TEMPZ ACADEMY
(A UNIT OF THECOS LTD) ZEAL TO TRIUMPH

NEET PHYSICS 2018-19 - Chennai

Periodic Test : 19 **Test ID :** 031

Number of questions: 60 **Test date: 08.04.2019**

Name: _____ **Time**: 2HRS

ID No: _____

Negative Marks : 4 marks for correct attempt & 1 mark deducted for every wrong attempt.

1. A particle moves from a point $(-2\hat{\imath} + 5\hat{\jmath})$ to $(4\hat{\jmath} + 3\hat{k})$ when a force of $(4\hat{\imath} + 3\hat{\jmath})$ N is applied. How much work has been done by the force?
   a) 8 J
   b) 11 J
   c) 5 J
   d) 2 J

2. Two similar springs P and Q have spring constants K_P and K_Q, such that $K_P > K_Q$. They are stretched, first by the same amount (case a), then by the same force (case b). The work done by the springs W_P and W_Q are related as, in case (a) and case (b), respectively
   a) $W_P = W_Q$; $W_P > W_Q$
   b) $W_P = W_Q$; $W_P = W_Q$
   c) $W_P > W_Q$; $W_Q > W_P$
   d) $W_P < W_Q$; $W_Q < W_P$

3. The heart of a man pumps 5 L of blood through the arteries per minute at a pressure of 150 mm of mercury. If the density of mercury be 13.6×10^3 kg/m^3 and g= 10 m/s^2, then the power of heart in watt is
   a) 1.70
   b) 2.35
   c) 3.0
   d) 1.50

4. Two particles of masses m_1 , m_2 move with initial velocities u_1 and u_2. On collision, one of the particles get excited to higher level, after absorbing energy ε. If final velocities of particles be v_1 and v_2 , then we must have
   a) $m_1^2 u_1 + m_2^2 u_2 - \varepsilon = m_1^2 v_1 + m_2^2 v_2$
   b) $\frac{1}{2} m_1 u_1^2 + \frac{1}{2} m_2 u_2^2 = \frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2 - \varepsilon$
   c) $\frac{1}{2} m_1 u_1^2 + \frac{1}{2} m_2 u_2^2 - \varepsilon = \frac{1}{2} m_1 v_1^2 + \frac{1}{2} m_2 v_2^2$
   d) $\frac{1}{2} m_1^2 u_1^2 + \frac{1}{2} m_2^2 u_2^2 + \varepsilon = \frac{1}{2} m_1^2 v_1^2 + \frac{1}{2} m_2^2 v_2^2$

5. A uniform force of $(3\hat{\imath} + \hat{\jmath})$ N acts on a particle of mass 2kg. Hence, the particle is displaced from position $(2\hat{\imath} + \hat{k})$ m to position $(4\hat{\imath} + 3\hat{\jmath} - \hat{k})$ m. The work done by the force on the particle is
   a) 9 J
   b) 6 J
   c) 13 J
   d) 15 J

6. A body of mass (4m) is lying in xy - plane at rest. It suddenly explodes into three pieces. Two pieces each of mass (m) move perpendicular to each other with equal speed (v). The total kinetic energy generated due to explosion is
   a) mv^2
   b) $\frac{3}{2}\ mv^2$
   c) $2mv^2$
   d) $4mv^2$

7. A bomb of mass 30 kg at rest explodes into two pieces of masses 18 kg and 12 kg. The velocity of 18 kg mass is 6 ms $^{-1}$. The kinetic energy of the other mass is
   a) 256 J
   b) 486 J
   c) 524 J
   d) 324 J

8. Two bodies with kinetic energies in the ratio 4:1 are moving with equal linear momentum. The ratio of their masses is
   a) 1 : 2
   b) 1 : 1
   c) 4 : 1
   d) 1 : 4

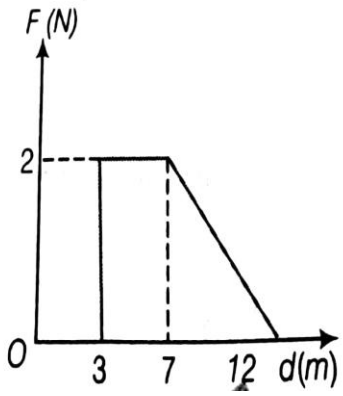
9. A bullet of mass 10g leaves a rifle at an initial velocity of 1000 m/s and strikes the earth at the same level with a velocity of 500 m/s. The work done in joule to overcome the resistance of air will be
   a) 375
   b) 3750
   c) 5000
   d) 500

10. Two identical balls A and B moving with velocities + 0.5 m/s and - 0.3 m/s respectively, collide head on elastically. The velocity of the balls A and B after collision will be respectively
   a) +0.5 m/s and 0.3 m/s
   b) - 0.3 m/s and 0.5 m/s
   c) +0.3 m/s and 0.5 m/s
   d) -0.5 m/s and 0.3 m/s

11. The KE acquired by a mass m in travelling a certain distance d, starting from rest, under the action of a constant force is directly proportional to
   a) m
   b) $\sqrt{m}$
   c) $\frac{1}{\sqrt{m}}$
   d) Independent of m

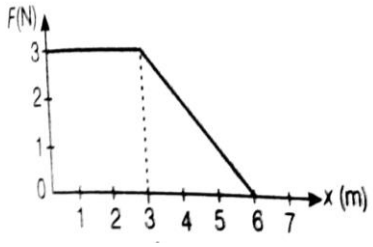
12. An engine pumps water through a hosepipe. Water passes through the pipe and leave it with a velocity of 2 ms $^{-1}$. The mass per unit length of water in the pipe is 100 kg m $^{-1}$. What is the power of the engine?
   a) 400 W
   b) 200 W
   c) 100 W
   d) 800 W

13. Force F on a particle moving in a straight line varies with distance d as shown in the figure. The work done on the particle during its displacement of 12 m is



a) 21 J
b) 26 J
c) 13 J
d) 18 J

14. A force F acting on an object varies with distance x as shown here. The force is in newton and x is in metre. The work done by the force in moving the object from $x = 0$ to $x = 6m$ is



a) 4.5 J
b) 13.5 J
c) 9.0 J
d) 18.0 J

15. A block of mass M is attached to the lower end of a vertical spring. The spring is hung from a ceiling and has force constant value k. The mass is released from rest with the spring initially unstretched. The maximum extension produced in the length of the spring will be

a) Mg/k
b) $2\,Mg/k$
c) $4\,Mg/k$
d) $Mg/2k$

16. The potential energy of a particle in a force field is $U = \frac{A}{r^2} - \frac{B}{r}$, where A and B are positive constants and r is the distance of particle from the centre of the field. For stable equilibrium, the distance of the particle is

a) $B/2A$
b) $2\,A/B$
c) A/B
d) B/A

17. A stone is tied to a string of length l and is whirled in a vertical circle with the other end of the string as the centre. At a certain instant of time, the stone is at its lowest position and has a speed u. The magnitude of the change in velocity as it reaches a position where the string is horizontal (g being acceleration due to gravity) is

a) $\sqrt{2(u^2 - gl)}$
b) $\sqrt{(u^2 - gl)}$
c) $u - \sqrt{(u^2 - 2gl)}$
d) $\sqrt{2gl}$

18. A ball of mass 2kg and another of mass 4kg are dropped together from a 60 ft tall building. After, a fall of 30ft each towards earth, their respective kinetic energies will be in the ration of

a) $\sqrt{2} : 1$
b) 1 : 4

c) 1 : 2
d) 1 : $\sqrt{2}$

19. If kinetic energy of a body is increased by 300%, then percentage change in momentum will be
a) 100%
b) 150%
c) 265%
d) 73.2%

20. A force acts on a 3.0g 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 metre and t in second. The work done during the first 4 s is
a) 570 mJ
b) 450 mJ
c) 490 mJ
d) 528 mJ

21. A metal ball of mass 2 kg moving with a velocity of 36km/h has a head on collision with a stationary ball of mass 3 kg. If after the collision, the two balls move together, the loss in kinetic energy due to collision is
a) 140 J
b) 100 J
c) 60 J
d) 40 J

22. An explosion blows a rock into three parts. Two parts go off at right angles to each other. These two are, 1 kg first part moving with a velocity of 12 ms^{-1} and 2 kg second part moving with a velocity of 8 ms^{-1}. If the third part flies off with a velocity of 4 ms^{-1}, its mass would be
a) 5 kg
b) 7 kg
c) 17 kg
d) 3 kg

23. Water falls from a height of 60 m at the rate of 15kg/s to operate a turbine. The losses due to frictional forces are 10% of energy. How much power is generated by the turbine? (Take g = 10 m/s^2)
a) 8.1 kW
b) 10.2 kW
c) 12.3 kW
d) 7.0 kW

24. A body of mass 3 kg is under a constant force, which causes a displacement s in metre in it, given by the relation $s = \frac{1}{3}t^2$,where t is in second. Work done by the force is 2 s is
a) $\frac{5}{19}$ J
b) $\frac{3}{8}$ J
c) $\frac{8}{3}$ J
d) $\frac{19}{5}$ J

25. A particle of mass m_1 is moving with a velocity v_1 and another particle of mass m_2 is moving with a velocity v_2. Both of them have the same momentum, but their different kinetic energies are E_1 and E_2 respectively. If $m_1 > m_2$, then
a) $E_1 < E_2$
b) $\frac{E_1}{E_2} = \frac{m_1}{m_2}$
c) $E_1 > E_2$
d) $E_1 = E_2$

26. The potential energy of a system increases, if work is done
a) By the system against a conservative force
b) By the system against a non-conservative force
c) Upon the system by a conservative force
d) Upon the system by a non-conservative force

27. If the momentum of a body is increased by 50%, then the percentage increase in its kinetic energy is
    a) 50%
    b) 100%
    c) 125%
    d) 200%

28. A body of mass m moving with velocity 3km / h collides with a body of mass 2 m at rest. Now, the coalesced mass starts to move with a velocity
    a) 1 km/h
    b) 2 km/h
    c) 3 km/h
    d) 4 km/h

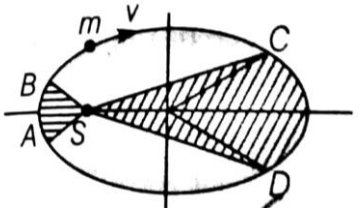
29. A block of mass 10 kg, moving in x-direction with a constant speed of 10 ms $^{-1}$, is subjected to a retarding force F = 0.1 $x\ J/m$ during its travel from x = 20 m to 30m. Its final KE will be
    a) 475 J
    b) 450 J
    c) 275 J
    d) 250 J

30. A particle of mass m is driven by a machine that delivers a constant power k watts. If the particle starts from rest, the force on the particle at time t is
    a) $\sqrt{\frac{mk}{2}}\, t^{-1/2}$
    b) $\sqrt{mk}\, t^{-1/2}$
    c) $\sqrt{2mk}\, t^{-1/2}$
    d) $\frac{1}{2}\sqrt{mk}\, t^{-1/2}$

31. At what height from the surface of earth the gravitation potential and the value of g are -5.4 × 10 ^{7} J kg $^{-2}$ and 6.0 ms $^{-2}$ respectively? Take, the radius of earth as 6400 km.
    a) 1600 km
    b) 1400 km
    c) 2000 km
    d) 2600 km

32. Kepler's third law states that square of period of revolution (T) of a planet around the sun, is proportional to third power of average distance r between the sun and planet i.e.$T^{2} = Kr^{3}$, here K is constant. If the masses of the sun and planet are M and m respectively, then as per Newton's law gravitation force of attraction between them is $= \frac{GMm}{r^2}$, here G is gravitational constant. The relation between G and K is described as
    a) $GK = 4\pi^2$
    b) $GMK = 4\pi^2$
    c) $K = G$
    d) $K = \frac{I}{G}$

33. The figure shows elliptical orbit of a planet m about the sun S. The shaded area SCD is twice the shaded area SAB. If t_1 is the time for the planet to move from C to D and t_2 is the time to move from A to B, then



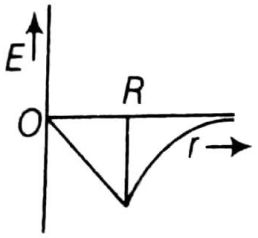
    a) $t_1 > t_2$
    b) $t_1 = 4t_2$
    c) $t_1 = 2t_2$
    d) $t_1 = t_2$

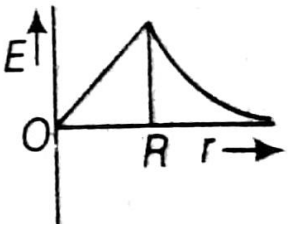
34. Imagine a new planet having the same density as that of the earth but it is 3 times bigger than the earth in size. If the acceleration due to gravity on the surface of the earth is g and that on the surface of the new planet g', then
    a) $g' = 3g$
    b) $g' = \frac{g}{9}$
    c) $g' = 9g$
    d) $g' = 27g$

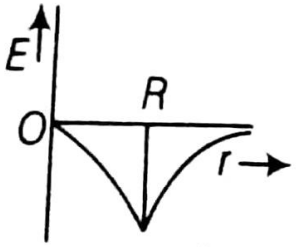
35. A spherical planet has a mass M_p and diameter D_p. A particle of mass m falling freely near the surface of this planet will experience an acceleration due to gravity, equal to
    a) $4GM_p / D^2$
    b) $GM_p m / D^2$
    c) GM_p / D_p^2
    d) $4GM_p\, m / D_p^2$

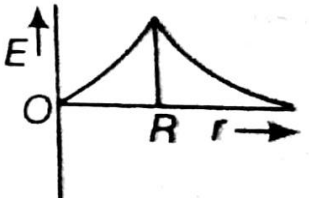
36. A satellite S is moving in an elliptical orbit around the earth. The mass of the satellite is very small as compared to the mass of the earth. Then,
    a) the angular momentum of S about the centre of the earth changes in direction, but its magnitude remains constant
    b) the total mechanical energy of S varies periodically with time
    c) the linear momentum of S remains constant in magnitude
    d) the acceleration of S is always directed towards the centre of the earth

37. Dependence of intensity of gravitational field (E) of the earth with distance (r) from centre of the earth is correctly represented by

a) 

b) 

c) 

d) 

38. A black hole is an object whose gravitational field is so strong that even light cannot escape from it. To what approximate radius would earth (mass = 5.98×10^{24} kg) have to be compressed to be a black hole?
    a) 10^{-9} m
    b) 10^{-6} m
    c) 10^{-2} m
    d) 100 m

39. The acceleration due to gravity on the planet A is 9 times the acceleration due to gravity on the planet B. A man jumps to a height of 2m on the surface of A. What is the height of jump by the same person on the planet B?
    a) 6 m
    b) $\frac{2}{3}$ m
    c) $\frac{2}{9}$ m
    d) 18 m

40. The largest and the shortest distance of the earth from the sun are r_1 and r_2. Its distance from the sun when it is perpendicular to the major axis of the orbit drawn from the sun

    a) $\frac{r_1+r_2}{4}$
    b) $\frac{r_1+r_2}{r_1-r_2}$
    c) $\frac{2r_1r_2}{r_1+r_2}$
    d) $\frac{r_1+r_2}{3}$

41. A planet is moving in an elliptical orbit around the sun. if T, U, E and L stand for its kinetic energy, gravitational potential energy, total energy and magnitude of angular momentum about the centre of force, which of the following is correct?
    a) T is conserved
    b) U is always positive
    c) E is always negative
    d) L is conserved but direction of vector L changes continuously

42. A seconds pendulum is mounted in a rocket. Its period of oscillation decreases when the rocket
    a) comes down with uniform acceleration
    b) moves round the earth in a geostationary orbit
    c) moves up with a uniform velocity
    d) moves up with uniform acceleration

43. The escape velocity from the earth is 11.2 km/s. If a body is to be projected in a direction making an angle 45^0 to the vertical, then the escape velocity is
    a) 11.2×2 km/s
    b) 11.2 km/s
    c) $\frac{11.2}{\sqrt{2}}$ km/s
    d) $11.2\sqrt{2}$ km/s

44. A rubber ball is dropped from a height of 5m on a planet where the acceleration due to gravity is not known. On bouncing it rises to 1.8 m. The ball loses its velocity on bouncing by a factor of
    a) 16/25
    b) 2/5
    c) 3/5
    d) 9/25

45. Escape velocity from the earth is 11.2 km/s. Another planet of same mass has radius ¼ times that of the earth. What is the escape velocity from another planet
    a) 11.2 km/s
    b) 44.8 km/s
    c) 22.4 km/s
    d) 5.6 km/s

46. Two satellites of the earth, S_1 and S_2 are moving in the same orbit. The mass of S_1 is four times the mass of S_2. Which one of the following statements is true?

    a) The time period of S_1 is four times that of S_2
    b) The potential energies of the earth and satellite in the two cases are equal
    c) S_1 and S_2 are moving with the same speed
    d) The kinetic energies of the two satellites are equal

47. A geostationary satellite is orbiting the earth at a height of 5 R above that surface of the earth, R being the radius of the earth. The time period of another satellite in hour at a height of 2 R from the surface of the earth is
    a) 5
    b) 10
    c) $6\sqrt{2}$
    d) $6 / \sqrt{2}$

48. The density of newly discovered planet is twice that of the earth. The acceleration due to gravity at the surface of the planet is equal to that at the surface of the earth. If the radius of the earth is R, the radius of the planet would be
    a) 2 R
    b) $4R$
    c) $\frac{1}{4} R$
    d) $\frac{1}{2} R$

49. Infinite number of bodies, each of mass 2 kg are situated on X - axis at distances 1m, 2m, 4m and 8m, respectively from the origin. The resulting gravitational potential due to this system at the origin will be
    a) $-G$
    b) $-\frac{8}{3} G$
    c) $-\frac{4}{3} G$
    d) $-4G$

50. Two spherical bodies of masses M and $5M$ and radii R and $2R$ are released in free space with intial separation between their centres equal to 12 R. If they attract each other due to gravitational force only, then the distance covered by the smaller body before collision is
    a) 2.5 R
    b) 4.5 R
    c) 7.5 R
    d) 1.5 R

51. The escape velocity from the surface of the earth is v_e. The escape velocity from the surface of a planet whose mass and radius are three times those of the earth, will be
    a) v_e
    b) $3v_e$
    c) $9v_e$
    d) $\frac{1}{3v_e}$

52. A body attains a height equal to the radius of the earth. The velocity of the body with which it was projected is

a) $\sqrt{\frac{GM}{R}}$

b) $\sqrt{\frac{2GM}{R}}$

c) $\sqrt{\frac{5}{4}\frac{GM}{R}}$

d) $\sqrt{\frac{3GM}{R}}$

53. A body of mass m is placed on the earth's surface. It is then taken from the earth's surface to a height $h = 3R$, then the change in gravitational potential energy is

a) $\frac{mgh}{R}$

b) $\frac{2}{3}mgR$

c) $\frac{3}{4}mgR$

d) $\frac{mgR}{2}$

54. The mean radius of the earth is R, its angular speed on its own axis is ω and the acceleration due to gravity at the earth's surface is g. What will be the radius of the orbit of a geostationary satellite?

a) $\left(\frac{R^2g}{\omega^2}\right)^{1/3}$

b) $\left(\frac{Rg}{\omega^2}\right)^{1/3}$

c) $\left(\frac{R^2\omega^2}{g}\right)^{1/3}$

d) $\left(\frac{R^2g}{\omega}\right)^{1/3}$

55. The escape velocity of a body on the surface of the earth is 11.2 km/s. If the earth's mass increases to twice its present value and the radius of the earth becomes half, the escape velocity would become

a) 44.8 km/s

b) 22.4 km/s

c) 11.2 km/s (remain unchanged)

d) 5.6 km/s

56. The period of revolution of the planet A round the sun is 8 times that of B. The distance of A from the sun is how many times greater than that of B from the sun?

a) 5

b) 4

c) 3

d) 2

57. If the gravitational force between two objects were proportional to $\frac{1}{R}$ (and not as $\frac{1}{R^2}$), where R is separation between them, then a particle in circular orbit under such a force would have its orbital speed v proportional to

a) $\frac{1}{R^2}$

b) R^0

c) R

d) $\frac{1}{R}$

58. A particle of mass M is situated at the centre of a spherical shell of same mass and radius a. The gravitational potential at a point situated at $a/2$ distance from the centre, will be

a) $-\frac{3\,GM}{a}$

b) $-\frac{2\,GM}{a}$

c) $-\frac{GM}{a}$

d) $-\frac{4GM}{a}$

59. The earth is assumed to be a sphere of radius R. A platform is arranged at a height R from the surface of the earth. The escape velocity of a body from this platform is fv_e, where v_e is its escape velocity from the surface of the earth. The value of f is
    a) $\sqrt{2}$
    b) $\frac{1}{\sqrt{2}}$
    c) $\frac{1}{3}$
    d) $\frac{1}{4}$

60. A compass needle which is allowed to move in a horizontal plane is taken to a geomagnetic pole. It
    a) will become rigid showing no movement
    b) will stay in any position
    c) will stay in North-South direction only
    d) will stay in East-West direction only