QB365 Question Bank Software Study Materials

Motion of System of Particles and Rigid Bodies 50 Important 1 Marks Questions With Answers (Book Back and Creative)

11th Standard

Physics

Total Marks : 50

Multiple Choice Question

50 x 1 = 50

1) The center of mass of a system of particles does not depend upon,

(a) position of particles (b) relative distance between particles (c) masses of particles **(d) force acting on particle**

2) A couple produces,

(a) pure rotation (b) pure translation (c) rotation and translation (d) no motion

3) A particle is moving with a constant velocity along a line parallel to positive X-axis. The magnitude of its angular momentum with respect to the origin is

(a) zero (b) increasing with x (c) decreasing with x **(d) remaining constant**

4) A rope is wound around a hollow cylinder of mass 3 kg and radius 40 cm. What is the angular acceleration of the cylinder if the rope is pulled with a force 30 N?

(a) 0.25 rad s^{-2} **(b) 25 rad s^{-2}** (c) 5 ms^{-2} (d) 25 ms^{-2}

5) A closed cylindrical container is partially filled with water. As the container rotates in a horizontal plane about a perpendicular bisector, its moment of inertia

(a) increases (b) decreases (c) remains constant (d) depends on direction of rotation

6) A rigid body rotates with an angular momentum L. If its kinetic energy is halved, the angular momentum becomes,

(a) L (b) L/2 (c) 2L **(d) $L/\sqrt{2}$**

7) A particle undergoes uniform circular motion. The angular momentum of the particle remain conserved about,

(a) the center point of the circle (b) the point on the circumference of the circle (c) any point inside the circle (d) any point outside the circle

8) A disc of the moment of inertia I_a is rotating in a horizontal plane about its symmetry axis with a constant angular speed ω. Another disc initially at rest of moment of inertia I_b is dropped coaxially on to the rotating disc. Then, both the discs rotate with the same constant angular speed. The loss of kinetic energy due to friction in this process is,

(a) $\frac{1}{2}\frac{I_b^2}{2(I_a+I_b)}\omega^2$ (b) $\frac{I_b^2}{(I_a+I_b)}\omega^2$ (c) $\frac{(I_b-I_a)^2}{(I_a+I_b)}\omega^2$ **(d)** $\frac{1}{2}\frac{I_bI_b}{(I_a+I_b)}\omega^2$

9) From a disc of radius R a mass M, a circular hole of diameter R, whose rim passes through the center is cut. What is the moment of inertia of the remaining part of the disc about a perpendicular axis passing through it

(a) $15MR^2/32$ **(b) $13MR^2/32$** (c) $11MR^2/32$ (d) $9MR^2/32$

10) The ratio of the acceleration for a solid sphere (mass m and radius R) rolling down an incline of angle θ without slipping and slipping down the incline without rolling is,

(a) 5: 7 (b) 2: 3 (c) 2: 5 (d) 7: 5

11) The speed of a solid sphere after rolling down from rest without sliding on an inclined plane of vertical height h is,

(a) $\sqrt{\frac{4}{3}gh}$ **(b)** $\sqrt{\frac{10}{7}gh}$ (c) $\sqrt{2gh}$ (d) $\sqrt{\frac{1}{2}gh}$

12) The speed of the center of a wheel rolling on a horizontal surface is v_o. A point on the rim in level with the center will be moving at a speed of,

(a) zero (b) v_o **(c) $\sqrt{2}v_o$** (d) $2v_o$

13) Two discs of same moment of inertia rotating about their regular axis passing through center and perpendicular to the plane of the disc with angular velocities ω_1 and ω_1. They are brought in to contact face to face coinciding with the axis of rotation. The expression for loss of energy during this process is

(a) $\frac{1}{4}I(\omega_1-\omega_2)^2$ (b) $I(\omega_1-\omega_2)^2$ (c) $\frac{1}{8}I(\omega_1-\omega_2)^2$ (d) $\frac{1}{2}I(\omega_1-\omega_2)^2$

14) When a mass is rotating in a plane about a fixed point, its angular momentum is directed along

(a) a line perpendicular to the plane of rotation (b) the line making an angle of 45° to the plane of rotation

(c) the radius (d) tangent to the path

15) A round object of mass M and radius R rolls down without slipping along an inclined plane. The fractional force,

(a) dissipates kinetic energy as heat (b) decreases the rotational motion

(c) decreases the rotational and transnational motion **(d) converts transnational energy into rotational energy**

16) The angular momentum of a system of particles is conserved _____.

(a) When no external force acts upon the system **(b) When no external torque acts upon the system**

(c) When no external impulse acts upon the system (d) When axis of rotation remains same

17) The angular momentum of a rotating body is doubled, its K.E. of rotation becomes _____

(a) Two times **(b) Four times** (c) Halved (d) Eight times

18) Which of the following has largest M.I _____.

(a) Ring about its axis perpendicular to its plane (b) Disc about its axis perpendicular to its plane (c) Solid sphere

(d) Bar magnet

19) A ball rolls without slipping. The radius of gyration of the ball about an axis passing through its center of mass is K. If radius of the ball be R, then the fraction of total energy associated with its rotational energy be _____.

(a) $\frac{k^2+r^2}{R^2}$ **(b)** $\frac{R^2}{k^2+r^2}$ (c) $\frac{k^2}{R^2}$ (d) $\frac{K^2}{k^2+r^2}$

20) A sphere of radius r is rolling without sliding. What is ratio of rotational K.E and total K.E associated with the sphere?

(a) 2/5 **(b) 2/7** (c) 1 (d) 1/2

21) A circular disc is to be made by using iron and aluminium so that it acquires maximum moment of inertia about geometrical axis. It is possible with _____.

(a) aluminium at interior and iron surround to it (b) iron at interior and aluminium surround to it

(c) Using iron and aluminium layers in alternate order

(d) Sheet of iron is used at both external surfaces and aluminium sheet as internal layers.

22) Moment of inertia does not depend upon _____.

(a) distribution of mass (b) axis of rotation **(c) point of application of force** (d) none of these

23) Moment of inertia of an object does not depend upon _____.

(a) mass of object (b) mass distribution **(c) angular velocity** (d) axis of rotation

24) The centre of mass of a system of particles does not depend on _____.

(a) position of the particles (b) relative distance between the particles (c) masses of the particles

(d) forces acting on the particles

25) A solid sphere is rotating in free space. If the radius of the sphere is increased keeping mass same, which one of the following will not be affected?

(a) Moment of inertia **(b) Angular momentum** (c) Angular velocity (d) Rotational kinetic energy

26) Kgm^2 is the unit for _____ of a body.

(a) momentum (b) mass **(c) moment of inertia** (d) inertia

27) A solid sphere rolls down an inclined plane of height h without slipping. The velocit y of the sphere when it reaches the bottom is _____.

(a) $\sqrt{gh}$ **(b)** $\sqrt{\frac{10}{7}gh}$ (c) $\sqrt{\frac{7}{10}gh}$ (d) $\sqrt{\frac{10}{3}gh}$

28) The angular velocity of a fly wheel changes with time as $\omega = p = qt$ where p and q are constants. The angle through which it turns before it comes to rest is _____.

(a) q/p **(b) $p^2/2q$** (c) $q^2/2p$ (d) p/q

29) A symmetrical body is rotating about its axis of symmetry. If its angular momentum is doubled its kinetic energy of rotation becomes _____.

(a) two times **(b) four times** (c) eight times (d) halved

30) A solid cylinder of mass M and radius R rolls without slipping down an inclined plane of length L and height h. What is the speed of its centre of mass when the cylinder reaches its bottom?

(a) $\sqrt{2gh}$ (b) $\sqrt{\frac{3}{4}gh}$ **(c)** $\sqrt{\frac{4}{3}gh}$**.** (d) $\sqrt{4gh}$

31) A solid spherical ball rolls on a table. Ratio of its rotational kinetic energy to total kinetic energy is _____.

(a) $\frac{1}{2}$ (b) $\frac{1}{6}$ (c) $\frac{7}{10}$ **(d)** $\frac{2}{7}$

32) A fly wheel rotating about fixed axis has a kinetic energy of 360 joule when its angular speed is 30 radian/sec, The moment of inertia of the wheel about the ax is of rotation is _____.

(a) 0.6 kgm^2 (b) 0.15 kgm^2 **(c) 0.8 kgm^2** (d) 0.75 kgm^2

33) A circular platform is mounted on a frictionless vertical axle. Its radius R = 2 m and its moment of inertia about the axle is 200 kgm^2. It is initially at rest. A 50 kg man stands on the edge of the platform and begins to walk along the edge at the speed of 1 ms^{-1} relative to the ground. Time taken by the man to complete one revolution is _____.

(a) πs (b) $\frac{3\pi}{2}s$ **(c)** $2\pi s$ (d) $\frac{\pi}{2}s$

34) A gramophone record is revolving with an angular velocity ω. A coin is placed at a distance r from the centre of the record. The static coefficient of friction is μ. The coin will revolve with the record if _____.

(a) $r = \mu g\omega^2$ (b) $r =< \frac{\omega^2}{\mu g}$ **(c)** $r =\leq \frac{\mu g}{\omega^2}$ (d) $r =\geq \frac{\mu g}{\omega^2}$

35) In pure rolling, the velocity of the point of the rolling object which comes in contact with the surface is _____.

(a) maximum (b) minimum **(c) zero** (d) $2V_{CM}$

36) Sliding of the object occurs when _____.

(a) V_{trans}rot (b) $V_{trans}=V_{rot}$ **(c) $V_{trans} > V_{rot}$** (d) $V_{trans}=0$

37) In sliding, the resultant velocity of a point of contact acts along _____.

(a) forward direction (b) backward direction (c) either (a) or (b) (d) tangential direction

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

39) Center of mass may lie _____.

(a) within the body (b) outside the body **(c) both (a) and (b)** (d) only at the centre

40) While negotiating a circular level road a cyclist has to bend by an angle θ from vertical to stay in an equilibrium is _____.

(a) $tan\theta = \frac{rg}{r^2}$ **(b)** $\theta = tan^{-1}(\frac{v^2}{rg})$ (c) $\theta = sin^{-1}(\frac{rg}{r^2})$ (d) zero

41) A circular plate of diameter 10 cm is kebt in contact with a square plate of side 10cm. The density of the material and the thickness are same everywhere. The centre of mass of the system will be _____.

(a) inside the circular plate **(b) inside the square plate** (c) At the point of contact (d) outside the system

42) A raw egg and hard boiled egg are made to spin on a table with the same angular speed about the same axis. The ratio of the time taken by the eggs to stop is _____.

(a) =1 (b) < 1 (c) > 1 **(d) none of these**

43) An isolated particle of mass m is moving in horizontal plane (x-y) along the axis at a certain height above the ground. It suddenly explodes into two fragments of masses $\frac{m}{4} and \frac{3m}{4}$. An instant later the smaller fragment is at $y = \pm 15$ cm. The larger fragment at this instant is at _____.

(a) y = -5cm (b) y = -20cm (c) y= +5cm (d) y = +20cm

44) The motion of planets in the solar system is an example for the conservation of

(a) energy (b) mass (c) linear momentum **(d) angular momentum**

45) A solid sphere is rotated in free space. If the radius of the sphere is increased keeping mass some, which one of the following will not be affected?

(a) angular velocity **(b) angular momentum** (c) kinetic energy (d) moment of inertia

46) A fan of moment of inertia 0.6 kgm^2 is turned up to a working speed of 0.5 rps. The angular moment of the fan is _____ $kgm^{-2}s^{-1}$

(a) 0.6π (b) 3 (c) 6 (d) $\frac{\pi}{6}$

47) The moment of inertia of a body about a given axis is 1.2 kgm^2. Initially the body is at rest. In order to produce a rotational Kinetic energy of 1500 J, an angular acceleration of 25 rad s^{-2} must be applied about the axis for a duration of

(a) 4s **(b) 2s** (c) 8s (d) 10s

48) The angular momentum changes from 2 units to 6 units in 4S. The torque is _____unit.

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

49) If a disc shots from top to bottom of an inclined plane, it takes time t_1. If it rolls, it takes time t_2. now $\frac{t_2^2}{t_t^2}$ is

(a) 1/2 (b) 2/3 **(c) 3/2** (d) 2/5

50) A rod of length 1 m and mass 1/2 kg rotates at angular velocity 6 $rads^{-1}$ about one of its ends. The kinetic energy of the rod is_____J.

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