10\sqrt{2}$ N
98. When a body moves with a constant speed along a circle:
    a) No work is done on it b) No acceleration is produced in the body
    c) No force acts on the body d) Its velocity remains constant
99. A sphere of mass m is tied to end of a string of length 1 and rotated through the other end along a horizontal circular path with speed v. The work done in full horizontal circle is :
    a) 0 b) $\left(\frac{mv^2}{l}\right).2\pi l$ c) mg.2πl d) $\left(\frac{mv^2}{l}\right).(l)$
100. Given vector $\vec{A} = 2\hat{i} + 3\hat{j}$ the angle between $\vec{A}$ and y-axis is:
    a) sin$^{-1}\frac{2}{3}$ b) cos$^{-1}\frac{2}{3}$ c) tan$^{-1}\frac{3}{2}$ d) tan$^{-1}\frac{2}{3}$
101. Forces F_1 and F_2 act on a point mass in two mutually perpendicular directions. The resultant force on the point mass will be:
    a) F_1+F_2 b) F_1-F_2 c) $\sqrt{F_1^2 + F_2^2}$ d) $F_1^2 + F_2^2$
102. Two forces, each of magnitude F have a resultant of the same magnitude F. The angle between the two forces is :
    a) 45^o b) 120^o c) 150^o d) 60^o
103. If $|V_1+V_2| = |V_1 - V_2|$ and V_2 is finite, then:
    a) V_1 is parallel to V_2 b) $V_1=V_2$ c) $V_1$and V_2 are mutually perpendicular d) $|V_1|=|V_2|$
104. A motor cyclist moving with a velocity of 72 km/ hour on a flat road takes a turn on the road at a point where the radius of curvature of the road is 20 meters. The acceleration due to gravity is 10 m/sec^2. In order to avoid skidding, he must not bend with respect to the vertical plane by an angle greater than:
    a) θ=tan^{-1}6 b) θ=tan^{-1}2 c) θ=tan^{-1}25.92 d) θ=tan^{-1}4
105. Following sets of three forces act on a body. Whose resultant cannot be zero?
    a) 10,10,10 b) 10,10,20 c) 10,20,23 d) 10,20,40

106. Two vectors $\vec{A}$ and $\vec{B}$ lie in a plane, another vector $\vec{C}$ lies outside this plane, then the resultant of these three vectors i.e., $\vec{A}+\vec{B}+\vec{C}$.
a) Can be zero b) Cannot be zero c) Lies in the plane containing $\vec{A}+\vec{B}$
d) Lies in the plane containing $\vec{C}$

107. A particle is simultaneously acted by two forces equal to 4 N and 3 N. The net force on the particle is:
a) 7 N b) 5 N c) 1 N d) Between 1 N and 7 N

108. Component of a vector is:
a) always less than its magnitude b) always greater than its magnitude
c) always equal to its magnitude d) none of the above

109. Which of the following is a scalar quantity?
a) Work b) Displacement c) Velocity d) Acceleration

110. Which of the following is a vector quantity?
a) Temperature b) Surface tension c) Calorie d) Force

111. If $\vec{A}\times\vec{B}=\vec{B}\times\vec{A}$ then the angle between $\vec{A}$ and $\vec{B}$ is:
a) π b) $\pi/3$ c) $\pi/2$ d) $\pi/4$

112. A body is projected with a velocity $\vec{v}=(3\hat{i}+4\hat{j})$ m/s. The maximum height attained by the body is:(g = 10m/s ^{2})
a) 0.8 m b) 8 m c) 80 m d) 800 m

113. A physical quantity which has a direction:
a) must be a vector b) may be a vector c) may be both scalar and vector
d) none of the above

114. Which of the following physical quantities are represented by axial vectors?
a) Displacement b) Force c) Velocity d) Torque

115. Which of the following physical quantities are represented by polar vectors?
a) Displacement b) Angular velocity c) Angular momentum d) Torque

116. The flight of a bird can be an example of:
a) dot product of vectors b) cross product of vectors c) composition of vectors
d) triangle law of vector addition

117. Which of the following operations make no sense in case of scalars and vectors?
a) Multiplying any vector by a scalar b) Adding a component of vector to the same vector
c) Multiplying any two scalars d) Adding a scalar to a vector of the same dimensions

118. The minimum number of vectors of equal magnitude required to produce a zero resultant is:
a) 2 b) 3 c) 4 d) more than 4

119. What is the maximum number of components into which a vector can be split?
a) 2 b) 3 c) 4 d) Infinite

120. What is the maximum number of rectangular components into which a vector can be split in space?
a) 2 b) 3 c) 4 d) Infinite

121. What is the maximum number of rectangular components into which a vector can be split in its own plane?
a) 2 b) 3 c) 4 d) Infinite

122. The vector sum of the forces of 10 newton and 6 newton can be:
a) 2N b) 8N c) 18N d) 20N

123. Vector sum of two forces of 10 N and 6 N cannot be :
a) 4N b) 8N c) 12N d) 2N

124. Keeping the banking angle same, to increase the maximum speed with which a vehicle can travel on the curved road by 10%, the radius of curvature of the road has to be changed from 20 m to :
a) 16 m b) 18 m c) 24.2 m d) 30.5 m

125. The vectors $\vec{A}$ and $\vec{B}$ are such that $|\vec{A}+\vec{B}| = |\vec{A}-\vec{B}|$ then the angle between the two vectors $\vec{A}$ and $\vec{B}$ will be:
a) 0° b) 60° c) 90° d) 180°

126. The vectors $\vec{A}$ and $\vec{B}$ are such that $\vec{A}+\vec{B}=\vec{C}$ and $A^2+B^2 = C^2$. If θ is the angle between positive directions $\vec{A}$ and $\vec{B}$ then mark the correct alternative:
a) θ=0° b) $\theta=\frac{\pi}{2}$ c) $\theta=\frac{2\pi}{3}$ d) $\theta=\pi$

127. If $=\vec{A}=\vec{B}+\vec{C}$ and the magnitudes of $\vec{A},\vec{B}$ and $\vec{C}$ are 5, 4 and 3 units respectively, the angle between $\vec{A}$ and $\vec{C}$ is:
a) $\cos^{-1}\left(\frac{3}{5}\right)$ b) $\cos^{-1}\left(\frac{4}{5}\right)$ c) $\frac{\pi}{2}$ d) $\sin^{-1}\left(\frac{3}{4}\right)$

128. If $\vec{A}.\vec{B}=|\vec{A}\times\vec{B}|$ then angle e between vectors $\vec{A}$ and $\vec{B}$ is:
a) 0 b) $\frac{\pi}{4}$ c) $\frac{\pi}{2}$ d) π

129. If two numerically equal forces P and P acting at a point produce a resultant force of magnitude P itself, then the angle between the two original forces is:
a) 0° b) 60° c) 90° d) 120°

130. Angular momentum is:
a) axial vector b) polar vector c) scalar d) none of these

131. A force vector applied on a mass is represented as $\vec{F}=6\hat{i}-8\hat{j}+10\hat{k}$ and the mass accelerates with 1 m/s ^{2}. What will be the mass of the body?
a) $10\sqrt{2}$kg b) $2\sqrt{10}$kg c) 10kg d) 20kg

132. Find the torque of a force $\vec{F}=-3\hat{i}+\hat{j}+5\hat{k}$ acting at the point $\vec{r}=7\hat{i}+3\hat{j}+\hat{k}$:
a) $14\hat{i}-38\hat{j}+1\hat{6}k$ b) $4\hat{i}+4\hat{j}+6\hat{k}$ c) $-14\hat{i}+38\hat{j}-1\hat{6}k$ d) $-21\hat{i}+3\hat{j}+5\hat{k}$

133. Let $\vec{A}$ = $\hat{i}\,Acos\theta+\hat{j}Asin\theta,$ be any vector. Another vector $\vec{B}$ which is normal to $\vec{A}$ is:
a) $\hat{i}\mathrm{B}\cos\theta+\hat{j}\mathrm{B}\sin\theta$ b) $\hat{i}\mathrm{B}\sin\theta+\hat{j}\mathrm{B}\cos\theta$ c) $\hat{i}\mathrm{B}\sin\theta-\hat{j}\mathrm{B}\cos\theta$ d) $\hat{i}\mathrm{A}\cos\theta-\hat{j}\mathrm{A}\sin\theta$

134. The magnitudes of vectors $\vec{A},\vec{B}$ and $\vec{C}$ are respectively 12 5 and 13 units and $\vec{A}+\vec{B}$ = $\vec{C}$, then the angle between $\vec{A}$ and $\vec{B}$ is:
a) 0 b) π c) π d) $\frac{\pi}{4}$

135. The angle between two vectors $2\hat{i} + 3\hat{j} + \hat{k}$ and $-3\hat{i} + 6\hat{k}$ is :
a) 0° b) 45° c) 60° d) 90°

136. The sum of two forces acting at a point is 16 N. If the resultant force is 8 N and its direction is perpendicular to minimum force, then the forces are:
a) 6 N and 10 N b) 8 N and 8 N c) 4 N and 12 N d) 2 N and 14 N

137. If vectors $\vec{P}, \vec{Q}$ and $\vec{R}$ have agnitudes 5, 12 and 13 units and $\vec{P} + \vec{Q} = \vec{R}$, the angle between $\vec{Q}$ and $\vec{R}$ is:
a) $\cos^{-1}$ (5/12) b) $\cos^{-1}$ (5/13) c) $\cos^{-1}$ (12/13) d) $\cos^{-1}$ (2/13)

138. Which of the following does not depend on the choice of the co-ordinate system?
a) $\vec{P} + \vec{Q} + \vec{R}$ b) $(P_x + Q_x + R_x)\hat{i}$ c) $P_x\hat{i} + Q_y\hat{j} + R_z\hat{k}$ d) None of these

139. What is the component $3\hat{i} + 4\hat{j}$ along $\hat{i} + \hat{j}$?
a) $\frac{1}{2}(\hat{i} + \hat{j})$ b) $\frac{3}{2}(\hat{i} + \hat{j})$ c) $\frac{5}{2}(\hat{i} + \hat{j})$ d) $\frac{7}{2}(\hat{i} + \hat{j})$

140. What can be the angle between $\vec{P} + \vec{Q}$ and $\vec{P} - \vec{Q}$?
a) 0° only b) 90° only c) 180° only d) Between 0° and 180°

141. When the following three forces of 50 dyne, 30 dyne and 15 dyne act on a body, then the body is:
a) at rest b) moving with uniform velocity c) in equilibrium
d) moving with an acceleration

142. A particle is moving eastward with a velocity of 5 m/s. In 10 seconds, the velocity changes to 5 m/s northwards. The average acceleration in this time is:
a) $1/\frac{1}{\sqrt{2}}$ m/sec^2 (towards north-west) b) $1/\sqrt{2}$ m/sec^2 (towards north-east)
c) $1/\sqrt{2}$m/sec^2 (towards north-west) d) $\frac{1}{\sqrt{2}}$ m/sec^2 (towards north)

143. If $\vec{A} + \vec{B} = \vec{C}$ and A + B = C, then the angle between $\vec{A}$ and $\vec{B}$ is: If $\vec{A} + \vec{B} = \vec{C}$ and A + B = C, then the angle between $\vec{A}$ and $\vec{B}$ is:
a) 0 b) π/4 c) π/2 d) π

144. An aircraft executes a horizontal loop with a speed of 150 m/s with its wings banked at an angle of 12°. The radius of the loop is : (g= 10m/s^2)
a) 10.6 km b) 9.6 km c) 7.4 km d) 5.8 km

145. If the magnitude of sum of two vectors is equal to the magnitude of difference of the two vectors, the angle between these vectors is:
a) 0° b) 90° c) 45° d) 180°

146. $\vec{A} + \vec{B} = \vec{C}$ and A = B = C, then what should be the angle between $\vec{A}$ and $\vec{B}$?
a) 0 b) π/3 c) 2π/3 d) π

147. At what angle the two vectors of magnitudes (A + B) and (A - B) must act, so that the resultant is $\sqrt{A^2 + B^2}$?
a) $cos^{-1}\frac{A^2-B^2}{A^2+B^2}$ b) $cos^{-1}\frac{A^2+B^2}{B^2-A^2}$ c) $cos^{-1}\frac{A^2-B^2}{2(A^2+B^2)}$ d) $cos^{-1}\frac{A^2+B^2}{2(B^2-A^2)}$

148. Resultant of two vectors $\vec{A}$ and $\vec{B}$ is inclined at 45° to either of them. What is the magnitude of resultant?

a) A+B b) A-B c) $\sqrt{A^2+B^2}$ d) $\sqrt{A^2-B^2}$

149. Given that $\vec{A}+\vec{B}+\vec{C}=0$ .Which of the following options is correct?

a) $|\vec{A}|+|\vec{B}|=\vec{C}$ b) $|\vec{A}+\vec{B}|=\vec{C}$ c) $|\vec{A}|-|\vec{B}|=\vec{C}$ d) $|\vec{A}-\vec{B}|=\vec{C}$

150. If $\vec{A}\times\vec{B}$ =0 and $\vec{A}.\vec{B}$ = - AB, then angle between $\vec{A}$ and $\vec{B}$ is:

a) zero b) π/4 c) π/2 d) π