MOTION IN TWO AND THREE DIMENSOIONS

Exercise problems

1) A particle is acted upon by a force of constant magnitude which is always normal to velocity of particle. The motion of particle is in plane. Then its
   a) velocity as well as acceleration are constant
   b) velocity is constant
   c) acceleration is constant
   d) Kinetic energy is constant.

2) A body moving in circular motion with constant speed has
   a) constant velocity
   b) constant displacement
   c) constant kinetic energy
   d) Constant acceleration.

3) When a body moves with a constant speed along a circle.
   a) Its velocity remains constant
   b) no force acts on it
   c) No work is done on it
   d) no acceleration is produced in it.

4) Taking air resistance to be effective, which out of the following may increase in the projectile?
   a) Maximum height
   b) Rage
   c) Speed of strike
   d) Angle of strike

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

2) At the top of the parabolic trajectory of a projectile, the acceleration is
   a) Maximum b) minimum c) zero d) g

3) The linear velocity and acceleration of a particle moving in a circular motion are related as
   a) Both in the same direction
   b) Normal to each other
   c) Both in the opposite direction
   d) Independent of each other

4) A particle projected from earth with speed u and angle with ground θ covers range R. The new range for same u and θ at moon is
   a) R b) 6R c) R/6 d) 13.6R

5) Which out of these does not affect the maximum height of projectile?
   a) mass of the projectile b) angle of projection c) acceleration of projectile d) velocity of projection

6) The range of projectile projected at angle of 15^0 with the horizontal is 1.5 km. The range of the projectile projected at an angle 45^0 to the horizontal is
   a) 1.5 km b) 3 km c) 6 km d) 0.75 km

7) Maximum height of a bullet when fired at 30^0 with the horizontal is 11 m. Then height when it is fired at 60^0 is.
   a) 7.8 m b) 6 m c) 33 m d) 22 m

8) A stone of mass 1 kg tied to the end of a string of length 1 m, is whirled in a horizontal circle with a uniform angular velocity 2 radian/sec. The tension of the string is (N)
   a) 4 b) 1/4 c) 2 d) 1/2

9) Range or a projectile is R. when the angle of projection is 30^0. Then, the value or the other angle of projection for the same range, is
   a) 50^0 b) 40^0 c) 35^0 d) 60^0

10) An aeroplane is flying with a uniform speed of 100 kmph along the circumference of a circle. The change in velocity in half the revolution will be (in kmph)

a) 200 b) 100 c) 150 d) 300

11) A projectile is moving at 20 m/s at its highest point, where it breaks into two equal parts due to an internal explosion. One moves vertically up at 30 m/s with respect to the ground. Then the other part will move at
a) $10\sqrt{13}$ m/s b) 20 m/s c) 30 m/s d) 50 m/s

12) A ball is projected at an angle 45^0 to the horizontal. If the horizontal range is 20 m, the maximum height to which the ball rises is ($g=10\ m/s^2$)
a) 2.5 m b) 5.0 m c) 7.5 m d) 10.0 m

13) A ball is projected with a speed of 10 m/s. What are two angles or projection for which range is 5.0 m? ($g=10\ m/s^2$)
a) 15^0, 75^0 b) 30^0, 60^0 c) 45^0, 45^0 d) none of these

14) A man in train moving with a constant velocity drops a ball on the platform. The path of the ball as seen by an observer standing on the platform is
a) a straight line b) a circle c) parabola d) none of these

15) A body is projected horizontally from a height of 5 m. It reaches the ground at a horizontal distance of 10 m. The speed of the particle when it reaches the ground is ($g=10\ m/s^2$)
a) 10 m/s b) $10\sqrt{2}$ m/s c) 20 m/s d) $20\sqrt{2}$ m/s

16) The height y and the horizontal distance x of a particle on certain planet are given by $y = 8t-5t^2$ and $x = 6t$ meter where t is in seconds.
a) 6 m/s b) 8 m/s c) 10 m/s d) none of these

17) A bag is dropped from an aeroplane flying horizontally at a constant speed. Neglecting air resistance, where will the aeroplane be when the bag is reaches the ground?
a) directly above the ground
b) ahead to the bag
c) behind the bag
d) data is not sufficient

18) The speed of a projectile at the maximum height is half of its initial speed u. Its horizontal range is
a) $u^2/\sqrt{3}g$ b) $2u^2/\sqrt{3}g$ c) $\sqrt{3}u/2g$ d) $\sqrt{3}u^2/g$

19) A person fires a bullet directly towards a monkey sitting on a tree. Just when the bullet leaves the gun, the monkey starts falling freely. The bullet
a) will go above the monkey
b) will hit the monkey
c) will go below the monkey
d) may of may not hit the monkey, depending on the speed of the bullet

20) A ball of mass m is thrown vertically up. Another ball of mass 2 m is thrown at angle θ. If their times of acent are equal, then the heights attained by them are in ratio
a) 1:1 b) 2:1 c) $1:\cos\theta$ d) $1:\sec\theta$

21) A man standing at top of a tower has two objects M and N. He drops M vertically downwards and throws N horizontally simultaneously. Then
a) M reaches the ground first
b) N reaches the ground first
c) Both the bodies reach the ground at the same time
d) Both the bodies may or may not reach the ground depending on their masses

22) An object is projected at angle 45^0 with the horizontal. The ratio of horizontal range and maximum height reached will be in the ratio
a) 1:2 b) 2:1 c) 1:4 d) 4:1

23) An athlete executing a long jump at an angle θ from the ground. For longest jump θ should be horizontal range will be
a) 1:1 b) $1:\sqrt{3}$ c) $\sqrt{3}:1$ d) $2:\sqrt{2}$

24) A body thrown horizontally from the top of a building. The horizontal component of velocity
   a) increases
   b) decreases
   c) remains constant
   d) first increases and then remains constant

25) A particle moves along circular path. Then its
   a) velocity is transverse and acceleration radial
   b) velocity is radial and acceleration is transverse
   c) both velocity and acceleration is radial
   d) both velocity and acceleration is transverse

26) Railway tracks are usually banked on the curves, so that
   a) the weight of train may be reduced
   b) the train may not fall down inwards
   c) friction force between wheels and the track is reduced
   d) the necessary centripetal force may be obtained from the normal reaction due to the track

NEWTON'S LAWS OF MOTION

MULTIPLE CHOICE QUESTIONS

1) A force of 10 N acts on a body of mass 5 kg at rest for 10 s. The velocity acquired and the distance traveled by the body during this interval are
   a) 20 m/s, 100 m b) 100 m/s, 20 m c) 200m/s, 10 m d) 10 m/s, 200m

2) A body of mass 2 kg at rest accelerates at a rate a=2 m/s^2 by a impressed force on it for 10 s. The net force on the body if it moves uniformly is
   a) 4 N b) 5N c) 0 d) none

3) When a shot of mass 50 gm fired from a gun passes through a wooden plank of thickness 20 cm, its velocity changes from 100 m/s to 80 m/s. The resistance offered by the plank is
   a) 500 N b) 400 N c) 450 N d) 550 N

4) A gun weighing 1000 kg recoils with a velocity of 3 cm. when shell weighing 1 kg is shot from it, The time taken by the bullet to hit a target at 300 m is
   a) 100 s b) 10 s c) 1 s d) none

5) A man pushes a truck of mass 2500 kg along horizontal rails with a steady force of 300 N. The resistance of the rails is 0.04 N per kg. The acceleration of a truck is_____ m/s^2.
   a) 8 b) 0.008 c) 0.08 d) 0.8

6) The average force required to stop a hammer with 25 Ns momentum in 0.5 s expressed in N is
   a) 500 b) 125 c) 50 d) 25

7) The mass of the lift is 500 kg. What is the tension in the cable of the lift when it is moving upwards with an acceleration of 2 m/s^2?
   a) 5000 N b) 5600 N c) 5900 N d) 6200 N

8) A gun fires a bullet of 50 g with a velocity of 30 m/s. The gun is then pushed back with a velocity of 1 m/s. The mass of the gun is
   a) 5.5 kg b) 3.5 kg c) 1.5 kg d) 0.5 kg

9) A canon shell explodes in air. Its total
   a) momentum increases b) momentum decreases c) K.E. increases d) K.E. decreases

10) Electromagnetic, gravitational and strong forces are represented by F_E, F_G and F_S respectively, then
   a) $F_E = F_G = F_S$ b) $F_E > F_G > F_S$ c) $F_E > F_G = F_S$ d) $F_S > F_E > F_G$

11) A rocket works on the principle of conservation of
   a) angular momentum b) only kinetic energy c) only total momentum d) none of these

12) Change in linear momentum is closely related to
   a) impulse b) kinetic energy c) angular momentum d) tangential velocity

13) A body is moving from rest along strait line. If it is then obstructed by an opposite force then,
   a) the body must change direction b) the body must slow down
   c) the body must continue to move in same direction with same velocity d) none of these

14) A body is acted upon by constant force then it will have a uniform
   a) acceleration b) momentum c) velocity d) speed

15) A rider on horseback falls forward when the horse suddenly stops. This is due to
   a) the inertia of horse b) the inertia of rider c) large weight of horse d) losing the balance

16) A man of mass 100 kg is standing on a spring balance inside a lift. Then lift falls freely downwards. The reading on the spring balance will be
   a) zero b) 100 kg c) more than 100 kg d) less than 100 kg

17) A cricket player caches a ball of mass 0.1 kg moving with a speed of 10 m/s in 0.1 s. Force exerted by him is
   a) 10 N b) 4 N c) 2 N d) 1 N

18) A car is moving with an acceleration of 4 m/s^2. If this car pulls another car of same mass, the acceleration produced will be
a) 8 $m/^2$ b) 2 m/s^2 c) 4 m/s^2 d) none

19) A particle of mass m is collides elastically a wall at an angle 60^0 with a velocity v. The change in momentum is
a) mv b) 2mv c) –mv d) 1/2mv

20) Inertia is a property by virtue of which the body is unable to change by itself the state of
a) rest only b) uniform linear motion only c) direction of motion only d) rest and of uniform linear motion

21) A car is moving on a rough road along a straight line with a uniform motion, then we can say
a) no force is acting on a car b) a force must act on the car c) no work is being done d) none

22) If the mass and force are doubled, then acceleration will become
a) 2 times b) 4 times c) same as before d) ¼ times

23) A man weighing mg is moving upward in a rocket with acceleration 4g. The apparent weight inside the rocket is
a) zero b) 4 mg c) 5 mg d) mg

24) A bomb at rest explodes into three parts of equal masses. Two parts fly at right angles to each other with velocities 9 m/s and 12 m/s respectively. Find speed of 3^{rd} part.
a) 15 m/s b) 20 m/s c) 10 m/s d) 5 m/s

25) Newton's first law of motion gives the concept of
a) inertia only b) force only c) both inertia and force d) none

26) An athlete runs some distance before making a long jump because
a) it helps to apply large force b) by running action and reaction force increases c) he gains energy to make long jump d) by running he gains inertia of motion

27) A man getting down from a moving bus tends to fall forward because
a) of inertia of rest b) of inertia of lower part of the body c) of inertia of motion of upper part of the body d) none

28) Newton's second law of motion gives the concept of
a) acceleration b) force c) angular momentum d) momentum

29) A body will continue to accelerate until
a) the resultant force on it is increasing continuously b) the resultant force on it is decreasing continuously c) the resultant force on it is zero d) the resultant force on it begins to decrease

30) A force of 2N is needed to accelerate a body to 10 m/s^2. To increase the acceleration to 20 m/s^2, the additional force required is
a) 4 N b) 2 N c) 1 N d) 8 N

31) A force of 10 N acts on a body of mass 1 kg for t s. another force of 15 N acts on second body of mass 2 kg for the same time. The accelerations produced in the ratio
a) 1:3 b) 3:1 c) 3:4 d) 4:3

32) According to Newton's third law of motion, the action and reaction are
a) equal and act in the same direction b) unequal and act in opposite direction c) equal and act in opposite direction d) unequal and act in the same direction

33) A boy jumps out of a boat stationary in water. The boat
a) moves forward b) moves backward c) moves sideways d) remains at rest

34) To keep a particle moving with constant velocity on a frictionless horizontal surface an external force
a) should act continuously b) should be a variable force c) not necessary d) none

35) A body is moving with acceleration 'a' under the action of a force 'g'. The weigh t of the body is
a) g/a b) $-g^2/a$ c) g^2/a d) a^2g

36) When a force of 1 N acts on a 1 kg body that is able to move freely, the body receives
a) a speed of 1 m/s b) an acceleration of 1 m/s^2 c) an acceleration of 9.8 m/s^2 d) none

37) An elevator is moving vertically up with an acceleration a. The force exerted on the floor by a passenger of mass m is
a) mg b) ma c) mg-ma d) mg+ma

38) A boy sits on the pan of a spring scale in an elevator. The reading of the spring scale will be maximum when the elevator
a) is stationary b) cable breaks and it falls freely towards the earth
c) accelerates downwards d) accelerates upwards

39) A force of 12N gives an object an acceleration of 4 m/s^2. The force required to give it an acceleration of 10 m/s^2 is
a) 15 N b) 20 N c) 25 N d) 30 N

40) Two spheres of masses 10 kg and 20 kg are sliding down a frictionless an inclined plane that makes an angle 30^0 with the horizontal. The ratio of acceleration produced in two spheres
a) 1:1 b) 1:2 c) 2:1 d) none of these

41) A body rolling freely on the surface on the earth eventually comes to rest becomes
a) it has mass b) it suffers friction c) it has inertia of rest d) it has momentum

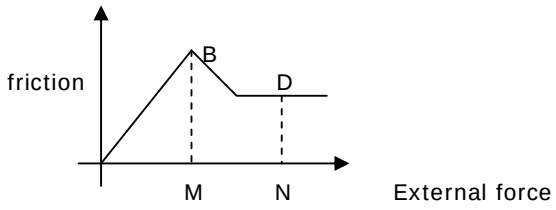
42) Friction between two bodies
a) adds the motion between the bodies b) destroys the relative motion between the bodies c) sometimes helps and sometime opposes the motion d) none

43) Two blocks A and B are sliding on the same road area of contact of A is twice that of the B. The frictional force between A and the road
a) twice that of B b) half that of B c) same that of B d) none

44) Friction can be reduced by
a) lubricants b) polishing c) streamlining d) all the above

45) Good lubricant should be highly
a) viscous b) non-volatile c) both a and b d) none

46) the following graph drawn between the frictional force between a body and a surface and the external force acting on the body. Then AM and DN represent,
a) static and kinetic friction
b) kinetic and static friction
c) both kinetic friction
d) both static friction



47) Kinetic friction is
a) greater than rolling friction b) equal to rolling friction c) less than rolling friction d) none

48) A block of mass 'm' resting on the floor of a lift. The coefficient of friction between the floor is μ when the lift is falling freely, the work done to move the block on the floor to a distance 's' is
a) μmg b) μmg/s c) mgs d) zero

49) Theoretically which of the following are best lubricants
a) solids b) liquids c) gases d) all have same lubricating capacity

50) Breaks are effective if their surface area is
a) small b) very large c) some times large and some times small d) none

51) When a moving body is suddenly stopped
a) frictional force increases b) roughness is found on the road
c) tyres of the vehicles burst d) the frictional force reduces to zero as it is a self adjusting force

52) A body of mass 1 kg is placed on a rough inclined lane of inclination 30^0. the frictional force acting on it when μ = 0.9 is.
a) 4.9 N b) $4.5\times\sqrt{2}$ N c) $4.5\times\sqrt{3}$ N d) none

53) A block B rests on A. A rests on horizontal surface C which is frictionless. There is friction between A and B. If B is pulled to the right,
a) B move forward b) B only moves to the left c) B does not move d) A and B move together to the right

54) The maximum speed of a car on a curved path of radius r and the coefficient of friction μ is
a) $(\mu g/r)^{1/2}$ b) $(\mu gr)^{1/2}$ c) $(\mu r/g)^{1/2}$ d) $(gr/\mu)^{1/2}$

55) If an external force and the frictional force acting on a body cancel each other, the frictional force is
a) rolling friction b) sliding friction c) static friction d) none

56) The wheels are made circular because
a) it is easy to manufacture circular wheels b) they look good c) rolling friction is least d) kinetic friction is least

57) Pick the correct statement.
a) frictional force can be made zero b) sliding friction is more than rolling friction c) frictional force is more for area of contact d) frictional force never act in the direction of motion

58) two masses rest on smooth surface as shown in the figure. The force exerted by A on B is
a) 0.5 N
b) 1 N
c) 2 N
d) 1.5 N

59) A block of mass m is placed on an inclined plane with angle θ with horizontal, slides down at uniform speed. The coefficient of kinetic friction is
a) $\sin\theta$ b) $\cos\theta$ c) g d) $\tan\theta$

60) A car moving with speed 72 km/h is to be stopped at stopped at shortest distance while moving ao a road of coefficient of friction μ = 0.5. The distance is
a) 30 m b) 40 m c) 72 m d) 20 m

WORK-ENERGY-POWER

MULTIPLE CHOICE QUESTIONS

1) What energy is stored in a wound spring of a watch?
   a) Kinetic b) heat c) electrical d) potential

2) The equivalent unit of energy of energy in dimensional formula is
   a) kg-m/s b) kg-m^2/s^2 c) kg-ms d) kg-m^2/s

3) A quantity represented by $ML^2 T^{-2}$ Is
   a) Surface tension b) viscosity c) force d) work

4) One horse power is equal to in Watts
   a) 750 b) 760 c) 770 d) 746

5) Electron Volt is a unit of
   a) Force b) pressure c) power d) energy

6) A force of 100 N displaces a body through 5 m. If the kinetic energy is increased by 400 J. Energy lost in friction is
   a) 100J b) 200J c) 300J d) 400J

7) A body of mass 0.2 kg is moving at a velocity 4 m/s. To bring it to rest in 10 minutes the work done is
   a) 0.16 J b) 1.6 J c) 16 J d) 160J

8) The dimensional formula for potential energy is same as
   a) Force b) power c) work d) stress

9) The fundamental unit which does not have the same power in dimensional formula of energy and surface tension is
   a) Length b) time c) mass d) none

10) If a force vector (2i+3j+4k) N makes a body to move with a velocity of (3i-2j+5k) m/s. The power applied in Watts is
   a) 20 b) 15 c) 10 d) 5

11) If the momentum of a body is increased by 100% then the percentage increase in kinetic energy is_____%
   a) 200 b) 225 c) 150 d) 300

12) Of the following graphs which one helps to calculate work
   a) velocity-time b) acceleration-time c) force-time d) force-displacement

13) What is the nature of graphs for force-displacement curve for a body projected vertically upwards?
   a) straight line b) ellipse c) parabola d) hyperbola

14) If the unit of mass, length and time is tripled, the unit of work is increased by
   a) three times b) six times c) nine times d) twenty seven times

15) The energy possessed by revolving electron in an orbit is
   a) only potential b) only kinetic c) both kinetic and potential d) none

16) The quantity that conserves during the motion of a simple pendulum is
   a) kinetic energy b) potential energy c) sum of potential and kinetic d) none

17) A simple pendulum is swinging freely and when it's in equilibrium position.
   a) potential energy is zero b) potential energy is minimum c) kinetic energy is zero d) none

18) Potential and kinetic energies are equal at height h. To what maximum height the body will rise
   a) h/2 b) h c) 2h d) 4h

19) If two bodies have same momentum which body has greater kinetic energy
   a) lighter b) heavier c) both (a) and (b) d) information insufficient

20) An iron ball and brass ball of same size are dropped from a tower simultaneously. When they reach 5 meter above the ground both of them have same
   a) kinetic energy b) potential energy c) linear momentum d) acceleration

21) A ball hits the floor and rebounds after an inelastic collision. In this case
a) linear momentum of ball is conserved b) linear momentum of earth is alone is conserved
c) linear momentum and earth is conserved d) none

22) A lorry and car moving with same kinetic energy are brought to rest by applying the same retarding force. Then
a) lorry will come to rest in shorter distance b) car will come to rest in shorter distance
c) both will come to rest in same distance d) data insufficient

23) When a body moves in a circular path, no work is done by the force since.
a) force and displacement are perpendicular to each other b) there is no displacement of the body
c) the force is always away from the center d) there is no net force

24) The kinetic energy of a body becomes four times its value. The new linear momentum will be
a) thrice the initial value b) four times the initial value
c) same as the initial value c) twice the initial value

25) Two bodies of masses 12 kg and 2 kg have equal momentum. Then, the ratio of their kinetic energies is
a) 2:1 b) 3:1 c) 1:3 d) 1:1

26) When a force is applied on a moving body, its motion is retorted. Then the work done is
a) positive b) negative c) zero d) positive or negative

27) A body moves a distance of 10m along a straight line under the action of 4 N. If the work done is 20J, the Angle which the force makes with the direction of motion of the body is
a) 0^0 b) 30^0 c) 45^0 d) 60^0

28) A body moves along a straight line with constant power. The distance traveled by the body in t seconds is Proportional to
a) $t^{3/2}$ b) $t^{3/4}$ c) t^2 d) $t^{1/2}$

29) A constant force F is applied on a body and it moves with a uniform velocity v. The power developed is
a) Fv b) F/v c) Fv^2 d) F/v^2

30) Two bodies of different masses m_1 and m_2 have equal momentum. Their kinetic energies are in the ratio
a) $m_1:m_2$ b) $m_2:m_2$ c) $m_1^2:m_2^2$ d) $\sqrt{m_1}:\sqrt{m_2}$

31) Potential energy of the system will increase if work is done
a) on the system by a conservative force b) on the system by a non-conservative force
c) on the system by a conservative of a non-conservative force d) none

31) A body of mass m moving with a velocity u strikes a stationary particle of mass 3m and strikes to it. The speed Of the system will be
a) u/3 b) u/4 c) 4u d) zero

32) Velocity of a moving body is doubled. Its kinetic energy will be
a) doubled b) halved c) tripled d) quadrupled

33) Two bodies of mass m and 16m move with equal kinetic energies. The ratio of their linear momenta is
a) 1:2 b) 2:1 c) 1:4 d) 4:1

34) A shell initially at rest explodes into two equal halves. The two pieces will
a) move with the same velocity and in the same direction
b) move with the same velocity but in the opposite direction
c) move with different velocities in the same direction
d) move with different velocities and in opposite directions

35) A bullet is fired from a gun, if the gun recoils then kinetic energy of the gun is _____ that of bullet
a) lesser than b) greater than c) equal to d) none

GRAVITAION
Exercise Problems

1) Kepler's second law is a consequence of
   a) law of conservation of energy
   b) law of conservation of linear momentum
   c) law of conservation of mass
   c) law of conservation of angular momentum

2) The force responsible for the motion of planets around sun is
   a) gravitational b) magnetic c) electrostatic d) frictional

3) The intensity of gravitational field of the earth is maximum at
   a) equator b) poles c) center of the earth d) same every where

4) Newton's law of gravitation is applicable to
   a) planets only b) small bodies c) both small and planets d) none of these

5)The force of attraction between two objects separated by a certain distance is F. If mass of one object is doubled that of the other is halved, and the distance between them is increased by three time, the new force of attraction is
   a) F / 9 b) F / 3 c) 3F d) F

6) If F_1 is magnitude of the force exerted by the earth on the sun and F_2 is The magnitude of the force exerted by the sun on the earth, then
   a) $F_1 > F_2$ b) $F_1 < F_2$ c) $F_1 = F_2$ d) $F_1 \geq F_2$

7) If M is mass and R is radius of the earth, then acceleration due gravity and gravitational constant G is related as
   a) $G = Mg / R$ b) $G = gM / R^2$ c) $G= g^2M / R$ d) $G = R^2G / M$

8) The units of gravitational constants are
   a) Nm^2kg^2 b) Nm^2kg^{-1} c) $Nmkg^{-1}$ d) $Nmkg^{-2}$

9) The value of universal gravitational constant G is
   a) 6.66×10^{-6} $N\text{-}m^2kg^{-2}$ b) 6.66×10^{-10} $N\text{-}m^2kg^{-2}$ c) 6.66×10^{-11} $N\text{-}m^2kg^{-2}$ d) 6.66×10^{-5} $N\text{-}m^2kg^{-2}$

10) The value of G depends
   a. directly on the masses
   b. on the nature of the masses
   c. inversely on the square of the distant between the masses
   d. it does not depend on any of these

11) The weight of the body at the center of the earth will be
   a) zero b) infinity c) same every where d) can not be determined

12) Weightlessness experienced in a spaceship is due to
   a. absence of inertia
   b. absence of gravity
   c. absence of accelerating force
   d. free fall of the spaceship

13) Two satellites are moving in the same circular orbits around the earth. They must have the same
   a) mass b) angular momentum c) kinetic energy c) speed

14) The period of a satellite moving in a circular orbit near the surface of a planet is independent of
   a. radius of the planet
   b. mass of the planet
   c. mass of the satellite
   d. none of the above

15) A geostationary satellite is taken to another orbit. Its distance from the center of the earth in the new orbit is two times that in the earlier orbit. The period of revolution in the second orbit is
   a) 48 hours b) $48\sqrt{2}$ hours c) 24 hours d) $24\sqrt{2}$ hours

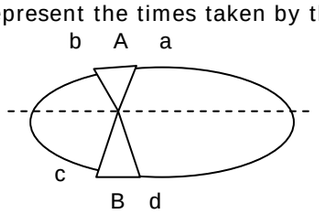
16) Gas escapes from the surface of a planet because it acquires an escape velocity. The escape velocity does not depend on
   a) mass of the planet b) mass of the particle escaping
   c) temperature of the planet d) radius of the planet

17) The tidal waves in the sea are primarily due to
   a. the gravitational effect of the sun on the earth
   b. the gravitational effect of the moon on the earth
   c. the rotation of the earth
   d. the atmospheric effect of the earth itself

18) A geostationary satellite should be launched such that it moves from
   a) north to south in the polar plane b) south to north in the polar plane
   c) east to west in the polar plane d) west to east in the polar plane

19) A satellite is moving in a circular orbit around the earth. If gravitational pull suddenly disappears, then it
   a. continues to move with the same speed along the same path
   b. moves with the same speed tangential to the original orbit
   c. falls down with increasing speed
   d. comes to rest after moving a certain distance along the original path

20) The figure shows the motion of a planet around the sun in an elliptic orbit with the sun at one focus. The shaded areas A and B can be assumed to be equal. If t_1 and t_2 represent the times taken by the planet to move from a to b and from c to d respectively, then
   a. $t_1 < t_2$
   b. $t_1 > t_2$
   c. $t_1 = t_2$
   d. none of the above



21) The acceleration due to gravity on the surface of a planet whose mass and radius are one-fourth of the earth will be
   a) g b) 4g c) g/4 d) g/3

22) The escape velocity of the body of mass m varies as
   a) m b) m^2 c) 1/m d) independent of m

23) If V_e and V_0 represent escape velocity and orbital velocity of a satellite for a circular orbit of radius R then
   a) $V_e = V_0$ b) $V_e = V_0/\sqrt{2}$ c) $V_0 = V_e/\sqrt{2}$ d) none of these

24) Moon does not have any atmosphere because,
   a) it is closer to the earth b) it gets light from the sun
   c) it revolves around earth d) the escape velocity of gas molecules is less than their rms velocity

25) A satellite is revolving round the earth. The centripetal force acting on the satellite is F and the gravitational force of the earth acting on the satellite is also F. The resultant force acting on the satellite is
   a) 2F b) F/2 c) F d) Zero

26) Two satellites A and B revolve round a planet in circular orbits of radii 4:1. The ratio of their critical speeds is
   a) 1:4 b) 4:1 c) 1:2 d) 2:1

27) The time period of geostationary satellite is
   a) 24 min b) 24 second c) 12 hours d) 24 hours

28) If value of acceleration due to gravity changes which of the following is affected?
   a) electrical force b) force of buoyancy c) magnetic force d) viscous force

29) In an atom two electrons move round the nucleus in circular orbits of radii R and 4R. The ratio of their periods
   a) 8:1 b) 1:8 c) 4:1 d) 1:4

30) The period of planet round the sun is $3\sqrt{3}$ years. Radius of the earth orbit round the sun is R. The radius of the planet round the sun is
   a) $\sqrt{3}R$ b) R/3 c) $R/\sqrt{3}$ d) 3R

31) When a planet revolves round the sun the physical quantity that remains constant is
   a) angular velocity b) linear velocity c) linear acceleration d) areal velocity

32) For a planet revolving round the sun, when it is nearest to the sun its
   a) K.E. is minimum and P.E. is maximum
   b) Both K.E. and P.E. are minimum
   c) K.E. and P.E. are equal
   d) K.E. is maximum and P.E. is minimum

33) A body is projected with a velocity greater than orbital velocity but less than the escape velocity its orbit will be
   a) hyperbolic b) parabolic c) elliptical d) circular

34) A man weighs 60 kg on the surface of the earth. The altitude where his weight will be 30 kg is (R is radius of the earth)
   a) $h = 2\sqrt{R}$ b) h = 2R c) $h = R/\sqrt{2}$ d) h = R/2

35) The radius and acceleration due to gravity of moon are 1/4 and 1/5 of the earth. The ratio of mass of earth to mass of moon is
   a) 1:80 b) 80:1 c) 1:20 d) 20:1