Ravi Maths Tuition Centre

Time : 1 Mins **LAWS Of MOTION 2 1** **Marks : 1596**

1. A ball of mass 150 g starts moving at 20 ms^{-l} and is hit by a force which acts on it for 0.1 seconds. Then, the impulsive force is:
   a) 75 N b) 300 N c) 3 N d) 30 N
2. Three concurrent co-planar forces 1 N, 2 N and 3 N acting along different directions on a body
   a) can keep the body in equilibrium if 2 N and 3 N act at right angle.
   b) can keep the body in equilibrium if 1 N and 2 N act at right angle
   c) cannot keep the body in equilibrium.
   d) can keep the body in equilibrium if 1 N and 3 N act at an acute angle.
3. A body of weight 200 N is placed on a rough horizontal plane. If the coefficient of friction between the body and the horizontal plane is 0.3, determine the horizontal force required to just slide the body on the plane.
   a) 75 N b) 84 N c) 60 N d) 55 N
4. (A) The division of a vector by another vector is not defined.
   (R) The division of a vector by a direction is not possible.
   a) If both assertion and reason are true and reason is the correct explanation of assertion.
   b)
   If both assertion and reason are true but reason is not the correct explanation of assertion.
   c) If assertion is true but reason is false. d) If both assertion and reason are false.
   e) If assertion is false but reason is true.
5. (A) In case of rolling without sliding, friction force can act in forward and backward direction both.
   (R) The angular momentum of a system will be conserved only about that point about which external angular impulse is zero.
   a) If both assertion and reason are true and reason is the correct explanation of assertion.
   b)
   If both assertion and reason are true but reason is not the correct explanation of assertion.
   c) If assertion is true but reason is false. d) If both assertion and reason are false.
   e) If assertion is false but reason is true.
6. A stone of mass 1 kg is tied to the end of 1m long string and is whirled in a vertical circle. The velocity of stone at the bottom of the circle is just sufficient to take it to the top of the circle without slackening the string. What is the tension in the string at the top of the circle? (Take g = 10m s^{-2})
   a) Zero b) 1 N c) $\sqrt{10}$ N d) 10 N
7. When a wheel rolls on a surface, the resistance offered by the surface, i.e.,rolling friction:

a) is greater than kinetic friction b) is equal to the kinetic friction
c) is negligible in comparison to kinetic friction d) none of the above

8. (A) The centre of mass of body may lie where there is no mass.
(R) Centre of mass of a body is a point, where the whole mass of the body is supposed to be concentrated.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

9. When a stone is rotated with uniform speed in horizontal plane by means ofa string the magnitude of the momentum is fixed but its direction changes. A force is needed to cause this change in momentum vector this force is provided by :
a) gravity b) our hand through the string c) both gravity and our hand through the string
d) none of the above

10. A block of mass M is held against a rough vertical wall by pressing it with a finger. If the coefficient of friction between the block and the wall is μ and the acceleration due to gravity is g, what is the minimum force required to be applied by the finger to hold the block against the wall?
a) μMg b) Mg c) $\frac{Mg}{\mu}$ d) 2μMg

11. (A) To cross the river in minimum time, swimmer should swim in perpendicular direction to the water current.
(R) Because in this case river flow helps to cross the river.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

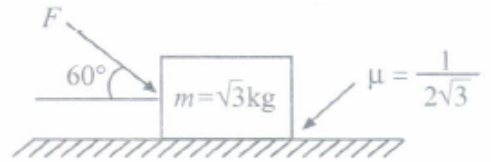
12. A rope of length 10 m and linear density of 0.5 kg/m is lying lengthwise on a smooth horizontal floor. It is pulled by a force of 25 N. The tension in the rope at a point 8 m away from the point of application is:
a) 20 N b) 15 N c) 10 N d) 5 N

13. A trolley T of mass 5 kg on a horizontal smooth surface is pulled by a load of 2 kg through a uniform rope ABC of length 2 m and mass 1 kg. As the load falls from BC = 0 to BC = 2m, its acceleration (in m/s^2) changes from:
a) $\frac{20}{6}$ to $\frac{30}{5}$ b) $\frac{20}{8}$ to $\frac{30}{8}$ c) $\frac{20}{5}$ to $\frac{30}{6}$ d) None of these

14. Two bodies of mass I kg and 3 kg have position vectors $\hat{i} + 2\hat{j} + \hat{k}$ and $-3\hat{j} - 2\hat{j} + \hat{k}$ respectively. The centre of mass of this system has a position vector:
a) $-2\hat{i} - \hat{j} + \hat{k}$ b) $2\hat{i} - \hat{j} + 2\hat{k}$ c) $\hat{i} + \hat{j} + \hat{k}$ d) $-2\hat{i} + 2\hat{k}$

15. Which one of the following cannot be explained on the basis of Newton's third law of motion?
a) Rowing of a boat in a pond b) Motion of jet in the sky
c) Rebounding of a ball from a wall d) Returning back of body, thrown above

16. What is the maximum value of the force F such that the block shown in the arrangement, does not move?



a) 20 N b) 10 N c) 12 N d) 15 N

17. From a disc of radius R and mass M, a circular hole of diameter R, whose rim passes through the centre is cut. What is the moment of inertia of the remaining part of the disc about a perpendicular axis, passing through the centre?
a) 15 $MR^2/32$ b) 13$MR^2/32$ c) 11$MR^2/32$ d) 9$MR^2/32$

18. The slope of the smooth banked horizontal road is p. If the radius of the curve be r, the maximum velocity with which a car can negotiate the curve is given by:
a) prg b) $\sqrt{prg}$ c) p/rg d) $\sqrt{p/rg}$

19. The moment of inertia of a cylinder about its own axis is equal to its M.I. about an axis passing through its centre and perpendicular to its length. The ratio of length to radius is:
a) 1 : 2 b) $\sqrt{2}:1$ c) $1:\sqrt{2}$ d) $\sqrt{3}:1$

20. A wheel having moment of inertia 2 kg-m^2 about its vertical axis, rotates at the rate of 60 rpm about this axis. The torque which can stop the wheel's rotation in one minute would be:
a) $\frac{2\pi}{15}N-m$ b) $\frac{\pi}{12}N-m$ c) $\frac{\pi}{15}N-m$ d) $\frac{\pi}{18}N-m$

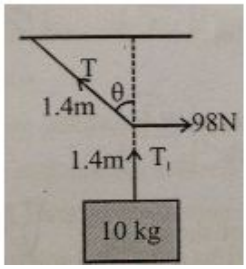
21. (A) A coin is placed on phonogram turn table. The motor is started, coin moves along the moving table.
(R) The rotating table is providing the necessary centripetal force to coin.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

22. (A) If $\vec{A}\times\vec{B}=\vec{A}\times\vec{C},\ \text{then}\ \vec{C}$ need not be equal to $\vec{B}$.
(R) The cross product of two vectors depend upon the angle between them.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

23. The position of a particle is given by $\vec{r}=\hat{i}+2\hat{j}-\hat{k}$ and its linear momentum is given by $\vec{p}=3\hat{i}+4\hat{j}-2\hat{k}$ Then its angular momentum about the origin is perpendicular to :
a) x-axis b) y-axis c) z-axis d) yz-plane

24. The speed of a homogeneous solid sphere after rolling down an inclined plane of vertical height h, from rest, without sliding is:
a) $\sqrt{gh}$ b) $\sqrt{(6/5)gh}$ c) $\sqrt{(4/3)gh}$ d) $\sqrt{(10/7)gh}$

25. A machine gun is mounted on a 2000 kg vehicle on a horizontal smooth road (friction negligible). The gun fires 10 bullets per see with a velocity of 500 m/s. If the mass of each bullet be 109, what is the acceleration produced in the vehicle?
    a) 50 m/s^2 b) 25 cm/s^2 c) 25 m/s^2 d) 50 cm/s^2
26. A particle is rotating with constant angular acceleration on a circular track. If its angular velocity changes from 20π rad/s to 40π rad/s in 10 s, what are the number of revolutions that the particle has completed during this time?
    a) 100 b) 150 c) 250 d) 1000
27. Assertion: A boiled egg can be easily distinguished from a raw unboiled egg by spinning.
    Reason : The hard boiled egg has a moment of inertia which is more than that of the raw egg.
    a) If both assertion and reason are true and reason is the correct explanation of assertion
    b) If both assertion and reason are true but reason is not the correct explanation of assertion
    c) If assertion is true but reason is false d) If both assertion and reason are false
28. The time taken by the particles for collision is:
    a) 3 sec b) $\sqrt{15}$ sec c) 4 sec d) 1 sec
29. A simple pendulum is suspended from the ceiling of a stationary elevator and its period of oscillation is T. The elevator is then set into motion and the new time period is found to be longer. Then, the elevator is:
    a) accelerated upward b) accelerated downward c) moving upward with uniform speed
    d) moving downward with uniform speed
30. Which one of the following motions- on a smooth plane surface does not involve force?
    a) Accelerated motion in a straight line b) Retarded motion in a straight line
    c) Motion with constant momentum along a straight line
    d) Motion along a straight line with varying velocity e) Motion in a circle with uniform speed
31. A disc is rolling on an inclined plane. What is the ratio of its rotational KE to the total KE?
    a) 1 : 3 b) 3 : 1 c) 1 : 2 d) 2 : 1
32. Identify the correct statement for the rotational motion of a rigid body.
    a) Individual particles of the body do not undergo an accelerated motion.
    b) The centre of mass of the body remains unchanged.
    c) The centre of mass of the body moves uniformly in a circular path.
    d) Individual particles and centre of mass of the body undergo an accelerated motion.
33. Two particles A and B are projected with same speed so that the ratio of their maximum heights reached in 3 : 1. If the speed of A is doubled without altering other parameters, the ratio ofthe horizontal ranges attained by A and B is:
    a) 1 : 1 b) 2 : 1 c) 4 : 1 d) 3 :2 e) 4 : 3
34. A mass of 10 kg is suspended by a rope of length 2.8 m from a ceiling. A force of 98 N is applied at the mid-point of the rope as shown in figure. The angle which the rope makes with the vertical in equilibrium is, tension T in the string is



a) 98 b) 98/tan θ c) 98 sin θ d) 98/cos θ

35. (A) The angular velocity of any point on a rigid body is same w.r.t. any other point on the rigid body.
(R) All points on a rigid body will rotate through same angle in same time.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion isfalse but reason is true.

36. A cord of negligible mass is wound round the rim of a flywheel of mass 20 kg and radius 20 cm. A steady pull of 25 N is applied on the cord. The work done by the pull when 2 m of the cord is unwound is
a) 20 J b) 215 J c) 45 J d) 50 J

37. (A) In projectile motion, the vertical velocity of the particle is continuously decreased during its ascending motion.
(B) In projectile motion near earth surface, downward constant acceleration is present in vertical direction.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

38. The term inertia was first used by
a) Newton b) Galileo c) Aristotle d) Kepler

39. If F denotes force and 't denotes torque, then the condition for equilibrium is:
a) $\sum F \neq 0, \sum t \neq 0$ b) $\sum F \neq 0, \sum t = 0$ c) $\sum F = 0, \sum t \neq 0$ d) $\sum F = 0, \sum t = 0$

40. A body is rolling without slipping on a horizontal surface and its rotational kinetic energy is equal to the translational kinetic energy. The body is:
a) disc b) sphere c) cylinder d) ring

41. Two particles P and Q initially at rest are I m apart. P has a mass of 0.1 kg and Q has a mass of 0.3 kg. P and Q attract each other with a constant force of 10^{-2} N. No external forces act on the system. At what distance from P' s original position do the particles collide?
a) 0.25m b) 0.75m c) 0.5m d) 0.8m

42. A diwali rocket is ejecting 50 g of gas/es at a velocity of 400 mls. The acceleration force on the rocket will be:
a) 22 dyne b) 20 N c) 20 dyne d) 100 N

43. Two bodies A and B have masses M and m respectively where M > m and they are at a distance d apart. Equal force is applied to each of them so that they approach each other. The position where they hit each other is:
    a) nearer to B b) nearer to A c) at equal distance from A and B d) cannot be decided

44. A stream of water flowing horizontally with a speed of 15 m S^{-1} gushes out of a tube of cross-sectional area 10^{-2} m^2, and hits a vertical wall normally. Assuming that it does not rebound from the wall, the force exerted on the wall by the impact of water is :
    a) 1.25 x 10^3 N b) 2.25 x 10^3 N c) 3.25 x 10^3 N d) 4.25 x 10^3 N

45. One hollow and one solid cylinder of the same outer radius rolls down on a smooth inclined plane. The foot of the inclined plane is reached by:
    a) solid cylinder earlier b) hollow cylinder earlier c) imultaneously
    d) the heavier earlier irrespective of being solid or hollow

46. When a solid sphere rolls without slipping down an inclined plane making an angle θ with the horizontal, the acceleration of its centre of mass is a. If the same sphere slides without friction, its acceleration a' will be

    a) $\frac{7}{2}a$ b) $\frac{5}{7}a$ c) $\frac{7}{5}a$ d) $\frac{5}{2}a$

47. A hockey player is moving northward and suddenly turns westward with the same speed to avoid an opponent. The force that acts on the player is :
    a) frictional force along westward. b) muscle force along southward
    c) frictional force along south-west. d) muscle force along south-west

48. Assertion: A rigid body not fixed in some way can have either pure translation or a combination of translation and rotation.
    Reason: In rotation about a fixed axis, every particle of the rigid body moves in a circle which lies in a plane perpendicular to the axis and has its centre on the axis
    a) If both assertion and reason are true and reason is the correct explanation of assertion
    b) If both assertion and reason are true but reason is not the correct explanation of assertion
    c) If assertion is true but reason is false d) If both assertion and reason are false

49. If the normal reactional force is doubled, the coefficient of friction is
    a) doubled b) halved c) not changed d) tripled

50. An object kept on a smooth inclined plane of 1 in 1 can be kept stationary relative to the incline by giving a horizontal acceleration to the inclined plane given by:
    a) g sin θ b) g cos θ c) g tan θ d) none of these

51. (A) Two teams having a tug-of-war always pull equally hard on one another.
    (R) The team, that pushes harder against the ground, in a tug-of-war, wins.
    a) If both assertion and reason are true and reason is the correct explanation of assertion.
    b)
    If both assertion and reason are true but reason is not the correct explanation of assertion.
    c) If assertion is true but reason is false. d) If both assertion and reason are false.
    e) If assertion is false but reason is true

52. (A) Angular momentum of a rigid body will remain conserved even when moment of inertia of body changes.
(R) Angular momentum of a rigid body does not depend upon moment of inertia of the rigid body.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

53. Two masses M_1 and M_2 are connected to the ends of a string passing over a smooth pulley. The tension in the string is T and the masses are moving with acceleration a. If the masses are interchanged, then:
a) both a and T will change b) a will change but will remain unchanged
c) T Will change but a will remian changed d) none of them will change

54. Assertion : If the head of a right handed screw rotates with the body, the screw advances in the direction of the angular velocity.
Reason: For rotation about a fixed axis, the angular velocity vector lies along the axis of rotation
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

55. Brakes stop a train in a certain distance. If the braking force is made one-fourth, the brakes will stop the train in a distance which is now:
a) half b) same c) double d) four times

56. A ball of mass 150 g moving with an acceleration 20 m/s^2 is hit by a force, which acts on it for 0.1 s. The impulsive force is _____
a) 0.5N-s b) 0.1N-s c) 0.3N-s d) 1.2N-s

57. The maximum static frictional force depends on:
a) area of surfaces in contact b) normal reaction c) direction of applied force
d) none of the above

58. (A) If the speed of a body is constant, the body cannot have a path other than a circular or straight line path.
(R) It is not possible for a body to have a constant speed in an accelerated motion.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

59. If the net external force acting on the system of particles is zero, then which of the following may vary?
a) Momentum of the system b) Kinetic energy of the system c) Velocity of centre of mass
d) Position of centre of mass

60. An iron block of sides 50 cm x 8 cm x 15 cm has to be pushed along the floor. The force required will be minimum when the surface in contact with ground is
    a) 8 cm x 15 cm surface b) 50 cm x 15 cm surface c) 8 cm x 50 cm surface
    d) force is same for all surfaces

61. (A) If polar ice melts, days will be shorter.
    (R) Moment of inertia decreases and thus angular velocity increases.
    a) If both assertion and reason are true and reason is the correct explanation of assertion.
    b)
    If both assertion and reason are true but reason is not the correct explanation of assertion.
    c) If assertion is true but reason is false. d) If both assertion and reason are false.

62. The direction of the angular velocity vector is along
    a) the tangent to the circular path b) the inward radius c) the outward radius
    d) the axis of rotation

63. A wet, open umbrella is held vertical and is twirled about the handle at a uniform rate of 21 revolutions in 44 second. If the rim of the umbrella is a circle of I metre in diameter and the height of the rim above the floor is 4.9 metre, then the angular speed of the umbrella is:
    a) 3 radian/sec b) 1.5 radian /sec c) 1 radian / sec d) $\sqrt{2.5}$ radian / sec

64. A body of mass I kg is rotating in a vertical circle of radius 1 m. What will be the difference in its kinetic energy at the top and bottom of the circle? (g = 10 ms $^{-2}$)
    a) 10 J b) 20 J c) 30 J d) 50 J

65. (A) If all particles of a system lie in a cube, the centre of mass would necessarily be in the cube.
    (R) For a uniform, symmetric body, the centre of mass is necessarily within the matter of the body.
    a) If both assertion and reason are true and reason is the correct explanation of assertion.
    b)
    If both assertion and reason are true but reason is not the correct explanation of assertion.
    c) If assertion is true but reason is false. d) If both assertion and reason are false.
    e) If assertion isfalse but reason is true.

66. Analogue of mass in rotational motion is
    a) moment of inertia b) torque c) radius of gyration d) angular momentum

67. A particle rests on the top of a hemisphere of radius R. Find the smallest horizontal velocity that must be imparted to the particle if it is to leave the hemisphere without sliding down it:
    a) $\sqrt{gR}$ b) $\sqrt{2gR}$ c) $\sqrt{3gR}$ d) $\sqrt{5gR}$

68. A cord is bound around the circumference of a wheel of diameter 0.3 m. The axis of the wheel is horizontal. A 0.5 kg mass is attached at the end of the cord and it is allowed to fall from rest. If the weight falls 15 m in 4 see, then the linear acceleration produced in the mass after 4 see is:
    a) 4.9 ms^{-2} b) 9.8 ms^{-2} c) 19.6 ms^{-2} d) 1.88 ms^{-2}

69. A solid cylinder has mass M, length L and radius R. The moment of inertia ofthis cylinder about a generator is:

a) $M\left(\frac{L^2}{12}+\frac{R^2}{4}\right)$ b) $\frac{ML^2}{4}$ c) $\frac{1}{2}MR^2$ d) $\frac{3}{2}MR^2$

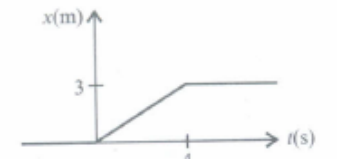
70. A man stands on a rotating platform with his arms stretched holding a 5 kg weight in each hand. The angular speed of the platform is 1.2 rev s^{-1}. The moment of inertia of the man together with the platform may be taken to be constant and equal to 6 kg m^2. If the man brings his arms close to his chest with the distance of each weight from the axis changing from 100 cm to 20 cm. The new angular speed of the platform is
a) 2 rev s^{-1} b) 3 rev s^{-1} c) 5 rev s^{-1} d) 6 rev s^{-1}

71. (A) Mass is the measure of inertia of a body in linear motion.
(R) Greater the mass, greater is the force required to change its state of rest or of uniform motion
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

72. In the first second of its flight, rocket ejects 1/60 of its mass with a velocity of 2400 ms^{-1} .The acceleration of the rocket is:
a) 19.6 ms^{-2} b) 30.2 ms^{-2} c) 40 ms^{-2} d) 49.8 ms^{-2}

73. Assertion: Friction opposes relative motion and thereby dissipates power in the form of heat.
Reason: Friction is always an undesirable force.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.

74. Figure shows the position-time graph of a particle of mass 4 kg. Let the force on the particle for t < 0, 0 < t < 4 s, t > 4 s be F_I, F_2 and F_3 respectively. Then



a) $F_1 = F_2 = F_3 = 0$ b) $F_1 > F_2 = F_3$ c) $F_1 > F_2 > F_3$ d) $F_1 < F_2 < F_3$

75. For traffic moving at 60 km/h along a circular track of radius 0.1 km, the correct angle of banking is:

a) $tan^{-1}\left(\frac{60^2}{0.1}\right)$ b) $tan^{-1}\left(\frac{(50/3)^2}{100\times 9.8}\right)$ c) $\tan^{-1}(60x0.1x\ 9.8)^{1/2}$ d) $tan^{-1}\left(\frac{100\times 9.8}{(50/3)^2}\right)$

76. A person in an elevator accelerating upwards with an acceleration of 2 m s^{-2}, tosses a coin vertically upwards with a speed of 20 m s^{-1}. After how much time will the coin fall back into his hand? (Take g=10 ms^{-2})
a) $\frac{5}{3}$ s b) $\frac{3}{10}$ s c) $\frac{10}{3}$ s d) $\frac{3}{5}$ s

77. A motor cyclist going round in a circular track at a constant speed has

a) constant linear velocity b) constant acceleration
c) acceleration of constant magnitude with its direction changing d) constant force

78. Two bodies have their moments of inertia I and 2I respectively about their axis of rotation. If their kinetic energies of rotation are equal, their angular momenta will be in the ratio :
a) 1:2 b) $\sqrt{2}:1$ c) $1:\sqrt{2}$ d) 2:1

79. A 1 kg stone at the end of 1 m long string is whirled in a vertical circle at constant speed of 4 m/sec. The tension in the string is 6 N when the stone is at: (Take g = 10 m/ sec^2)
a) top of the circle b) bottom of the circle c) halfway down d) none of these

80. (A) Inertia is the property by virtue of which the body is unable to change by itself the state of motion.
(R) The bodies do not change their state unless acted upon by an unbalanced external force
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true

81. When the angle of inclination of an inclined plane is 9, an object slides down with uniform velocity. If the same object is pushed up with an initial velocity u on the same inclined plane; it goes up the plane and stops at a certain distance on the plane. Thereafter, the body:
a) slides down the inclined plane and reaches the ground with velocity' u'
b) slides down the inclined plane and reaches the ground with velocity less than' u'
c) slides down the inclined plane and reaches the ground with velocity greater than' u'
d) stays at rest on the inclined plane and will not slide down.

82. A mass M is moving with a constant velocity parallel to x-axis. Its angular momentum w.r.t. origin
a) is zero b) remains constant c) goes on increasing d) goes on decreasing

83. An initial momentum is imparted to a homogeneous cylinder, as a result of which it begins to roll without slipping up an inclined plane at a speed ofvo = 4 m s^{-1} . The plane makes an angle θ = 30° with the horizontal. What height II will the cylinder rise to? (Take g = 10m s^{-2})
a) 0.8 m b) 1.2 m c) 1.0 m d) 1.6 m

84. A body is rolling on the ground with a velocity of 1 m/s. After travelling a distance of 5 m, the body stops. The coefficient of friction is:
a) 0.00102 b) 0.0102 c) 0.102 d) 1.02

85. (A) It is more difficult to open the door by applying the force near the hinge.
(R) Torque is maximum at hinge.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

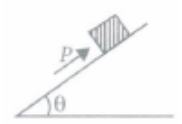
86. For a given angle of projection, if the time of flight of a projectile is doubled, the horizontal range will increase to:
a) four times b) thrice c) once d) twice

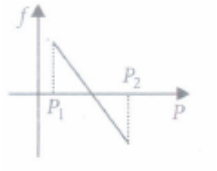
87. (A) A cyclist bends inwards from his vertical position, while turning to secure the necessary centripetal force.
(R) Friction force between the tyres and road provides him the necessary centripetal force.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

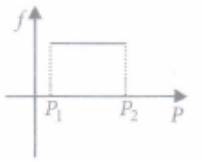
88. Three forces are acting on a particle of mass m initially in equilibrium. If the first 2 forces (R_1 and R_2) are perpendicular to each other and suddenly the third force (R_3) is removed, then the acceleration of the particle is:
a) $\frac{R_3}{m}$ b) $\frac{R_1+R_2}{m}$ c) $\frac{R_1-R_2}{m}$ d) $\frac{R_1}{m}$

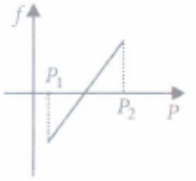
89. Two spheres of equal masses, one of which is a thin spherical shell and the other a solid, have the same moment of inertia about their respective diameters. The ratio of their radii will be:
a) 5 : 7 b) 3 : 5 c) $\sqrt{3}:\sqrt{5}$ d) $\sqrt{3}:\sqrt{7}$

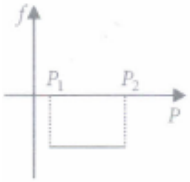
90. A block of mass m is on an incline plane of angle 8. The coefficient of friction between the block and the plane μ and tan θ > μ The block is held stationary by applying a force P parallel to the plane. The direction of force pointing up the plane is taken to be positive. As P is varied from P_1 = mg(sinθ - μcosθ) to P_2 = mg(sin + μcos), the frictional force f versus P graph will look like



a) 

b) 

c) 

d) 

91. (A) A body is moving along a straight line under a variable force, area under the force-time graph on the time axis will be the 'Impulse'.
(R) Impulse is the total change in linear momentum.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true

92. The total kinetic energy of a body of mass 10 kg and radius 0.5 m moving with a velocity of 2 m/s without slipping is 32.8 J. The radius of gyration of the body is:
a) 0.25 m b) 0.2 m c) 0.5 m d) 0.4 m

93. (A) The maximum horizontal range of projectile is proportional to square of velocity.
(R) The maximum horizontal range of projectile is equal to maximum height attained by projectile.

a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

94. What is moment of inertia in terms of angular momentum (L) and kinetic energy (K)?
a) $\frac{L^2}{K}$ b) $\frac{L^2}{2K}$ c) $\frac{L}{2K^2}$ d) $\frac{L}{2K}$

95. A boy presses a book against the front wall such that the book does not move. The force of friction between the wall and the book is:
a) towards right b) towards left c) downwards d) upwards

96. A car turns a comer on a slippery road at a constant speed of 12 rn/s. If the coefficient of friction is 0.4, the minimum radius of the arc (in metre) in which the car turns is:
a) 72 b) 36 c) 18 d) 9

97. Total angular momentum of a rotating body is conserve, if the net torque acting on the body is
a) zero b) maximum c) minimum d) unity

98. An ice cube is kept on an inclined plane of angle 30°. Coefficient of kinetic friction between the block and the inclined plane is $\left(1\sqrt{3}\right)$, What is the acceleration of block?
a) Zero b) 2 m/s^2 c) 1.5 m/s^2 d) 5 m/s^2

99. A rocket of mass 120 kg is fired in the gravity-free space. It ejects gases with velocity 600 m s^{-1} at the rate of 1 kg/so What will be the initial acceleration of the rocket? 80 percent of the mass of the rocket is fuel, what will be the acceleration of the rocket 100 seconds after the firing?
a) Zero b) 1 ms^{-2} c) 5 ms^{-2} d) 10 ms^{-2}

100. An aeroplane requires for take-off a speed of 81 kmlh, the run on ground being 100 m. The mass of aeroplane is 10,000 kg and coefficient of friction between the plane and the ground is 0.2. Assume that the plane accelerates uniformly during take-off. The minimum force required by engine of the plane for take-off is: (Take g = 10m s-^{2})
a) 4.53 N b) 4.53 x 10^4 N c) 4.53 x 10^2 N d) 4.53 x 10^6 N

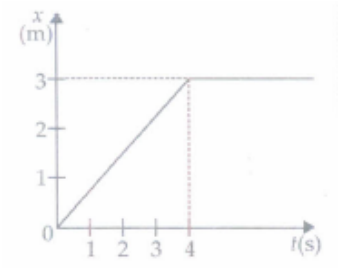
101. A projectile is fired from the surface of the earth with a velocity of 5 ms^{-1} and angle θ with the horizontal. Another projectile fired from another planet with a velocity of 3 ms^{-1} at the same angle follows a trajectory which is identical with the trajectory of the projectilee fired from the earth. The value of the acceleration due to gravity on the planet is (in m s^{-2}) is: (Given g = 9.8 ms^{-2})
a) 3.5 b) 5.9 c) 16.3 d) 110.8

102. A block of mass m is placed on a rough inclined plane of inclination θ kept on the floor of the lift. The coefficient of friction between the block and the inclined plane is u. With what acceleration will the block slide down the inclined plane when the lift falls freely?
a) Zero b) g sin θ - μg cos θ c) g sin θ + μg cos θ d) None of these

103. Two discs of moments of inertia I_1 and I_2 about their respective axes, rotating with angular frequencies ω_1 and ω_2 respectively, are brought into contact face to face with their axes of rotation coincident. The angular frequency of the composite disc will be :

a) $\frac{I_1\omega_1+I_2\omega_2}{I_1+I_2}$ b) $\frac{I_2\omega_1+I_1\omega_2}{I_1+I_2}$ c) $\frac{I_1\omega_1-I_2\omega_2}{I_1-I_2}$ d) $\frac{I_2\omega_1-I_1\omega_2}{I_1-I_2}$

104. The position-time graph of a body of mass 2 kg is as shown in figure. What is the impulse on the body at t = 4 s?



a) $\frac{2}{3}$ kg ms^{-1} b) -$\frac{2}{3}$ kg ms^{-1} c) $\frac{3}{2}$ kg ms^{-1} d) -$\frac{3}{2}$ kg ms^{-1}

105. A body is moving with a velocity of 72 km/h on a rough horizontal surface of coefficient of friction 0.5. If the acceleration due to gravity is 10 m/s 2 , find the minimum distance it can be stopped.
a) 400 m b) 40 m c) 0.40 m d) 4 m

106. Two bodies with moment of inertia I1 and I_2 (I_1>I_2) have equal angular momentum. If the KE of rotation is E_1 and E_2, then:
a) E_1>E_2 b) E_1<E_2 c) E_1=E_2 d) none of these

107. A bottle of soda water is held by the neck and swing briskly in a vertical circle. Near which position of the bottle do the bubbles collect?
a) Near the bottom b) Near the neck c) In the middle of the bottle
d) Bubbles remain uniformly distributed

108. A block of mass 1 kg is placed on a truck which accelerates with acceleration 5 m/s^2. The coeflicient of static friction between the block and truck is 0.6. The frictional force acting on the block is _____
a) 5N b) 6N c) 5.88N d) 4.6N

109. A cyclist is riding with a speed of 27 km h^{-1}. As he approaches a circular turn on the road of radius 80 m, he applies brakes and reduces his speed at the constant rate of 0.50 ms^{-1} every second. The net acceleration of cyclist on the circular turn is :
a) 0.68 ms^{-2} b) 0.86 ms^{-2} c) 0.56 ms^{-2} d) 0.76 ms^{-2}

110. A person, with outstretched arms, is spinning on a rotating stool. He suddenly brings his arms down to his sides. Which of the following is true about his kinetic energy K and angular momentum L?
a) Both K and L increase b) Both K and L remain unchanged
c) K remains constant, L increases d) K increases but L remains constant

111. A body of mass 5 kg rests on a rough horizontal surface of coefficient of friction 0.2. The body is pulled through a distance of 10 m by a horizontal force of 25 N. The kinetic energy acquired by it is:
a) 200 J b) 150 J c) 100 J d) 50 J

112. For a body moving with constant speed in a horizontal circle, which of the following remains constant?
a) Velocity b) Centripetal force c) Acceleration d) Kinetic energy

113. (A) If the position vector of a particle moving in space is given by $\vec{r} = 2t\hat{i} + 4t^2\hat{j}$, then the particle moves along a parabolic trajectory.

(R) Because $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k} = 2t\hat{i} + 4t^2\hat{j} \Rightarrow y = x^2$.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b)

If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false.

e) If assertion is false but reason is true.

114. In a carbon monoxide molecule, the carbon and the oxygen atoms are separated by a distance 1.12×10^{-10} m . The distance of the centre of mass from the carbon atom is:

a) 0.48×10^{-10}m b) 0.51×10^{-10}m c) 0.56×10^{-10}m d) 0.64×10^{-10} m

115. The diameter of a flywheel increases by 1%. What will be percentage increase in moment of inertia about axis of symmetry?

a) 2% b) 4% c) 1% d) 0.5%

116. (A) When speed of projection of a body is made n times, its time of flight becomes n times.

(R) At this speed, the range of projectile becomes n^2 times.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b)

If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false.

e) If assertion is false but reason is true.

117. A homogeneous disc with a radius 0.2 m and mass 5 kg rotates around an axis passing through its centre. The angular velocity of the rotation of the disc as a function of time is given by the formula $\omega = 2 + 6t$. The tangential force applied to the rim of the disc is:

a) 1 N b) 2 N c) 3 N d) 4 N

118. If a force $10\hat{i} + 15\hat{j} + 25\hat{k}$ acts on a system and gives an acceleration $2\hat{i} + 3\hat{j} - 5\hat{k}$ to the centre of mass of the system, the mass of the system is:

a) 5 units b) units c) $5\sqrt{38}$ units d) given data is not correct

119. Two particles of masses ml and m2 ($m_1 > m_2$) attract each other with a force inversely proportional to the square of the distance between them. The particles are initially held at rest and then released. Which one is correct?

a) The CM moves towards m_1 b) The CM moves towards m_2 c) The CM remains at rest

d) The CM moves at right angles to the line joining m_1 and m_2

120. Two projectiles A and B thrown with speeds in the ratio $1 : \sqrt{2}$ acquired the same heights. If A is thrown at an angle of 45° with the horizontal, the angle of projection of B will be:

a) 0° b) 60° c) 30° d) 45° e) 15°

121. The moment of inertia of a body does not depend on:

a) the mass of the body b) the angular velocity of the body

c) the axis of rotation of the body d) the distribution of the mass in the body

122. A monkey of mass m is climbing a rope with uniform speed; the tension in the rope will be:

a) more than mg b) less than mg c) equal to mg d) zero

123. A uniform heavy disc is rotating at constant angular velocity ω about a vertical axis through its centre and perpendicular to the plane of the disc. Let Lbe its angular momentum. A lump of plasticine is dropped vertically on the disc and sticks to it. Which of the following will change?
a) ω b) ω and L both c) L only d) Neither ω nor L

124. A body of mass 4 kg is being rotated with 120 rev per minute in a horizontal circular path of radius 2 m. Its kinetic energy is:
a) 2 J b) 32 J c) 80 J d) 1263 J

125. The moment of inertia of a solid cylinder about its axis is I. It is allowed to roll down an inclined plane without slipping. it is angular velocity at the bottom be co,then kinetic energy of the cylinder will be:
a) $\frac{1}{2}I\omega^2$ b) $I\omega^2$ c) $\frac{3}{2}I\omega^2$ d) $2I\omega^2$

126. A conveyor belt is moving at a constant speed of 2 m/s. A box is gently dropped on it. The coefficient of friction between them is (μ = 0.5). The distance that the box will move relative to belt before coming to rest on it taking g = 10 ms^{-2}, is :
a) 1.2 m b) 0.6 m c) zero d) 0.4 m

127. A ring and a disc of different masses are rotating with the same kinetic energy. If we apply a retarding torque, τ on the ring, it stops after making n revolutions. After how many revolutions will the disc stop if the retarding torque on it is also, τ?
a) n/2 b) n c) 2n d) 4n

128. (A) In projectile motion, the angle between the instantaneous velocity and acceleration at highest point is 90°.
(R) At the highest point, velocity of projectile will be in horizontal direction only.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

129. A body of mass 2 kg is hung on a spring balance mounted vertically in a lift. If the lift descends with an acceleration equal to the acceleration due to gravity 'g', the reading on the spring balance will be:
a) 2 kg b) (2 × g) kg c) (4 × g) kg d) Zero

130. The relation $\vec{F}$ = m$\vec{a}$, cannot be deduced from Newton's second law, if
a) force depends on time b) momentum depends on time
c) acceleration depends on time d) mass depends on time

131. (A) A body X is thrown vertically upwards with an initial speed 45 mls. Another body Y is also thrown vertically upwards with an initial speed 27 m/s. During the last $\frac{1}{2}$ sec of motion of each body, speed of each reduces by the same value.
(R) Both bodies are moving with same acceleration.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

132. Two particles of masses 4 kg and 8 kg are separated by distance of 12 m. If they are moving towards each other under the influence ofa mutual force of attraction, then the two particles will meet each other at a distance of:
a) 6 m from 8 kg mass b) 2 m from 8 kg mass c) 4 m from 8 kg mass
d) 8 m from 8 kg mass

133. A particle crossing the origin of co-ordinates at time t = 0, moves in the xy-plane with a constant acceleration a in the y-direction. If its equation of motion is $y = bx^2$ (b is a constant), its velocity component in the x-direction is :
a) $\sqrt{\frac{2b}{a}}$ b) $\sqrt{\frac{a}{2b}}$ c) $\sqrt{\frac{a}{b}}$ d) $\sqrt{\frac{b}{a}}$ e) $\sqrt{ba}$

134. A particle moves through angular displacement θ on a circular path of radius r. The linear displacement will be:
a) 2r sin (θ/2) b) 2r cos(θ/2) c) 2r tan (θ/2) d) 2r cot (θ/2)

135. Assertion: The motion of a ceiling fan is rotational only.
Reason: The motion of a rigid body which is pivoted or fixed in some way is rotation.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

136. A thin hollow sphere of mass m is completely filled with a liquid of mass m. When the sphere rolls with a velocity v, kinetic energy of the system is equal to:
a) $\frac{1}{2}mv^2$ b) mv^2 c) $\frac{4}{3}mv^2$ d) $\frac{4}{5}mv^2$

137. Passengers standing in a bus are thrown outwards when the bus takes a sudden turn. This happens because of:
a) outward pull on them b) inertia c) change in momentum d) change in acceleration

138. If a ladder weighing 250 N is placed against a smooth vertical wall having coefficient of friction between it and floor as 0.3. Then what is the maximum force of friction available at the point of contact between the ladder and the floor?
a) 75 N b) 50 N c) 35 N d) 25 N

139. Why does a horse need to pull harder during the first few steps in pulling the cart?
a) Limiting friction is greater than dynamic friction
b) Sliding friction is greater than rolling friction
c) No frictional force acts after the cart comes in motion
d) Air friction is greater during first few steps of motion

140. A particle is projected at an angle of 45°, then find relation between range and maximum height attained by the particle:
a) 2H = R b) none of these c) R = 4H d) 4R = H

141. (A) On a rainy day, it is difficult to drive a car at high speed.
(R) The value of coefficient of friction is lowered due to wetting of the surface

a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true

142. Which of the following principles a circus acrobat employs in his performance?
a) Conservation of energy b) Conservation of linear momentum c) Conservation of mass
d) Conservation of angular momentum

143. (A) A frame accelerated with respect to an inertial frame is a non- inertial frame.
(R) The concept of pseudo force is valid both for inertial as well as non-inertial frame.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true

144. A body moves along a circular path of radius 5 m. The coefficient of friction between the surface of the path and the body is 0.5. The angular velocity (in radians/see) with which the body should move so that it does not leave the path is: (Takeg = 10m/s ^{2})
a) 4 b) 3 c) 2 d) 1

145. Awire of mass mand length lis bent in the form ofa circular ring. The moment of inertia ofthe ring about its axis is:
a) ml^2 b) $\frac{ml^2}{4\pi^2}$ c) $\frac{ml^2}{2\pi^2}$ d) $\frac{ml^2}{8\pi^2}$

146. If the equation for the displacement of a particle moving on a circular path is given by:
$\theta = 2t^3 + 0.5$
where θ is in radian and t in second, then the angular velocity of the particle is:
a) 8 rad/sec b) 12 rad/sec c) 24 rad /sec d) 36 rad /sec

147. A spirit level is placed at the edge of a turntable along its radius. The bubble will lie:
a) at the centre b) at the outer edge c) at the inner edge
d) will oscillate about the centre

148. Which one of the following statements is not true about Newton's second law of motion $\vec{F}$ = m $\vec{a}$?
a) The second law of motion is consistent with the first law.
b) The second law of motion is a vector law.
c) The second law of motion is applicable to a single point particle.
d) The second law of motion is not a local law

149. (A) In Karate, a brick is broken with a bare hand.
(R) In this process the impulse is sharp.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

150. Two bodies of masses m and 4 m are moving with equal kinetic energies. The ratio of their linear momentum will be :
a) 1 : 4 b) 4 :1 c) 1 : 2 d) 2 : 1

151. A spaceman in training is rotated in a seat at the end of a horizontal arm of length 5 m. If he can withstand acceleration upto 9g, then what is the maximum number of revolutions per second permissible? (Take g = 10 m/s^2)
a) 13.5 rev/s b) 1.35 rev/s c) 0.675 rev/s d) 6.75 rev/s

152. Angular momentum of a body is defined as the product of:
a) mass and angular velocity b) centripetal force and radius
c) linear velocity and angular velocity d) moment of inertia and angular velocity

153. A false balance is such that the beam remains horizontal when the pans are empty. An object weighs W_1 when placed in one pan and W_2 when placed in the other pan. Then the weight W of the object is:
a) $\sqrt{W_1 W_2}$ b) $\frac{w_1+w_2}{2}$ c) $\sqrt{w_1^2+w_2^2}$ d) $\frac{w_1-w_2}{2}$

154. Two billiard balls A and B, each of mass 50 g and moving in opposite directions with speed of 5 m s^{-1} each, collide and rebound with the same speed. The impulse imparted to each ball is
a) 0.25 kg m s^{-1} b) 0.5 kg m s^{-1} c) 0.1 kg m s^{-1} d) 0.125 kg m s^{-1}

155. Two particles of equal masses are revolving in circular paths of radii r_1 and r_2 respectively with the same period. The ratio of their centripetal force is:
a) r_1/r_2 b) $\sqrt{r_2/r_1}$ c) $(r_1/r_2)^2$ d) $(r_2/r_1)^2$

156. (A) In uniform circular motion, speed is constant.
(R) In uniform circular motion, tangential acceleration is zero.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

157. A mass of M kg is suspended by a weightless string. The horizontal force that is required to displace it until the string makes an angle of 45° with the initial vertical direction is:
a) Mg $\left(\sqrt{2}+1\right)$ b) Mg $\sqrt{2}$ c) $\frac{Mg}{\sqrt{2}}$ d) Mg $\left(\sqrt{2}-1\right)$

158. We can derive Newton's
a) second and third laws from the first law. b) first and second laws from the third law.
c) third and first laws from the second law
d) all the three laws are independent of each other.

159. Mass is distributed uniformly over a thin square plate. If two end points of a diagonal are (-2, 0) and (2, 2), what are the co-ordinates of the centre of mass of plate?
a) (2,1) b) (2,2) c) (1,0) d) (0,1)

160. Consider a two particle system with particles having masses m_1 and m_2 If the first particle is pushed towards the centre of mass through a distance d, by what distance should the second particle be moved, so as to keep the centre of mass at the same position?
a) d b) (m_2/m_1) d c) $[m_1/(m_1+m_2)]$d d) (m_1/m_2)d

161. A body of mass 10 kg is moved with a uniform speed on a rough horizontal surface, for a distance of 2 m. The work done is 150 J. The surface is inclined to the horizontal at 30°. The same body is moved over the inclined plane for a distance of 2 m. The work done against friction will be: (Take g = 10m s^{-2})
a) 250 J b) 50 J c) 150 J d) 75 $\sqrt{3}$J

162. A fielder in a cricket match throws ball from the boundary line to the wicket keeper. The ball describes a paraboA particle is moving in a vertical circle. The tension in the string when passing through two positions at angle of 30° and 60° from vertical (the lowest position) are T_1 and T_2 respectively, thenlic path. Which of the following quantities remain constant during the motion in air? (Neglecting air resistance)
a) $T_1 = T_2$ b) $T_2 > T_1$ c) $T_1 > T_2$ d) tension in the string always remains the same

163. Which one of the following is not force?
a) Impulse b) Tension c) Thrust d) Weight

164. A body of mass 2 kg moving on a horizontal surface with an initial velocity of 4 m/sec comes to rest after 2 sec. If one wants to keep this body moving on the same surface with a velocity of 4 m/sec, the force required is:
a) 8 N b) Zero c) 4 N d) 2 N

165. A cricket ball of mass 0.25 kg with speed 10 m S^{-1} collides with a bat and returns with same speed within 0.01 s. The force acted on bat is:
a) 25 N b) 50 N c) 250 N d) 500 N

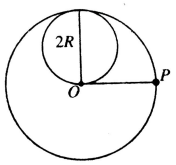
166. A batsman hits back a ball of mass 0.15 kg straight in the direction of the bowler without changing its initial speed of 12 m S^{-1}. If the ball moves linearly, then the impulse imparted to the ball is
a) 1.8 N s b) 2.8 N s c) 3.6 N s d) 4.2 N s

167. A body revolving in a circle with uniform speed possesses:
a) normal acceleration b) uniform acceleration c) tangential acceleration
d) none of these

168. Let g be acceleration due to gravity on the surface of the earth and K_R be the rotational kinetic energy of the earth. Suppose the earth's radius decreases by 2%, keeping all other quantities same (even ω):
a) g decreases by 2% and K_R decreases by 4%
b) g decreases by 4% and K_R decreases by 2%
c) g increases by 4% and K_R decreases by 4%
d) g decreases by 4% and K_R increases by 4%

169. A lamina is made by removing a small disc of diameter 2R from a bigger disc of uniform mass density and radius 2R, as shown in the figure. The moment of inertia of this lamina about axes passing through O and P is I_O and I_P respectively. Both these axes are perpendicular to

the plane of the lamina. The ratio $\frac{I_P}{I_O}$



a) 13/37 b) 37/13 c) 73/31 d) 8/13

170. (A) A body rolls down an inclined plane without slipping. The fraction of total energy associated with its rotation will depend on its radius of gyration.
(R) Total kinetic energy of rolling body is equal to addition of kinetic energy of rotation and kinetic energy of translation.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

171. The radius of gyration ofa uniform rod oflength Labout an axis passing through its centre of mass is:
a) $\frac{L}{\sqrt{12}}$ b) $\frac{L^2}{12}$ c) $\frac{L}{\sqrt{3}}$ d) $\frac{L}{\sqrt{2}}$

172. A ball is thrown up at an angle with the horizontal. Then, the total change of momentum by the instant it returns to the ground is:
a) acceleration due to gravity x total time of flight
b) weight of the ball x half the time of flight c) weight of the ball x total time of flight
d) weight of the ball x horizontal range

173. Two weights are suspended from a string thrown over a light frictionless pulley. The mass of one weight is 0.200 kg. If a heavy weight is attached to its other end, the tension in the string is:
a) Zero b) 0.200 Kgf c) 0.400 Kgf d) 0.600 Kgf

174. A force of 250 N is required to lift a 75 kg mass through a pulley system. In order to.lift the mass through 3 m, the rope has to be pulled through 12 m. The efficiency of the system is:
a) 50% b) 75% c) 33% d) 90%

175. A small object of mass m is attached to a light string and made to rotate on a frictionless table in a circular path whose radius can be changed by pulling the other end of the string through the hole at the centre. If the initial and final values of the radius of the orbit, speed and angular velocities of the object are r_1, v_1 ω_1 and r_2, v_2, ω_2 (02 respectively, then ω_2/ω_1 is:
a) R_1/R_2 b) $(r_1/r_2)^2$ c) $(r_2/r_1)^2$ d) r_2/r_1

176. (A) A man who falls from a height on a cement floor receive more injury than when he falls from the same height on a heap of sand.
(R) The impulse given by cement floor is more than the impulse given by a heap of sand.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

177. A man sits on a chair supported by a rope passing over a frictionless fixed pulley. The man who weighs 1000 N exerts a force of 450 N on the chair downwards while pulling on the rope. If the chair weighs 250 N and g is $10 m.s^2$, then the acceleration of the chair is:
a) 0.45 m/sec^2 b) Zero c) 2 m/sec^2 d) (9/25) m/sec^2

178. A person of mass 50 kg stands on a weighing scale on a lift. If the lift is ascending upwards with a uniform acceleration of 9 m s^{-2}, what would be the reading of the weighing scale? (Take g =10 ms^{-2})
a) 50 kg b) 60 kg c) 95 kg d) 100 kg

179. Assertion: The moment of inertia of a rigid body depends only on the mass of the body, its shape and size.
Reason: Moment of inertia $I = MR^2$, where M is the mass of the body and R is the radius vector.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

180. Why do we prefer rubber tyres than steel tyres?
a) Rubber is cheaper than steel. b) It is easy to give rubber a circular shape.
c)
Coefficient of friction between rubber and concrete is lower than that between steel and concrete.
d) Steel tyres produce more noise than rubber tyres

181. The mass of a lift is 2000 kg. When the tension in the supporting cable is 28000 N, then its accelerption is _____
a) 4 ms^{-2} upwards b) 4 ms^{-2} downwards c) 14 ms^{-2} upwards d) 30ms^{-2} downwards

182. A force acts on a 3.0 g particle in such a way that the position of the particle as a function of time is given by: $x = 3t - 4t^2 + t^3$
Where x is in metres and 1 is in seconds. The work done during the first 4 s is:
a) 570 mJ b) 450 mJ c) 490 mJ d) 530 mJ

183. If the road is unbanked and the coefficient of friction between the road and the tyres is 0.8, then the maximum speed with which an automobile can move around a curve of 84.5 m radius without slipping is:(Take g = 10 ms^{-2})
a) 26 ms^{-1} b) 67.6 ms^{-1} c) 13 ms^{1} d) 36.7 ms^{-1}

184. (A) A block of mass m is kept at rest on an inclined plane, the force applied by the surface to the block will be mg.
(R) Contact force between block and inclined plane is the resultant of normal reaction and frictional force.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true

185. A motorcar is travelling at 60 m/s on a circular road of radius 1200 m. It is increasing its speed at the rate of 4 m/s 2. The acceleration of the car is:
a) 3 m/s^2 b) 4 m/s^2 c) 5 m/s^2 d) 7 m/s^2

186. A student unable to answer a question on Newton's laws of motion attempts to pull himself up by tugging on his hair. He will not succeed:
a) as the force exerted is small b) the frictional force while gripping is smal
c) Newton's law of inertia is not applicable to living beings
d) as the force applied is internal to the system

187. A body of moment of inertia of 3 kg x m^2 rotating with an angular speed of 2 radlsec has the same KE as a mass of 12 kg moving with a speed of:
a) 2 ms^{-1} b) 1 ms^{-1} c) 4 ms^{-1} d) 8 ms^{-1}

188. A solid sphere and a hollow sphere of equal mass and radius are placed over a rough horizontal surface after rotating it about its mass centre with same angular velocity ω_0 Once the pure rolling starts let V_1 and V_2 be the linear speeds of their centre of mass. Then:
a) $v_1 = v_2$ b) $v_1 > v_2$ c) $v_1 < v_2$ d) data is insufficient

189. The moment of inertia of a body about a given axis is 1.2 kg x m^2. Initially, the body is at rest. In order to produce a rotational KE of 1500 joule, an angular acceleration of 25 rad/sec^2 must be applied about that axis for a duration of:
a) 4 s b) 2 s c) 8 s d) 10 s

190. (A) The rate of change of total momentum of a many particle system is proportional to the sum of the internal forces of the system.
(R) Internal forces can change the kinetic energy but not the momentum of the system.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

191. (A) The work done during a round trip is always zero.
(R) No force is required to move a body in its round trip.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

192. A light string is wound several times around a spool of mass M and radius R. The free end of the string is attached to a fixed point and the spool is held so that the part of the string not in contact with its vertical. If the spool is let go, the acceleration is:
a) g/3 b) 2g/3 c) g d) 3g/4

193. A large force is acting on a body for a short time. The impulse imparted is equal to the change in
a) acceleration b) momentum c) energy d) velocity

194. (A) A solid body of density, half that of water, falls from a height of 10m and then enters into water. The depth to which it wiJl go in water is 10m.
(R) Depth in water is equal to height from which water faJls.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

195. The angular speed of a motor wheel is increased from 1200 rpm to 3120 rpm in 16 seconds. The angular acceleration of the motor wheel is :
a) 8π rad s $^{-2}$ b) 2π rad s $^{-2}$ c) 4π rad s $^{-2}$ d) 6π rad s $^{-2}$

196. The overbridge of a canal is in the form of a circular arc of radius R. What is the greatest speed at which a motorcyclist can cross the bridge without leaving the ground?
a) $\sqrt{5gR}$ b) $\sqrt{3gR}$ c) $\sqrt{2gR}$ d) $\sqrt{gR}$

197. A force of 5N acts on a body of weight 9.8 N. What is the acceleration produced in m/sec^2.
a) 49.00 b) 1.46 c) 5.00 d) 0.51

198. The rear side of a truck is open and a box of mass 40 kg is placed S m away from the open end. The coefficient of friction between the box and the surface below it is 0.15. The truck starts from rest with an acceleration of 2 m S^{-2} on a straight road. At what distance from the starting point does the box fall off the truck?
a) 20 m b) 30 m c) 40 m d) 50 m

199. Two blocks of masses 6 kg and 4 kg are placed on a frictionless surface and connected by a spring. If the heavier mass is given a velocity of 14 m/s in the direction of lighter one, then the velocity gained by the centre of mass will be:
a) 7.4 m/s b) 14 m/s c) 8.4 m/s d) 10 m/s

200. Particles of masses m, 2m, 3m, ... , nm grams are placed on the same line at distances l, 2l, 3l, ... , nl em from a fixed point. The distance of the centre of mass of the particles from the fixed point (in centimetres) is:
a) $\frac{(2n+1)l}{3}$ b) $\frac{l}{n+1}$ c) $\frac{n(n^2+1)l}{2}$ d) $\frac{2l}{n(n^2+1)}$

201. If $\vec{F}$ is the force acting on a particle having position vector $\vec{r}$ and $\vec{\tau}$ be the torque of this force about the origin, then
a) $\vec{r}.\vec{\tau} > 0$ and $\vec{F}.\vec{\tau} < 0$ b) $\vec{r}.\vec{\tau} = 0$ and $\vec{F}.\vec{\tau} = 0$ c) $\vec{r}.\vec{\tau} = 0$ and $\vec{F}.\vec{\tau} \neq 0$
d) $\vec{r}.\vec{\tau} \neq 0$ and $\vec{F}.\vec{\tau} = 0$

202. (A) The acceleration of a body down a rough inclined plane is greater than the acceleration due to gravity.
(R) The body is able to slide on a inclined plane only when its acceleration is greater than acceleration due to gravity.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true

203. (A) A body subjected to three concurrent forces cannot be in equilibrium.
(R) If large number of concurrent forces are acting on the same point, then the point will be in equilibrium, if sum of all the forces is equal to zero.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

204. (A) Mountain roads rarely go straight up the slope.
(R) Slope of mountains are large, therefore more chances of vehicle to slip from roads.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

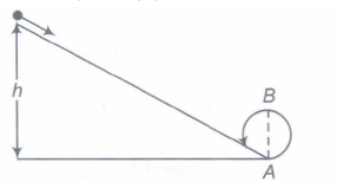
205. A rocket of initial mass 6000 kg ejects gases at a constant rate of 16 kg S^{-1} with constant relative speed of 11 km S^{-1}. What is the acceleration of the rocket one minute after the blast?
a) 25 m S^{-2} b) 50 m S^{-2} c) 10 m S^{-2} d) 35 m S^{-2}

206. A cylinder of mass 10 kg is rolling on a rough plane with a velocity of 10 rn/s. If the coefficient of friction between the surface and cylinder is 0.5, then before stopping, it will cover a distance of: (Take g = 10 M/s^2)
a) 10 m b) 7.5 m c) 5 m d) 2.5 m

207. If a body is projected with an angle O to the horizontal, then:
a) its velocity is always perpendicular to its acceleration
b) its velocity becomes zero at its maximum height
c) its velocity makes zero angle with the horizontal at its maximum height
d)
the body just before hitting the ground, the direction of velocity coincides with the acceleration

208. A block B is pushed momentarily along a horizontal surface with an initial velocity Z. If m is the coefficient of sliding friction between B and the surface, block B will come to rest after a time
_____
a) gm/V b) g\V c) V\g d) V\(gm)

209. A body initially at rest and sliding along a frictionless track from a height h (as shown in the figure) just completes a vertical circle of diameter AB = D. The height h is equal to:



a) 7/5 D b) D c) 3/2 D d) 5/4 D

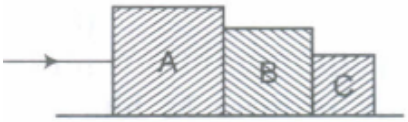
210. A particle is moving in a circle with uniform speed. It has constant:

a) velocity b) acceleration c) kinetic energy d) displacement

211. A constant power is supplied to a rotating disc. Angular velocity (ω) of disc varies with number of rotations (n) made by the disc as:
a) $\omega \propto (n)^{1/3}$ b) $\omega \propto (n)^{3/2}$ c) $\omega \propto (n)^{2/3}$ d) $\omega \propto (n)^2$

212. An object of mass 5 kg is attached to the hook of a spring balance and the balance is suspended vertically from the roof of a lift. The reading on the spring balance when the lift is going up with an acceleration of 0.25 ms $^{-2}$ is: (Take g = 10 m/s^2)
a) 51.25 N b) 48.75 N c) 52.75 N d) 47.25 N e) 55 N

213. Three blocks A, B and C, of masses 4 kg, 2 kg and 1 kg respectively, are in contact on a frictionless surface, as shown. If a force of 14 N is applied on the 4 kg block, then the contact force between A and B is:



a) 18 N b) 2 N c) 6 N d) 8 N

214. In the question number 91, if a force F is applied to 20 kg block, then the tension in the string is
a) 100 N b) 200 N c) 300 N d) 400 N

215. (A) An object can possess acceleration even at a time when it has uniform speed.
(R) It is possible when the direction of motion keeps changing.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

216. The static friction is:
a) equal to the dynamic friction b) always less than the dynamic friction
c) always greater than the dynamic friction
d) sometimes greater and sometimes equal to dynamic friction

217. An automobile is negotiating a curve of radius r. The coefficient of friction between the tyres and the road is μ. The velocity of the vehicle should not be more than:
a) μrg b) μg/r c) $\sqrt{\mu gr}$ d) $\sqrt{\mu rg}$

218. Brakes of very small contact area are not used, although friction is independent of area, because friction:
a) resists motion b) causes wear and tear c) depends upon the nature of the material
d) operating in this case is sliding friction

219. A ball of mass m strikes a rigid wall with speed u and rebounds with the same speed. The impulse imparted to the ball by the wall is
a) 2mu b) mu c) Zero d) -2mu

220. A book is lying on the table. What is the angle between the action of the book on the table and the reaction of the table on the book?
a) 0° b) 45° c) 90° d) 180°

221. Two bodies are projected from ground with equal speeds 20 m/s from the same position in same vertical plane to have equal range but at different angle above the horizontal. If one of the angle is 30°, the sum of their maximum heights is: (assume g= 10 m/s^2)
a) 400 m b) 20 m c) 30 m d) 40 m

222. A rigid body rotates about a fixed axis with variable angular velocity equal to $\alpha - \beta t$ at time t, where α and β are constants. The angle through which it rotates before it comes to rest isl:
a) $\frac{\alpha^2}{2\beta}$ b) $\frac{\alpha^2-\beta^2}{2\alpha}$ c) $\frac{\alpha^2-\beta^2}{2\beta}$ d) $\frac{\alpha(\alpha-\beta)}{2}$

223. A block of mass M is pulled along a horizontal frictionless surface by a rope of mass m. If a force F is applied at one end of the rope, the force which the rope exerts on the block is:
a) F/(M + m) b) F c) FM/(m + M) d) zero

224. The radius of gyration of an uniform rod of length 1 about an axis passing through one of its ends and perpendicular to its length is
a) $\frac{1}{\sqrt{2}}$ b) $\frac{1}{3}$ c) $\frac{1}{\sqrt{3}}$ d) $\frac{1}{2}$

225. (A) If $\vec{A}, \vec{B}$ and $\vec{C}$ are three coplanar vectors representing same physical quantities such that $|\vec{A}| = |\vec{B}| = |\vec{C}|$ with each pair of vectors having angle of $\frac{2\pi}{3}$ radian between them, then their resultant is zero.
(B) The resultant of three coplanar vectors is zero if they can be represented by three sides of a triangle taken in order.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

226. When a ceiling fan is switched on, it makes 10 revolutions in the first 3 seconds. Assuming a uniform angular acceleration, how many rotations it will make in the next 3 seconds?
a) 10 b) 20 c) 30 d) 40 e) 60

227. 5 discs each of mass m are placed one above the other. The force on the first from the bottom because of the remaining on the top is:
a) mg b) 2mg c) 3mg d) 4mg

228. (A) Two bodies of different masses are projected horizontally with different speeds, they reach the ground simultaneously.
(B) For both bodies, the vertical component of initial velocity is zero.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

229. (A) If there is no external torque on a body about its centre of mass, then the velocity of centre of mass remains constant.
(R) The linear momentum of an isolated system remains constant.

a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion isfalse but reason is true.

230. Three identical metal balls, each of radius r, are placed touching each other on a horizontal surface such that an equilateral triangle is formed when the centres of the three balls are joined. The centre of mass of the system is located at:
a) horizontal surface b) centre of one of the balls c) line joining centres of any two balls
d) point of intersection of their medians

231. Two bodies A and B are attracted towards each other due to gravitation. Given that A is much heavier than B, which of the following correctly describes the relative motion of the centre of mass of the bodies?
a) It moves towards A b) It remains at rest W.r.t. A as well as B c) It moves towards B
d) It moves perpendicular to the line joining the particles

232. A coin is placed on a gramophone record rotating at a speed of 45 rpm. It flies away when the rotational speed is 50 rpm. If two such coins are placed one over the other on the same record, both of them will fly away when the rotational speed is:
a) 12.5 rpm b) 25 rpm c) 50 rpm d) 100 rpm

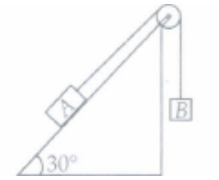
233. A child is standing with folded hands at the centre of a platform rotating about its central axis. The kinetic energy of the system is K. Now, the child stretches his arms so that moment of inertia of the system doubled. Now, the kinetic energy of the system is :
a) $\frac{K}{4}$ b) $\frac{K}{2}$ c) 2K d) 4K

234. For ordinary terrestrial experiments the observer in an inertial frame in the following cases, is:
a) a child revolving in a giant wheel
b) a driver in a sports car moving with a constant high speed of 200 km/hr on a straight road
c) the pilot of an aeroplane which is taking-off d) a cyclist negotiating a sharp curve

235. A wheel has angular acceleration of 3.0 rad/sec^2 and an initial angular speed of 2.0 rad/see. In a time of 2 sec it has rotated through an angle (in radian) of:
a) 10 b) 12 c) 4 d) 6

236. A solid cylinder is rolling down on an inclined plane of angle θ. The coefficient of static friction between the plane and cylinder isu μ_S. The condition for the cylinder not to slip is:
a) tan $\theta \geq 3\mu_S$ b) tan $\theta > 3\mu_S$ c) tan$\theta \leq 3\mu_S$ d) tan $\theta < 3\mu_S$

237. Block A of weight 100 rests on a frictionless inclined plane of slope angle 30° as shown in the figure. A flexible cord attached to A passes over a frictionless pulley and is connected to block B of weight W. Find the weight W for which the system is in equilibrium.



a) 25 N b) 50 N c) 75 N d) 100 N

238. (A) Aeroplanes always fly at low altitudes.
(R) According to Newton's IIIrd law of motion, for every action there is an equal and opposite reaction.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

239. Sand is being dropped on a conveyor belt at the rate of M kg/s. The force necessary to keep the belt moving with a constant velocity of v m/s will be _____
a) Mv newton b) 2 Mv newton c) $\frac{Mv}{2}$ newton d) zero

240. The moment of inertia of a solid sphere of density p and radius R about its diameter is:
a) $\frac{105}{176}R^5p$ b) $\frac{105}{176}R^2p$ c) $\frac{176}{105}R^5p$ d) $\frac{176}{105}R^2p$

241. A rocket with a lift-off mass 2 x10^4 kg is blasted upwards with an initial acceleration of 5 m s^{-2}. The initial thrust of the blast is (Take g = 10 m S^{-2})
a) 2 x 10^5 N b) 3 x 10^5 N c) 4 x 10^5 N d) 5 x 10^5 N

242. Five vehicles of mass 2 kg are attached to the rim of a circular disc of radius 0.1 m and negligible mass. Moment of inertia 0, the system about the axis passing through the centre of the disc and perpendicular to its plane is:
a) 1 Kg - m^2 b) 0.1 Kg - m^2 c) 2 Kg - m^2 d) 0.2 Kg - m^2

243. A wheel is subjected to uniform angular acceleration about its axis. Initially its angular velocity is zero. In the first 2 sec, it rotates through an angle θ_1; in the next 2 see it rotates through an additional angle θ_2. The ratio of $\frac{\theta_2}{\theta_1}$.
a) 1 b) 2 c) 3 d) 5

244. A block of metal weighing 2 kg is resting on a frictionless plane. It is struck by a jet releasing water at a rate of 1 kg/s and at a speed of 5 mls. The initial acceleration of the block will be:
a) 2.5 m/s^2 b) 5 m/s2 c) 10m/s^2 d) 20m/s^2

245. A man of mass 60 kg is standing on a spring balance inside a lift. If the lift falls freely downwards, then the reading of the spring balance will be:
a) > 60 Kgf b) 60 kg + weight of the spring c) Zero d) 60 Kgf e) < 60 kgf

246. (A) In circular motion, centripetal and centrifugal forces act in opposite directions and balance each other.
(R) Centripetal force is a pseudo force.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

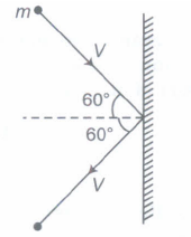
247. (A) Instantaneous axis of rotation is stationary w.r.t. ground.
(R) Instantaneous axis of rotation may lie within or outside the rigid body.

a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

248. A convey or belt is moving at a constant speed of 2m/s' A box is gently dropped on it. The coefficient of friction between them is m: 0.5. The distance that the box will move relative to belt before coming to rest on it taking g = 10 ms 2, is _____
a) 12m b) 0.6m c) zero d) 0.4m

249. Two blocks A and B are released at the top of a rough inclined plane so that A slides along the plane and B falls down freely. Which will have higher velocity on reaching the ground?
a) A b) B c) Both will reach the ground with same velocity
d) It depends on the coefficient of friction

250. A rigid ball of mass m strikes a rigid wall at 60° and gets reflected without loss of speed as shown in the figure below. The value of impulse imparted by the wall on the ball will be



a) $\frac{mV}{2}$ b) $\frac{mV}{3}$ c) mV d) 2mV

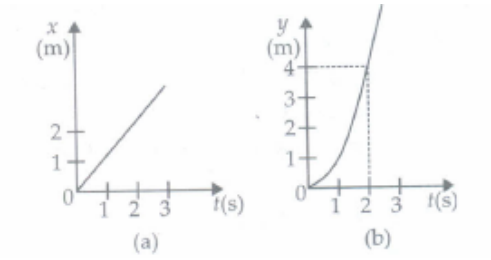
251. Even if the force on the rocket remains same, its acceleration:
a) increases b) decreases c) remains same d) first increases and then decreases

252. Match the Column I with Column II.

Column-I		**Column-II**	
(A)	For translational equilibrium	(p)	Mk^2
(B)	For rotational equilibrium	(q)	Angular acceleration
(C)	Moment of inertia of a body	(r)	$\sum \vec{F} = 0$
(D)	Torque is required to produce	(s)	$\sum \vec{\tau} = 0$

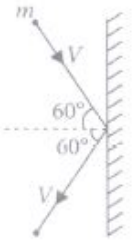
a) A - p, B - q, C - r, D - s b) A - q, B - r, C - s, D - P c) A - r, B - q, C - p, D - s
d) A - r, B - s, C - p, D - q

253. Figure shows (x, t), (y, t) diagram of a particle moving in 2-dimensions. If the particle has a mass of 500 g, the force acting on the particle is



a) 1 N along y-axis b) 1 N along x-axis c) 0.5 N along x-axis d) 0.5 N along y-axis

254. Two blocks of masses 6 kg and 4 kg connected by a rope of mass 2 kg are resting on a frictionless floor as shown in the following figure. tension in the rope at points A, Band Care respectively given by:



a) 60 N, 60 N, 60 N b) 30 N, 25 N, 20 N c) 20 N, 25 N, 30 N d) 20 N, 20 N, 20 N

255. The linear velocity ofthe particle on the N-pole ofthe earth will be:
a) zero b) 486 km h^{-1} c) infinite d) 125 ms^{-1}

256. A body is whirled in a horizontal circle of radius 20 cm. It has angular velocity of 10 radls. What is its linear velocity at any point on circular path?
a) $\sqrt{2}$ ms^{-1} b) 10 ms^{-1} c) 2 ms^{-1} d) 20 ms^{-1}

257. A particle of mass 109 moves along a circle of radius 6.4 em with a constant tangential acceleration. What is the magnitude of this acceleration if the kinetic energy of the particle becomes equal to 8 x 10^{-4} J by the end of the second revolution after the beginning of the motion?
a) 0.1 m/s^2 b) 0.15m/s^2 c) 0.18 m/s^2 d) 0.2 m/s^2

258. Assertion: A girl sits on a rolling chair, when she stretch her arms horizontally, her speed is reduced.
Reason: Principle of conservation of angular momentum is applicable in this situation.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

259. If the radius of a solid sphere is 35 cm, calculate the radius of gyration when the axis is along a tangent:
a) $7\sqrt{10}cm$ b) $7\sqrt{35}cm$ c) $\frac{7}{5}cm$ d) $\frac{2}{5}cm$

260. In an elevator moving vertically up with an acceleration 'g', the force exerted on the floor by a passenger of mass M is :
a) Mg b) $(\frac{1}{2})$Mg c) zero d) 2Mg

261. A dish of mass 109 is kept floating horizontally in the air by firing bullets each of mass 5 g with the same velocity. If 10 bullets are fired per second and the bullets rebound with the same velocity, then the, velocity of each bullet is:
a) 196 cm/sec b) 98 cm/sec c) 49 cm/sec d) None of these

262. When a bicycle is in motion but not pedalled, the force of friction exerted by the ground on the two wheels is such that it acts:
a) in the backward direction on the front wheel and in the forward direction on the rear wheel
b) in the forward direction on the front wheel and in the backward direction on the rear wheel
c) in the forward direction on both the wheels
d) in the backward direction on both the wheels

263. A tangential force F acts at the top of a disc of mass m and radius R. If it rolls without slipping. Then

a) Acceleration of disc = $\frac{2F}{3m}$ b) Friction force between disc and surface = $\frac{2F}{3m}$

c) Acceleration of disc = $\frac{6F}{5m}$ d) Friction force between disc and surface is $\frac{F}{3}$

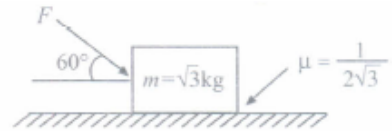
264. A thin rod of length L and mass M is held vertically with one end on the floor and is allowed to fall. Find the velocity of the other end when it hits the floor, assuming that the end on the floor docs not slip:

a) $\sqrt{\frac{3g}{L}}$ b) $\sqrt{3gL}$ c) $\sqrt{\frac{L}{3g}}$ d) $\sqrt{\frac{g}{3L}}$

265. 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^2L

266. A string of negligible mass going over a clamped pulley of mass m supports a block of mass M as shown in the figure. The force on the pulley by the clamp is given by



a) $\sqrt{2}$ Mg b) $\sqrt{2}$ mg c) $\sqrt{(M+m)^2 g}$ d) $\sqrt{(M+m)^2 + M^2 g}$

267. A stone of mass 1 kg is lying on the floor of a train which is accelerating with 1 m S^{-2}. The net force acting on the stone is

a) zero b) 1 N c) 5 N d) 10 N

268. A child stands at one end of a boat moving with a speed v in still water. If the child starts running towards the other end of the boat with a speed u, the centre of mass of the system (boat and child) will move with a speed:

a) v - u b) v c) u d) v + u

269. A particle of mass m is circulating on a circle of radius r having angular momentum L; then the centripetal force will be:

a) L^2/mr b) $L^2m/rL^2/mr^3$ c) L^2/mr^3 d) L^2/mr^2

270. (A) A stationary object placed on ground may experience a pseudo force as observed by the reference frame attached to the ground.

(R) Earth is a non-inertial frame of reference.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b)

If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false.

e) If assertion is false but reason is true.

271. A mass 1 kg is suspended by a thread. It is

(i) lifted up with an acceleration 4.9 m/s^2,

(ii) lowered with an acceleration 4.9 m/s^2.

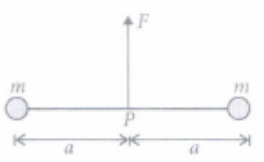
The ratio of the tensions is:

a) 3:1 b) 1:3 c) 1:2 d) 2:1

272. Consider a car moving along a straight horizontal road with a speed of 72 km/h. If the coefficient of static friction between the tyres and the road is 0.5, the shortest distance in which the car can be stopped is (takingg=10 m/s^2) :
a) 30 m b) 40 m c) 72 m d) 20 m

273. A body of mass 10 kg falls from a height of 5 m (g = 10m/s^2) and is stopped within one-tenth of a second on the ground. The force of interaction is:
a) 100 N b) Zero c) 1000 N d) 1100 N

274. Two particles of mass m each are tied at the ends of a light string of length 2a The whole system is kept on a frictionless horizontal surface with the string held tight so that each mass is at a distance a from the centre P (as shown in the figure). Now, the mid-point of the string is pulled vertically upwards with a small but constant force F. As a result, the particles move towards each other on the surface. The magnitude of acceleration, when the separation between them becomes 2x is :



a) $\frac{F}{2m}\frac{a}{\sqrt{a^2-x^2}}$ b) $\frac{F}{2m}\frac{x}{\sqrt{a^2-x^2}}$ c) $\frac{F}{2m}\frac{x}{a}$ d) $\frac{F}{2m}\frac{\sqrt{a^2-x^2}}{x}$

275. (A) If torque $\left(\vec{t}\right)$ acting on a rigid body is defined $\vec{t}-\vec{A}\times\vec{L}$ as where $\vec{A}$ is a constant vector and $\vec{L}$ is the angular momentum of the body then magnitude of the angular momentum of the body remains same.

(R) In this case $\vec{t}$ is perpendicular $\vec{L}$ and hence torque does not deliver any power to the body.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion isfalse but reason is true.

276. (A) A body can have acceleration even if its velocity is zero at a given instant of time.
(R) A body is momentarily at rest when it reverses its direction of motion.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

277. (A) A shell at rest, explodes. The centre of mass of fragments moves along a straight line.
(R) In explosion, the linear momentum of the system does not remain always conserved.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.

278. In the question number 77, the force acting on the particle is

a) $m\omega^2\vec{r}$ b) $-m\omega^2\vec{r}$ c) $2m\omega^2\vec{r}$ d) $-2m\omega^2\vec{r}$

279. A particle is moving along a circular path of radius 5 m with a uniform speed 5ms $^{-1}$. What will be the average acceleration when the particle completes half revolution?

a) Zero b) 10 ms^{-1} c) 10 πms^{-2} d) $\frac{10}{\pi}$ ms^{-2}

280. A block of mass 2 kg rest on a plane inclined at an angle of 30° with the horizontal. The coefficient of friction between the block and the surface is 0.7. What will be the frictional force acting on the block?

a) 10.3 N b) 23.8 N c) 11.9 N d) 6.3 N

281. Assertion: The centre of gravity of a body coincides with its centre of mass only if the gravitational field does not vary from one part of the body to the other
Reason : Centre of gravity is independent of the gravitational field

a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

282. A body is rolling down an inclined plane. If kinetic energy of rotation is 40% of kinetic energy in translatory state, then the body is a

a) ring b) cylinder c) hollow ball d) solid ball

283. (A) When an automobile while going too fast around a curve overturns, its inner wheels leave the ground first.
(R) The inner wheels are moving in a circle of smaller radius, the maximum permissible velocity for them is less.

a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

284. A constant torque of 31.4 N-m is exerted on a pivoted wheel. If angular acceleration of wheel is 4π rad/sec 2 , then the moment of inertia ofthe wheel is:

a) 2.5 kg - m^2 b) 3.5 kg - m^2 c) 4.5 kg - m^2 d) 5.5 kg - m^2

285. An open knife edge of mass M is dropped from a height h on a wooden floor. If the blade penetrates a distance s into the wood, the average resistance offered by the wood to the blade is:

a) Mg b) $Mg\left(1+\frac{h}{s}\right)$ c) $Mg\left(1-\frac{h}{s}\right)$ d) $Mg\left(1+\frac{h}{s}\right)^2$

286. A rod of weight W is supported by two parallel knife edges A and B and is in equilibrium in a horizontal position. The knives are at a distance d from each other. The center of mass of the rod is at distance x from A. The normal reaction on A is :

a) $\frac{W(d-x)}{x}$ b) $\frac{Wx}{d}$ c) $\frac{Wd}{x}$ d) $\frac{W(d-x)}{d}$

287. A satellite in a force free space sweeps stationary interplanetary dust at a rate $\left(\frac{dM}{dt}\right) = \alpha v$. The acceleration of satellite is _____

a) $-\frac{2\alpha v^2}{M}$ b) $-\frac{\alpha v^2}{M}$ c) $-\frac{\alpha v^2}{2M}$ d) $-\mathrm{a}v^2$

288. A spring is compressed between two toy cars of masses M_1 and M_2. When the cars are released they move apart. If X_1 and x_2 be the displacements of the cars when in contact with the spring, then:

a) $M_1x_1 = M_2x_2$ b) $M_1x_2 = M_2x_1$ c) $M_1x_1^2 = M_2x_2^2$ d) $M_1xx_2^2 = M_2xx_1^2$

289. The horizontal range of a projectile is 400 m. The maximum height attained by it will be:

a) 100 m b) 200 m c) 400 m d) 800 m

290. A cart is moving horizontally along a straight line with constant speed 30 mls. A projectile is to be fired from the moving cart in such a way that it will return to the cart after the cart has moved 80 m. At what speed (relative to the cart) must the projectile be fired? (Take g = 10 m/s^2)

a) $10\sqrt{8}$m/s b) $8\sqrt{10}$m/s c) $\frac{40}{3}$m/s d) None of these

291. (A) A body is rolling without slipping on a surface. There must be frictional force for start to such a motion.

(R) In rolling without slipping, work done against the frictional force is zero.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b)

If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false.

e) If assertion isfalse but reason is true.

292. (A) The centre of mass and centre of gravity of a body are two different positions in general.

(R) The centre of mass and centre of gravity of a body coincide if gravitational field is uniform.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b)

If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false.

e) If assertion isfalse but reason is true.

293. A force of 100 N need to be applied parallel to a smooth inclined plane just to hold a body on it. The angle of inclination of the inclined plane is 30°. How much horizontal force need to be applied to do the same?

a) 115 N b) 50 N c) 87 N d) 100 N

294. The range of a projectile fired at an angle of 15° is 50 m. If it is fired with the same speed at an angle of 45°, its range will be:

a) 50 m b) 100 m c) 25 m d) 37 m

295. A car is moving in a circular horizontal track of radius 10m with a constant speed of 10 m/s. A bob is suspended from the roof of the car by a light wire of length 1.0 m. The angle made by the wire with the vertical is _____

a) 0^o b) $\frac{\pi}{3}$ c) $\frac{\pi}{6}$ d) $\frac{\pi}{4}$

296. (A) Two bodies A and B are attracted towards each other due to gravitation. If A is much heavier than B, then the centre of mass of the bodies moves towards A.
(R) The centre of mass depends upon mass distribution of a body or a system of bodies.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

297. A heavy disc is thrown on a horizontal surface in such a way that it slides with a speed V_0 initially without rolling. It will start rolling without slipping when its speed reduces to:
a) $\frac{V_0}{2}$ b) $\frac{2V_0}{3}$ c) $\frac{3V_0}{5}$ d) $\frac{5V_0}{7}$

298. Which one of the following statements is not true?
a)
The same force for the same time causes the same change in momentum for different bodies.
b)
The rate of change of momentum of a body is directly proportional to the applied force and takes place in the direction in which the force acts.
c)
A greater opposing force is needed to stop a heavy body than a light body in the same time, if they are moving with the same speed.
d)
The greater the change in the momentum in a given time, the lesser is the force that needs to be applied.

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

300. Assertion: The familiar equation rng = R for a body on a table is true only if the body is in equilibrium.
Reason: The equality of rng and R has no connection with the third law.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.

301. (A) If a particle is found to be in equilibrium in two different frames of reference implies that both frames are inertial.
(R) Newton's second law can be used for motion of a particle in any reference frame.

a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true

302. Of the following forces of friction, the one which is self-adjusting is:
a) rolling friction b) sliding friction c) static friction d) dynamic friction

303. A body is under the action of three forces $\vec{F}_1, \vec{F}_2$ and $\vec{F}_3$ In which case the body cannot undergo angular acceleration?
a) $\vec{F}_1, \vec{F}_2$ and $\vec{F}_3$ are concurrent b) $\vec{F}_1 + \vec{F}_2 + \vec{F}_3 = 0$
c) $\vec{F}_1, \vec{F}_2$ is parallel to $\vec{F}_3$ but the three forces are not concurrent.
d) $\vec{F}_1$ and $\vec{F}_2$ act at the same point but $\vec{F}_3$ acts at different point

304. Assertion: A sphere cannot roll on a smooth inclined surface
Reason: The motion of a rigid body which is pivoted or fixed in some way is rotation.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

305. A car sometimes overturns while taking a turn. When it overturns, it is:
a) the inner wheel which leaves the ground first
b) the outer wheel which leaves the ground first
c) both the wheels leave the ground simultaneously
d) either wheel which leaves the ground first

306. A closed tube, partly filled with a liquid and set horizontal, is rotated about a vertical axis passing through its centre. In the process, the moment ofthe system about its axis would:
a) decrease always b) increase always c) remain constant
d) increase if tube is less than halffilled otherwise decrease

307. A body moves in a circular path of radius r = 500 m with tangential acceleration a_t = 2 m/s^2. When its tangential linear velocity is 30 m/s, the total acceleration will be:
a) 5.4 ms^{-2} b) 3.9 ms^{-2} c) 2.7 ms^{-2} d) 2.1 ms^{-2}

308. A hollow cylinder of mass Mand radius R is rotating about its axis of symmetry and a solid sphere of same mass and radius is rotating about an axis passing through its centre. If torques of equal magnitude are applied to them, then the ratio of angular accelerations produced is :
a) $\frac{2}{5}$ b) $\frac{5}{2}$ c) $\frac{5}{4}$ d) $\frac{5}{4}$

309. A fielder in a cricket match throws ball from the boundary line to the wicket keeper. The ball describes a parabolic path. Which of the following quantities remain constant during the motion in air? (Neglecting air resistance)
a) Kinetic energy b) Vertical component of velocity c) Horizontal component of velocity
d) Speed

310. Newton's second and third laws of motion lead to the conservation of:

a) linear momentum b) angular momentum c) potential energy d) kinetic energy
e) force

311. The moment of inertia of a ring of mass M and radius R about an axis, passing through the centre and perpendicular to the plane of the ring is:
a) $\frac{1}{2}MR^2$ b) MR^2 c) $\frac{1}{4}MR^2$ d) $\frac{3}{4}MR^2$

312. A mass of 2 kg is whirled in a horizontal circle by means of a string at an initial speed of 5 revolutions per minute. Keeping the radius constant, the tension in the string is doubled. The new speed is nearly:
a) 14 rpm b) 10 rpm c) 2.25 rpm d) 7 rpm

313. A ballet dancer, dancing on a smooth floor is spinning about a vertical axis with her arms folded with an angular velocity of 20 rad/s. When she stretches her arms fully, the spinning speed decrease in 10 rad/ s. If I is the initial moment of inertia of the dancer, the new moment of inertia is:
a) 2 I b) 3 I c) I/2 d) I/3

314. A particle starting from the origin (0, 0) moves in a straight line in the x, y-plane. Its co-ordinates at a later time are $(\sqrt{3},3\}$ The path of the particle makes with the x-axis an angle of:
a) 45° b) 60° c) 0° d) 30

315. 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 the lack of proper centripetal force
c) due to the rolling frictional force between the tyre and road
d) due to the reaction of the ground

316. A person is sitting in a lift accelerating upwards. Measured weight of the person will be:
a) less than actual weight b) equal to actual weight c) more than actual weight
d) none of these

317. The position of the centre of mass of a cube of uniform mass density will be at
a) the centre of one face b) the centre of the interaction of diagonals of one face
c) the geometric centre of the cube d) the edge of a cube

318. A body A of mass M while falling vertically downwards under gravity breaks into two parts; a body B of mass $\frac{1}{3}$ M and body C of mass $\frac{2}{3}$ M. The centre of mass of bodies B and C taken together shifts compared to that of body A towards:
a) body C b) body B c) depends on height of breaking d) does not shift

319. Two discs have same mass and same thickness. Their materials are of densities ρ_1 and ρ_2. The ratio of their moments of inertia about central axis will be:
a) $\rho_1\rho_2 : I$ b) $I : \rho_1\rho_2$ c) $\rho_1 : \rho_2$ d) $\rho_2 : \rho_1$

320. A stone of mass 1 kg is tied to the end of a string 1m long. It is whirled in a vertical circle. If the velocity of the stone at the top be 4 ms^{-1}, what is the tension in the string?
($g = 10m\ s^{-2}$)
a) 16 N b) 10 N c) 6 N d) 5 N

321. (A) The angle between vectors $\vec{A} \times B$ and $\vec{B} \times \vec{A}$ is π radian.

(R) $\vec{B} \times A = -\vec{A} \times \vec{B}$

a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

322. A solid sphere rolling on a surface has total kinetic energy given by:
a) $\frac{1}{2}mv^2$ b) $\frac{7}{5}mv^2$ c) $\frac{7}{10}mv^2$ d) $\frac{3}{10}mv^2$

323. A 1200 kg automobile rounds a level curve of radius 200 m, on an unbanked road, with a velocity of 72 km/h. The minimum coefficient of friction between the tyres and the road in order that the automobile may not skid is: ($g=10ms^{-2}$)
a) 0.3 b) 0.2 c) 0.6 d) 0.5

324. The time period of a simple pendulum of length '1' is measured in an elevator descending with acceleration $\frac{g}{3}$:
a) $2\pi\sqrt{\frac{3l}{2g}}$ b) $2\pi\sqrt{\frac{l}{g}}$ c) $2\pi\sqrt{\frac{2l}{3g}}$ d) $2\pi\sqrt{\frac{3l}{4g}}$

325. A particle covers equal distance around a circular path, in equal intervals of time. Which of the following quantities connected with the motion of the particle remains constant with time?
a) Displacement b) Velocity c) Speed d) Acceleration

326. A man weighing 80 kg, stands on a weighing scale in a lift which is moving upwards with a uniform acceleration of $5m/s^2$. What would be the reading on the scale?
a) 1200n b) 0 c) 400N d) 800N

327. The maximum velocity at which a truck can safely travel without toppling over, on a curve of radius 250 m (the height of the centre of gravity of the truck above the ground is 1.5 m and the distance: between the wheels is 1.5 m, the track being horizontal) is:
a) 30 ms^{-1} b) 35 ms^{-1} c) 40 ms^{-1} d) 45 ms^{-1}

328. A block of mass m is placed on a rough floor of a lift. The coefficient of friction between the block and the floor is μ When the lift falls freely, the block is pulled horizontally on the floor. What will be the force of friction?
a) μmg b) μmg/2 c) μmg d) None of these

329. A cylinder rolls down an inclined plane of inclination 30°, the acceleration of cylinder is:
a) g/3 b) g c) g/2 d) 2g/3

330. An astronaut accidentally gets separated out of his small spaceship accelerating in interstellar space at a constant rate of 100 m S^{-2}. What is the acceleration of the astronaut the instant after he is outside the spaceship?
(Assume that there are no nearby stars to exert gravitational force on him)
a) zero b) $10ms^{-2}$ c) 50 m S^{-2} d) 100 m S^{-2}

331. (A) When a man jumps from a boat to the shore, the boat slightly moves away from the shore.
(R) In absence of net force, the total momentum is conserved.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

332. (A) At the centre of the earth, a body has centre of mass,but no centre of gravity.
(R) Acceleration due to gravity is zero at the centre of the earth.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

333. A car is travelling at the rate of 70 km/h. Suddenly the brakes are applied causing the tyres to skid. How far will the car travel before coming to rest? (Given μ = 0.20)
a) 9.645 m b) 96.45 m c) 96.45 cm d) 964. 5 m

334. Four spheres of diameter 2a and mass M are placed with their centres on the four comers of a square of side b. Then the moment of inertia of the system about an axis along one of the sides of the square is:
a) $\frac{4}{5}Ma^2 + 2Mb^2$ b) $\frac{8}{5}Ma^2 + 2Mb^2$ c) $\frac{8}{5}Ma^2$ d) $\frac{4}{5}Ma^2 + 4Mb^2$

335. A man is standing on a weighing machine placed in a lift, when stationary, his weight is recorded as 40 kg. If the lift is accelerated upwards with an acceleration of 2m/s^2, then the weight recorded in the machine will be (g = 10m/s^2) :
a) 32 kg b) 40 kg c) 42 kg d) 48 kg

336. The potential energy for a conservative system is given by: U =ax^2 - bx the equilibrium position is given by:
a) x = 2ab b) x =$\frac{b}{2a}$ c) x = $\frac{2a}{b}$ d) x = $\sqrt{2ab}$

337. A uniform cylinder has radius R and length L.If the moment of inertia of this cylinder an axis passing through its center and normal to its circular face to the moment of inertia of the same cylinder about an axis passing through its center and normal to its length , then
a) L = R b) L = $\sqrt{3}$ c) $\frac{R}{\sqrt{3}}$ d) L = 0

338. (A) It will be much easier to accelerate a merry- go-round full of children if they stand close to its axis then if they all stand at the outer edge.
(R) For larger moment of inertia, the angular acceleration is small for given torque.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false d) If both assertion and reason are false
e) If assertion is false but reason is true

339. A particle is describing uniform circular motion. Its acceleration is:
a) along the radius of circular path pointing towards the centre
b) along the tangent to the circular path
c) along the radius of the circular path pointing away from the centre d) zero

340. The moment of inertia of a sphere is 20 kg-m^2 about the diameter. What is the moment of inertia about any tangent?

a) 25kg-m^2 b) 50kg-m^2 c) 70kg-m^2 d) 80kg-m^2

341. An object is kept on a smooth inclined plane of 1 in l. The horizontal acceleration to be imparted to the inclined plane so that the object is stationary relative to incline is:

a) $g\sqrt{l^2-1}$ b) $g\left(l^2-1\right)$ c) $\frac{g}{\sqrt{l^2-1}}$ d) $\frac{g}{l^2-1}$

342. (A) Mass of the projectile does not affect the maximum height.
(R) Heavier the body, greater is the force required to project it.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

343. A body is suspended from a smooth horizontal nail by a string of length 0.25 m. What minimum horizontal velocity should be given to it in the lowest position so that it may move in a complete vertical circle with the nail at the centre?
a) $\sqrt{12.25}ms^{-1}$ b) 4.9 ms^{-1} c) $7\sqrt{2}$ ms^{-1} d) $\sqrt{9.8}$ ms^{-1}

344. A light string passing over a smooth light pulley connects two blocks of masses m_l and m_2 (vertically). If the acceleration of system is $\frac{g}{8}$, then the ratio of masses is :
a) 8: 1 b) 9 : 7 c) 4: 3 d) 5 : 3

345. A particle is acted upon by a force of constant magnitude which is always perpendicular to the velocity of the particle, the motion of the particle takes place in a plane. It follows that:
a) its velocity is constant b) its acceleration is constant c) its kinetic energy is constant
d) it moves in a straight line

346. A mass is supported on a frictionless horizontal surface. It is attached to a string and rotates about a fixed centre at an angular velocity coo. If the length of the string and angular velocity are doubled, the tension in the string which was initially To, is now:
a) T_0 b) $T_0/2$ c) $4T_0$ d) $8T_0$

347. Two bodies of different masses of 2 kg and 4 kg are moving with velocities 2 m/s and 10 m/s towards each other due to mutual gravitational attraction. What is the velocity of their centre of mass?
a) 5 m/s b) 6 m/s c) 8 m/s d) Zero

348. An object is placed on the surface of a smooth inclined plane of inclination 8. It takes time t to reach the bottom. If the same object is allowed to slide down a rough inclined plane of inclination 8, it takes time nt to reach the bottom where n is a number greater than 1. The coefficient of friction Il is given by:

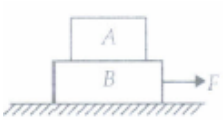
a) $\mu = tan\theta\left(1-\frac{1}{n^2}\right)$ b) $\mu = cot\theta\left(1-\frac{1}{n^2}\right)$ c) $\mu = tan\theta\sqrt{1-\frac{1}{n^2}}$ d) $\mu = cot\theta\sqrt{1-\frac{1}{n^2}}$

349. Assuming the gravity to be in negative Z-direction, a force $\vec{F} = \vec{v}x\vec{A}$ is exerted on a particle in addition to the force of gravity, where $\vec{v}$ is the velocity and $\vec{A}$ is a constant vector in positive X-direction. With what minimum speed a particle of mass m be projected so that it continues to

move un deflected with constant velocity?

a) $-\frac{A}{mg}\hat{j}$ b) $\frac{A}{mg}\hat{j}$ c) $-\frac{mg}{A}\hat{j}$ d) $\frac{mg}{A}\hat{j}$

350. In figure, the coefficient of friction between the floor and the block B is 0.1. The coefficient of friction between the blocks B and A is 0.2. The mass of A is m/2 and of B is m. What is the maximum horizontal force F which can be applied to the block B so that two blocks move together?



a) 0.15 mg b) 0.05 mg c) 0.1 mg d) 0.45 mg

351. (A) If earth shrinks to half its present size, length of the day would become 6 hours.
(R) As the size of the earth changes, its moment of inertia changes.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

352. The minimum force required to start pushing a body up a rough (frictional coefficient μ) inclined plane is F_1 while the minimum force needed to prevent it from sliding down is F_2. If the inclined plane makes an angle θ with the horizontal such that tanθ =2μ, then the ratio $\frac{F_1}{F_2}$ is

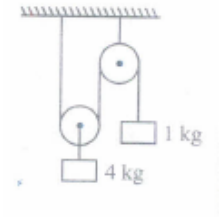
a) 4 b) 1 c) 2 d) 3

353. Two blocks of masses 5 kg and 2 kg are placed on frictionless surface and connected by a spring. An external kick gives a velocity of 14 mlsec to the heavier block in the direction of lighter one. The velocity gained by the centre of mass is:
a) $14ms^{-1}$ b) $7ms^{-1}$ c) $12ms^{-1}$ d) $10ms^{-1}$

354. The tangential component of acceleration of a particle in circular motion is due to:
a) speed of the particle b) change in the direction of velocity
c) change in the magnitude of velocity d) rate of change of acceleration

355. (A) The spokes near the top of a rolling bicycle wheel are more blurred than those near the bottom of the wheeL
(R) The spokes near the top of wheel are moving faster than those near the bottom of the wheel
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion isfalse but reason is true.

356. In the system shown in the figure, the acceleration of 1 kg mass is



a) $\frac{g}{4}$ downwards b) $\frac{g}{2}$ downwards c) $\frac{g}{2}$ upwards d) $\frac{g}{4}$ upwards

357. A rocket of mass 6000 kg is set for vertical firing. If the exhaust speed be 1 km/s, how much gas must be ejected to give the rocket an upward acceleration of 20 m s^{-2}? (Take g = 10 ms^{-2})
a) 45 kg/s b) 90 kh/s c) 120 kg/s d) 180 kg/s

358. A circular disc is rolling on a horizontal plane. Its total kinetic energy is 150 J. What is its translational KE?
a) 200 J b) 100 J c) 125 J d) None of these

359. An 80 kg person is parachuting and is experiencing a downward acceleration of 2.8 m/s'. The mass of the parachute is 5 kg. The upward force on the open parachute is (Take g = 9.8 m/s^2)
a) 595 N b) 675 N c) 456 N d) 925 N

360. (A) Rate of change of linear momentum is equal to external force.
(R) There is always equal and opposite reaction to every action.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

361. Moment of couple is called :
a) angular momentum b) force c) torque d) impulse

362. A particle is moving on a circular path of 10 m radius. At any instant of time, its speed is 5 m s^{-1} and the speed is increasing at a rate of 2 m s^{-2}. The magnitude of net acceleration at this instant is
a) 5 m s^{-2} b) 2 m s^{-2} c) 3.2 m s^{-2} d) 4.3 m s^{-2}

363. An athlete throws a discus from rest to a final angular velocity of 15 rad S^{-1} in 0.270 s before releasing it. During acceleration, discus moves a circular arc of radius 0.810 m. Acceleration of discus before it is released is
a) 45 m s^{-2} b) 182 m s^{-2} c) 187 m s^{-2} d) 192 m s^{-2}

364. Inertia is that property of a body by virtue of which the body is
a) unable to change by itself the state of rest
b) unable to change by itself the state of uniform motion
c) unable to change by itself the direction of motion.
d) unable to change by itself the state of rest or of uniform motion

365. A stone of mass 5 kg is tied to a string of length 10 m is whirled round in a horizontal circle. What is the maximum speed with which the stone can be whirled around if the string can withstand a maximum tension of 200 N?
a) 10 m S^{-1} b) 15 m S^{-1} c) 20 m S^{-1} d) 25 m S^{-1}

366. Assertion: No real body is truly rigid.
Reason : A rigid body is a body with a perfectly definite and unchanging shape.The distances between different pairs of particles of such a body do not change
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false

367. Four particles each of mass I kg are placed at the comers of a square of side 1 min X -Y plane.If the point of intersection of the diagonals of the square is taken as origin, the co-ordinates ofthe centre of mass are:
a) (1,1) b) (-1,1) c) (1,-1) d) (0,0)

368. A grindstone has a moment of inertia of 6 kg m2. A constant torque is applied and the grindstone is found to have a speed of 150 rpm, 10 seconds after starting from rest. The torque is :
a) 3π N m b) 3 N m c) $\frac{\pi}{3}$ N m d) 4π N m

369. Assertion: If external force on a body is zero, its acceleration is zero.
Reason: This is the simple form of Newton's second law of motion.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.

370. A block moves down a smooth inclined plane of inclination θ. Its velocity on reaching the bottom is v. If it slides down a rough inclined plane of same inclination, its velocity on reaching the bottom is v/n, .where n is a number greater than zero. The coefficient of friction Il is given by

a) $\mu = tan\theta\left(1-\frac{1}{n^2}\right)$ b) $\mu = cot\theta\left(1-\frac{1}{n^2}\right)$ c) $\mu = tan\theta\sqrt{1-\frac{1}{n^2}}$ d) $\mu = cot\theta\sqrt{1-\frac{1}{n^2}}$

371. A solid sphere of mass 2 kg rolls on a smooth horizontal surface at 10 m/s. It then rolls up a smooth inclined plane of inclination 30° with the horizontal. The height attained by the sphere before it stops, is:
a) 1.7 m b) 4.5 m c) 5.4 m d) 7.1 m

372. Which statement is wrong?
a) If a body is rotating around a circle with constant speed, its velocity is accelerating.
b) Force is conserved. c) Kirchhoff's law obeys conservation of charge.
d) When electron falls on lower orbit from higher orbit, energy is released.

373. The moment of inertia of a solid sphere about an axis passing through centre of gravity is $\frac{1}{5}MR^2$; then its radius of gyration about a parallel axis at a distance 2R from first axis is:
a) 5R b) $\sqrt{22/5}R$ c) $\frac{5}{2}R$ d) $\sqrt{12/5}R$

374. A wheel has radius 10 cm and it is coupled by a belt to another wheel of radius 30 em, The smaller wheel increases its speed from rest at a uniform rate of π: rad/ sec^2. After how much time will the speed of larger wheel become 100 rpm?

a) 2 s b) 5 s c) 10 s d) 20 s

375. A person of mass 60 kg is inside a lift of mass 940 kg and presses the button on control panel. The lift starts moving upwards with an acceleration 1.0m/s^2, If g =10m/s^{-2} the tension in the supporting cable is _____
a) 8600N b) 9680N c) 11000N d) 1200N

376. A rope of length 8 m and linear density 0.5 kg/m is lying lengthwise on a horizontal smooth floor. It is pulled by a force of 12 N. The tension at the mid-point would be :
a) 12 N b) 8 N c) 6 N d) 4 N

377. A heavy uniform chain lies on horizontal table top. If the coefficient of friction between the chain and the table stnface is 0.25, then the maximum friction of the length of the chain that can hang over one edge of the table is _____
a) 20% b) 25% c) 15% d) 35%

378. Two masses 2 kg and 3 kg are attached to the ends of the string passed over a pulley fixed at the top. The tension and acceleration in the string in terms of 'g' are:
a) $\left(\frac{7g}{8}, \frac{g}{8}\right)$ b) $\left(\frac{21g}{8}, \frac{g}{8}\right)$ c) $\left(\frac{21g}{8}, \frac{g}{5}\right)$ d) $\left(\frac{12g}{8}, \frac{g}{5}\right)$

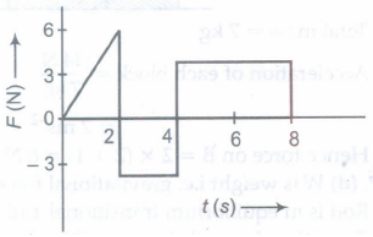
379. Two thin uniform circular rings each of radius 10 em and mass 0.1 kg are arranged such that they have common centre and their planes are perpendicular to each other. The moment of inertia of this system about an axis passing through common centre and perpendicular to the plane of either of the rings (in kg-m^2) is:
a) 1.5 x 10^{-3} b) 5 x 10^{-3} c) 15 x 10^{-4} d) 18 x 10^{-4}

380. A gun of mass 10 kg fires 4 bullets per second. The mass of each bullet is 20 kg and the velocity of the bullet when it leaves the gun is 300 m s^{-1} .The force required to hold the gun when firing is:
a) 6 N b) 8 N c) 24 N d) 240 N

381. (A) In uniform circular motion, magnitude of acceleration is v^2/R and direction is always towards the centre.
(R) In uniform circular motion, acceleration is constant.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

382. If vector $\vec{F}$ be a force acting on a particle having the position vector $\vec{r}$ and $\vec{\tau}$ be the torque of this force about the origin, then:
a) $\vec{r}.\vec{\tau} = 0 \; and \; \vec{F}.\vec{\tau} = 0$ b) $\vec{r}.\vec{\tau} = 0 \; and \; \vec{F}.\vec{\tau} \neq 0$ c) $\vec{r}.\vec{\tau} \neq 0 \; and \; \vec{F}.\vec{\tau} \neq 0$ d) $\vec{r}.\vec{\tau} \neq 0 \; and \; \vec{F}.\vec{\tau} \; 0$

383. 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 :



a) 12 Ns b) 6 Ns c) 24 Ns d) 20 Ns

384. A homogeneous chain of length L lies on a table. The coefficient of friction between the chain and the table is u. The maximum length which can hang over the table in equilibrium is:

a) $\left(\frac{\mu}{\mu+1}\right)L$ b) $\left(\frac{1-\mu}{\mu}\right)L$ c) $\left(\frac{1-\mu}{1+\mu}\right)L$ d) $\left(\frac{2\mu}{\mu+1}\right)L$

385. (A) If the ice on the polar caps of the earth melts, then length of day will increase.
(R) Moment of inertia of earth increases as ice on polar caps melts.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If assertion is true but reason is false.
e) If assertion is false but reason is true.

386. (A) The sum of squares of cosines of angle made by a vector with X, Y and Z axes is equal to unity.
(R) A vector makes 45° from X-axis have equal components along X and Y-axes.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

387. The direction of motion of body with the horizontal at this instant is:
a) $\tan^{-1}(2)$ b) $\tan^{-1}(1/2)$ c) 45° d) 0°

388. Torque applied on a particle is zero, then its angular momentum will be:
a) equal in direction b) equal in magnitude c) both (a) and (b) d) neither (a) nor (b)

389. The outer rail of the curved railway track is raised above the inner one:
a) to provide centripetal force b) to overcome the frictional force c) to balance the gravity
d) for some reason other than those mentioned above

390. A bird is sitting in a large closed cage which is placed on a spring balance. It records a weight placed on a spring balance. It records a weight of 25 N. he bird (mass = 0.5 kg) flies upward in the cage with an acceleration of $2 m/s^2$.The spring balance will now record a weight of:
a) 24 N b) 25 N c) 26 N d) 27 N

391. Which of the following statements about the centripetal and centrifugal forces is correct?
a) Centripetal force balances the centrifugal force.
b) Both centripetal force and centrifugal force act on the same body.

c) Centripetal force is directed opposite to the centrifugal force.

d)

Centripetal force is experienced by the observer at the centre of the circular path described by the body.

392. (A) The relative angular velocity between any two points of a rigid body is zero at any instant.
(R) There is no relative velocity between the points of a rigid body.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion isfalse but reason is true.

393. If the length of the second's hand in a stop-clock is 3 em, the angular velocity and linear velocity of the tip is:
a) 0.2047 $rads^{-1}$,0.0314ms^{-1} b) 0.2547 $rads^{-1}$,0.314ms^{-1} c) 0.1472 $rads^{-1}$,0.06314ms^{-1}
d) 0.1047 $rads^{-1}$,0.00314ms^{-1}

394. Ball bearings are used to:
a) convert static to dynamic friction b) convert limiting friction to dynamic friction
c) convert sliding friction to rolling friction d) convert rolling friction to fluid friction

395. Two particles starting from a point on a circle of radius 4 m in horizontal plane move along the circle with constant speeds of 4 ms^{-1} and 6 ms^{-1} respectively in opposite directions. The particles will collide with each other after a time of:
a) 3.0 s b) 2.5 s c) 2.0 s d) 1.5 s e) 3.5 s

396. A motor cyclist rides around the well with a round vertical wall and does not fall down while riding because
a) the force of gravity disappears b) he loses weight some how.
c) he is kept in this path due to the force exerted by surrounding air.
d) the frictional force of the wall balances his weight.

397. Angular momentum L and rotational kinetic energy K_R of a rigid body are related to each other by the relation. (I = moment of inertia)
a) K_R =2IL b) $K_R = \frac{L^2}{2I}$ c) $K_R = \frac{2I}{L}$ d) $K_R \frac{L^2}{I}$

398. When a sphere of moment of inertia 1 about an axis through its centre of mass and of mass M rolls from rest down an inclined plane without slipping, its KE is:
a) $\frac{1}{2}I\omega^2$ b) $\frac{1}{2}Mv^2$ c) $I\omega + Mv$ d) $\frac{1}{2}I\omega^2 + \frac{1}{2}Mv^2$

399. An electric fan is placed on a stationary boat and air is blown with it on the sail of the boat. Which of the following statements is correct?
a) The boat will remain stationary as before.
b) The boat will be uniformly accelerated in the direction of the flow of the air.
c) The boat will start moving with uniform speed.
d) The boat will be uniformly accelerated opposite to the direction of flow of air.

400. A uniform metal chain is placed on a rough table such that one end of it hangs down over the edge of the table. When one-third of its length hangs over the edge, the chain starts sliding. Then, the coefficient of static friction is:

a) $\frac{3}{4}$ b) $\frac{1}{4}$ c) $\frac{1}{4}$ d) $\frac{1}{2}$

401. (A) A ring and a disc of same mass and radius begin to roll without slipping from the top of and inclined surface at t =(1 The ring reaches the bottom of incline at time t_1 while the disc reaches the bottom at time t_2, then $t_1 > t_2$
(R) Disc will roll down the plane with a large acceleration because of its smaller moment of inertia.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion isfalse but reason is true.

402. (A) Pseudo force is an imaginary force which is recognized only by a non-inertial observer to explain the physical situation according to Newton's laws.
(R) Pseudo force has no physical origin, that is it is not caused by one of the basic interactions in nature. It does not exist in the action- reaction pair.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true

403. (A) A solid sphere is rolling on a rough horizontal surface. Tangential acceleration of contact point is zero.
(R) For contact point, tangential acceleration is given by at = a_{cm} - αR = 0,
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If assertion is true but reason is false.
e) If assertion is false but reason is true.

404. (A) Moment of inertia of a rigid body is a tensor quantity.
(R) Moment of inertia of a body always occurs due to tensile effects produced in the body.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

405. A particle of mass m is revolving in a horizontal circle of radius r with constant angular speed ω. The areal velocity of the particle is:
a) $r^2\omega$ b) $r^2\theta$ c) $\frac{r^2\omega}{2}$ d) $\frac{r\omega^2}{2}$

406. If a block moving up at θ=30° with a velocity 5m/s, stops after 0.5sec, then μ is
a) 0.5 b) 1.25 c) 0.6 d) none of the above

407. A truck is moving on a frictionless surface with uniform velocity of 10 m/s. A leak occurs in the water tank of the truck at the rate of 2 kg/so What is the speed of truck after 50 s, if the mass of the truck is 100 kg and mass of water in the truck initially was 100 kg?
a) 20 m/s b) 10 m/s c) 5 m/s d) None of these

408. (A) The work done, in bringing a body down from the top to the base along a frictionless inclined plane, is the same as the work done in bringing it down the vertical circle.
(R) The gravitational force on the body along the inclined plane is the same as that along the vertical circle.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

409. A man weighing 60 kg is standing on a trolley weighing 240 kg. The trolley is resting on frictionless horizontal rails. If the man starts walking on the trolley along the rails at speed 1 m/s, then after 4 seconds, his displacement relative to the ground will be:
a) 6 m b) 4.8 m c) 3.2 m d) 2.4 m

410. The string of a pendulum of length I is displaced through 90° from the vertical and released. Then, the minimum strength of the string in order to withstand the tension as the pendulum passes through the mean position is:
a) mg b) 3mg c) 5mg d) 6mg

411. (A) Inertia and moment of inertia are same quantities.
(R) Moment of inertia represent the capacity of a rigid body to oppose its state of translatory motion.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

412. The force $7\hat{i} - 3\hat{j} - 5\hat{k}$ acts on a particle whose position vector is $\hat{i} - \hat{j} + \hat{k}$ What is the torque of a given force about the origin?
a) $2\hat{i} + 12\hat{j} + 10\hat{k}$ b) $2\hat{i} + 10\hat{j} + 12\hat{k}$ c) $2\hat{i} + 10\hat{j} + 10\hat{k}$ d) $10\hat{i} + 2\hat{j} + \hat{k}$

413. A ball is projected from the ground at a speed of 10 ms-I making an angle of 30° with the horizontal. Another ball is simultaneously released from a point on the vertical line along the maximum height of the projectile. The initial height of the second ball is: (Take g = $10ms^{-2}$)
a) 6.25 m b) 2.50 m c) 3.75 m d) 5 m

414. An electric fan has blades oflength 30 cm as measured from the axis of rotation. If the fan is rotating at 1200 rpm, the acceleration of a point on the tip of a blade is about:
a) 4740 m/sec/^{2} b) 5055 m/sec^2 c) 1600 m/sec^2 d) 2370 m/sec^2

415. A body is just being revolved in a vertical circle of radius R with a uniform speed. The string breaks when the body is at the highest point. The horizontal distance covered by the body after the string breaks is:

a) 2 R b) R c) R√2 d) 4 R

416. Frictional force increases when surfaces in contact are made very-very smooth. This is because :
a) of molecular forces b) of decrease in surface area c) of decrease in irregularities
d) increase in area

417. (A) Pulling a lawn roller is easier than pushing it.
(R) Pushing increases the apparent weight and hence friction.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

418. A hoop of radius 2 m weighs 100 kg. It rolls along a horizontal floor so that its centre of mass has a speed of 20 cm s^{-1}. How much work has to be done to stop it?
a) 2 J b) 4 J c) 6 J d) 8 J

419. pendulum of length l= 1m is released from 80 = 60° . The rate of change of speed of the bob at θ = 30° is: (g = 10 m/s^2)
a) 5√5 m/s^2 b) 5 m/s^2 c) 10 m/s^2 d) 2.5 m/s^2

420. (A) If polar ice cap melts, the day will be shortened.
(R) Angular momentum of earth about its own rotation axis is conserved
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

421. A 60 kg man stands on a spring scale in the lift. At some instant he finds, scale reading has changed from 60 kg to 50 kg for a while and then comes back to the original mark. What should we conclude?
a) The lift was in constant motion upwards. b) The lift was in constant motion downwards
c) The lift while in constant motion upwards, is stopped suddenly.
d) The lift while in constant motion downwards, is suddenly stopped

422. Vehicle of mass 1500 kg is moving along a curved path of length 314 m with a speed of 20 ms^{-1} Ifit takes a turn of 90°, the centripetal force needed by the vehicle is:
a) 1000 N b) 2000 N c) 3000 N d) 4000 N

423. Which one of the following can also act as a lubricant in the machines?
a) Iron fillings b) Polish on machines c) Flow of water through the machine
d) Flow of compressed and purified air.

424. (A) As the frictional force increases, the safe velocity limit for taking a turn on an unbanked road also increases.
(R) Banking of roads will increase the value of limiting velocity.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

425. A body is moving up an inclined plane of angle θ with an initial kinetic energy E. The coefficient of friction between the plane and the body is μ The work done against friction before the body comes to rest is:
a) $\frac{\mu cos\theta}{Ecos\theta+sin\theta}$ b) μEcosθ c) $\frac{\mu Ecos\theta}{\mu cos\theta-sin\theta}$ d) $\frac{\mu Ecos\theta}{\mu cos\theta+sin\theta}$

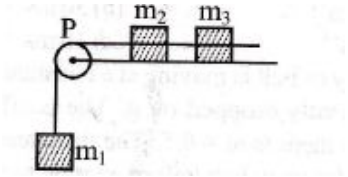
426. A ball rolls-off the top of stairway with a horizontal velocity of magnitude 1.8 m/s. The steps are 0.20 m high and 0.20 m wide. Which step will the ball hit first?
a) First b) Second c) Third d) Fourth

427. Figure shows the position-time (x-t) graph of one dimensional motion of a body of mass 500 g. What is the time interval between two consecutive impulses received by the body?

a) 2 s b) 4 s c) 6 s d) 8 s

428. A tube of length L is filled completely with an incompressible liquid of mass M and closed at both the ends. The tube is then rotated in a horizontal plane about one of its ends with a uniform angular velocity ω. The force exerted by the liquid at the other end is:
a) $M\omega^2L$ b) $\frac{1}{2}M\omega^2L$ c) $2M\omega^2L$ d) none of these

429. A system consists of three masses m_1, m_2 and m_3 connected by a string passing over a pulley p. The mass m_1 hangs freely and m_2 and m_3 are on a rough horizontal table (the coefficient of friction : m. The pulley is frictionless and of negligible mass. The downward acceleration of mass m_1 is _____
(Assume $m_1= m_2= m_3 = m$)



a) $\frac{g(1-g\mu)}{g}$ b) $\frac{2g\mu}{3}$ c) $\frac{g(1-2\mu)}{3}$ d) $\frac{g(1-2\mu)}{2}$

430. The average acceleration vector (taken over a full circle) for a particle having a uniform circular motion is:
a) a constant vector of magnitude $\frac{v^2}{r}$ b) a null vector
c) a vector of magnitude $\frac{v^2}{r}$ directed normal to the plane of the given uniform circular motion
d) equal to the instantaneous acceleration vector

431. A body takes $1\frac{1}{3}$ times as much time to slide down a rough inclined plane as it takes to slide down an identical but smooth inclined plane. If the angle of inclined plane is 45°, the coefficient of friction is:
a) $\frac{7}{16}$ b) $\frac{9}{16}$ c) $\frac{7}{9}$ d) $\frac{3}{4}$

432. Two rotating bodies A and B of masses m and 2m with moments of inertia I_A and I_B ($I_B > I_A$) have equal kinetic energy. of rotation. If L_A and L_B be their angular momenta respectively, then :

a) $L_A > L_B$ b) $L_A = \frac{L_B}{2}$ c) $L_A = 2L_B$ d) $L_B > L_A$

433. A car is moving with a speed of 10 ms $^{-1}$ on a concave road of radius 100 m. If the mass of the car is 700 kg, then the reaction on the car tyres when it is at the lowest position will be:

a) 4560 N b) 5560 N c) 6560 N d) 7560 N

434. A body of mass m slides down a rough plane of inclination α if μ is the coefficient offriction, then acceleration of the body will be:

a) g sin α b) μ cos a c) g (sin α - μ cos α) d) g (cos α - μ sin α)

435. (A) When a particle is thrown obliquely from the surface of the earth, it always moves in a parabolic path, provided the air drag is negligible.

(R) A projectile motion is a three dimensional motion.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b)

If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If both assertion and reason are false.

e) If assertion is false but reason is true.

436. Two bodies of equal masses revolve in circular orbits of radii R_1 and R_2 with the same period. Their centripetal forces are in the ratio:

a) $\left(\frac{R_2}{R_1}\right)^2$ b) $\frac{R_1}{R_2}$ c) $\left(\frac{R_1}{R_2}\right)^2$ d) $\sqrt{R_1 R_2}$

437. (A) The trajectory of projectile in XY -plane is quadratic in x and linear in y if x is horizontal.

(R) j-coordinate of trajectory is independent of x-coordinate.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b)

If both assertion and reason are true but reason is not the correct explanation of assertion.

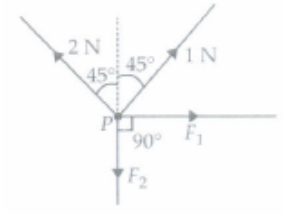
c) If assertion is true but reason is false. d) If both assertion and reason are false.

e) If assertion is false but reason is true.

438. A circular disc A of radius r is made from an iron plate of thickness 1 and another circular disc B of radius 4r and thickness 1/4. The relation between moments of inertia I_A and I_B is:

a) $I_A > I_B$ b) $I_A = I_B$ c) $I_A < I_B$ d) depends on the actual values of 1 and r

439. There are four forces acting at a point P produced by strings as shown in figure, which is at rest. The forces F_1 and F_2 are



a) $\frac{1}{\sqrt{2}}N, \frac{3}{\sqrt{2}}N$ b) $\frac{3}{\sqrt{2}}N, \frac{1}{\sqrt{2}}N$ c) $\frac{1}{\sqrt{2}}N, \frac{1}{\sqrt{2}}N$ d) $\frac{3}{\sqrt{2}}N, \frac{3}{\sqrt{2}}N$

440. The resultant of two forces, one double the other in magnitude, is perpendicular to the smaller of the two forces. The angle between the two forces is:
a) 60° b) 120° c) 150^0 d) 90°

441. A monkey climbs up and another monkey climbs down a rope hanging from a tree with same uniform acceleration separately. If the respective masses of monkeys are in the ratio 2 : 3, the common acceleration must be:
a) g/5 b) 6g c) g/2 d) g e) g/3

442. (A) On an un banked road, as the frictional force increases, the safe velocity limit for taking a turn also increases.
(R) Banking of roads will increase the value of limiting velocity.
a) If both assertion and reason are true and reason is the correct explanation of assertion.
b)
If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false.
e) If assertion is false but reason is true.

443. A mass of 1 kg is suspended by a thread. It is
1. Lifted up with an acceleration 4.9 m/s^2,
2. lowered with an acceleration 4.9 m/s^2.
The ratio of the tensions is _____
a) 3:1 b) 1:3 c) 1:2 d) 2:1

444. (A) When a body dropped from a height, explodes in mid-air, its centre of mass keeps moving in vertically downward direction.
(R) Explosion occur under internal forces only.
a) If assertion is true but reason is false. b) If both assertion and reason are false.
c) If assertion is false but reason is true.
d) If both assertion and reason are true and reason is the correct explanation of assertion.
e)
If both assertion and reason are true but reason is not the correct explanation of assertion.

445. A block has been placed on an inclined plane with the slope angle θ, block slides down the plane at constant speed. The coeflicient of kinetic friction is equal to _____
a) $\sin\theta$ b) $\cos\theta$ c) g d) $\tan\theta$

446. The potential energy at the equilibrium position is, the equilibrium is :
a) unstable b) stable c) neutral d) none of these

447. A wheel of mass 5 kg and radius 0.40 m is rolling on a road without sliding with angular velocity 10 rad s^{-1}. The moment of inertia of the wheel about the axis of rotation is 0.65 kg m^2 The percentage of kinetic energy of rotation in the total kinetic energy of the wheel is
a) 22.4 % b) 11.2 % c) 88.8 % d) 44.8 %

448. (A) A solid sphere and ring of same mass and radius are released simultaneously from the top of an inclined surface. The two objects roll down the plane without slipping. They reach the bottom of the incline with equal linear speeds.
(R) Loss of potential energy for both is the different.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b)

If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false. d) If assertion is true but reason is false.

e) If assertion isfalse but reason is true.

449. Point masses 1, 2, 3 and 4 kg are lying at the points (0, 0, 0), (2, 0, 0), (0, 3, 0) and (-2, - 2, 0) respectively. The moment of inertia of this system about x-axis will be:

a) 43 kg-m^2 b) 34 kg-m^2 c) 27 kg-m^2 d) 72 kg-m^2

450. A car of mass m starts from rest and acquires a velocity along east $\vec{v} = v\hat{i}$ (v > 0) in two seconds. Assuming the car moves with uniform acceleration, the force exerted on the car is

a) $\frac{mv}{2}$ eastward and is exerted by the car engine

b) $\frac{mv}{2}$ eastward and is due to the friction on the tyres exerted by the road.

c) more than $\frac{mv}{2}$ eastward exerted due to the engine and overcomes the friction of the road.

d) $\frac{mv}{2}$ exerted by the engine.