NEET PHYSICS 2018-19 - Chennai

Periodic Test : 01 **Test ID : 013**

Number of questions: 150 **Test date: 20.03.2019**

Name: _____ **Time**: 3HRS

ID No: _____

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

1. The density of a material in CGS system of units is 4 g cm^{-3}. In a system of units in which unit of length is 10 cm and unit of mass is 100g, the value of density of material will be
   a. 0.04
   b. 0.4
   c. 40
   d. 400

2. The unit of permittivity of free space, ε_0 , is
   a. Coulomb/newton-metre
   b. Newton-$metre^2$ / $coulomb^2$
   c. $coulomb^2$ / Newton-$metre^2$
   d. $coulomb^2$ / $(Newton\text{-}metre)^2$

3. Percentage errors in the measurement of mass and speed are 2% and 3% respectively. The error in the estimate of kinetic energy obtained by measuring mass and speed will be
   a. 8%
   b. 2%
   c. 12%
   d. 10%

4. Of the following quantities, which one has dimensions different from the remaining three?
   a. Energy per unit volume
   b. Force per unit area
   c. Product of voltage and charge per unit volume
   d. Angular momentum

5. If force (F), velocity (V) and time (T) are taken as fundamental units, then the dimensions of mass are
   a. $[FVT^{-1}]$
   b. $[FVT^{-2}]$
   c. $[FV^{-1}T^{-1}]$
   d. $[FV^{-1}T]$

6. A particle covers half of its total distance with speed v_1 and the rest half distance with speed v_2. Its average speed during the complete journey is
   a. $(v_1 + v_2) / 2$
   b. $(v_1 . v_2) / (v_1 + v_2)$
   c. $(2(v_1 . v_2)) / (v_1 + v_2)$
   d. $(v_1^2 . v_2^2) / (v_1^2 + v_2^2)$

7. The position x of a particle with respect to time t along x-axis is given by $x=9t^2 - t^3$ where x is in metres and t in seconds. What will be the position of this particle when it achieves maximum speed along +x direction?
   a. 54m
   b. 81m
   c. 24m
   d. 32m

8. Motion of a particle is given by equation $s=(3t^3 + 7t^2 + 14t + 8)$ m. The value of acceleration of the particle at t=1 sec is
   a. 10 m/s^2
   b. 32 m/s^2
   c. 23 m/s^2
   d. 16 m/s^2

9. A particle moves along a straight line such that its displacement at any time t is given by

s= ($t^3 - 6t^2 + 3t + 4$) metres. The velocity when the acceleration is zero is

a. 3 m/s
b. 42 m/s
c. – 9 m/s
d. – 15 m/s

10. What will be the ratio of the distance moved by a freely falling body from rest in 4th and 5th seconds?

a. 4:5
b. 7:9
c. 16: 25
d. 1:1

11. A projectile is fired from the surface of the earth with a velocity of 5 m s^{-1} angle Θ with the horizontal. Another projectile fired from another planet with a velocity of 3 m s^{-1} at the same angle follows a trajectory which is identical with the trajectory of the projectile fired from the earth. The value of the acceleration due to gravity on the planet is (in m s^{-2}) is
(g=9.8 ms^{-2})

a. 3.5
b. 5.9
c. 16.3
d. 110.8

12. A body is moving with velocity 30 m/s towards east. After 10 seconds its velocity becomes 40 m/s towards north. The average acceleration of the body is

a. 1 m/s^2
b. 7 m/s^2
c. $\sqrt{7}$ m/s^2
d. 5 m/s^2

13. A and B are the two vectors and Θ is the angle between them, if$|A \times B| = \sqrt{3}\ (A.B)$
the value of Θ is

a. 45®
b. 30®
c. 90®
d. 60®

14. Let A, B are two vectors. If$|A \times B| = \sqrt{3}\ (A.B)$ then value of $|A + B|$ is

a. $(A^2 + B^2 + AB)^{1/2}$
b. $\left(A^2 + B^2 + \frac{AB}{\sqrt{3}} \right)^{½}$
c. A + B
d. $(A^2 + B^2 + \sqrt{3}\, AB)^{1/2}$

15. Two projectiles of same mass and with same velocity are thrown at an angle 60® and 30® with the horizontal, then which will remain same

a. time of flight
b. Range of projectile
c. Maximum height acquired
d. All of them

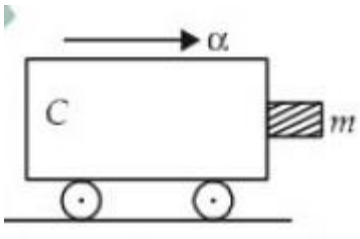
16. Three blocks A, B, C of masses 4 Kg, 2 Kg and 1 Kg respectively, are in contact on a frictionless surface, as shown. If a force of 14 N is applied on the 4 kg block, then the contact force between A and B is

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

17. The upper half of an inclined plane of inclination Θ is perfectly smooth while lower half is rough. A block starting from rest at the top of the plane will again come to rest at the bottom, if the coefficient of friction between the block and lower half of the palne is given by

a. μ = 2 tanΘ
b. μ = tanΘ
c. μ = 1 / tanΘ
d. μ = 2 / tanΘ

18. A block of mass m is in contact with the cart C as shown in the figure. The coefficient of static friction between the block and the cart is μ. The acceleration α of the cart that will prevent the block from falling satisfies



a. α > mg / μ
b. α > g / μm
c. α > = g / μ
d. α < g / μ

19. A 0.5 Kg ball moving with a speed of 12 m/s strikes a hard wall at an angle of 30® with the wall. It is reflected with the wall. It is reflected with the same speed at the same angle. If a ball is in contact with the wall for 0.25 seconds, the average force acting on wall is
a. 96 N
b. 48 N
c. 24 N
d. 12 N

20. 250 N force is required to raise 75 Kg mass from a pulley. If rope is pulled 12 m then the load is lifted to 3 m, the efficiency of pulley system will be
a. 25 %
b. 33.3 %
c. 75%
d. 90%

21. A body of mass 1 kg begins to move under the action of a time dependent force vector $F = (2t\ i\hat{} + 3t^2\ j\hat{})$ N, where i^ and j^ are unit vectors along x and y axis. What power will be developed by the force at a time t?
a. $(2t^3 + 3t^4)$ W
b. $(2t^3 + 3t^5)$ W
c. $(2t^2 + 3t^3)$ W
d. $(2t^2 + 4t^4)$ W

22. A particle of mass m is driven by a machine that delivers a constant power k watts. If the particle starts from rest of the force on particle at time t is
a. $\sqrt{2mk}\ t^{-1/2}$
b. $0.5\sqrt{mk}\ t^{-1/2}$
c. $(mk/2)^{1/2}\ t^{-1/2}$
d. $\sqrt{mk}\ t^{-1/2}$

23. A particle with total energy E is moving in a potential energy region U(x). Motion of the particle is restricted to the region when
a. U(x) < E
b. U(x) = 0
c. U(x) <= E
d. U(x) > E

24. The potential energy of a system increases if work is done
a. Upon the system by a nonconservative force.
b. By the system against a conservative force.
c. By the system against a nonconservative force.
d. Upon the system by a conservative force.

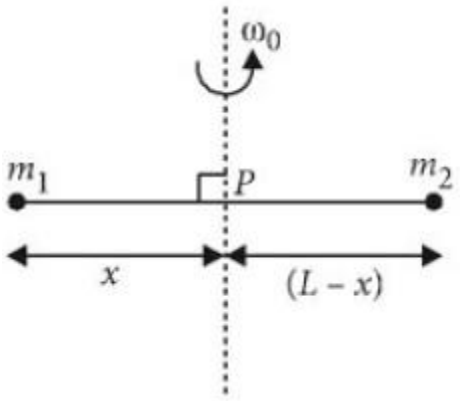
25. An engine pumps water through a hose pipe. Water passes through the pipe and leaves it with a velocity of 2 m/s. The mass per unit length of water in the pipe is 100 kg/m. What is the power of the engine?
a. 400 W
b. 200 W
c. 100 W
d. 800 W

26. A solid sphere of mass m and radius R is rotating about its diameter. A solid cylinder of the same mass and same radius is also rotating about its geometrical axis with an angular speed twice that of the sphere. The ratio of their

kinetic energies of rotation (E_{sphere} / $E_{Cylinder}$) will be

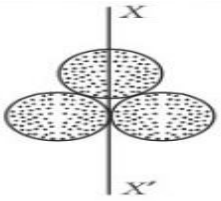
a. 2:3
b. 1:5
c. 1:4
d. 3:1

27. Point masses m1 and m2 are placed at the opposite ends of a rigid rod of length L, and negligible mass. The rod is to be set rotating about an axis perpendicular to it. The Position of point P on this rod through which the axis should pass so that the work required to set the rod rotating with angular velocity $\dot{\omega}_o$ is minimum, is given by



a. X=$\frac{m2}{m1}$ L
b. X=$\frac{m2\,L}{m1+m2}$ L
c. X=$\frac{m1\,L}{m1+m2}$ L
d. X=$\frac{m1}{m2}$ L

28. Three identical spherical shells, each of mass m and radius r are placed as shown in figure. Consider an axis XX' which is touching to two shells and passing through diameter of third shell. Moment of inertia of the system consisting of these three spherical shells about XX' axis is

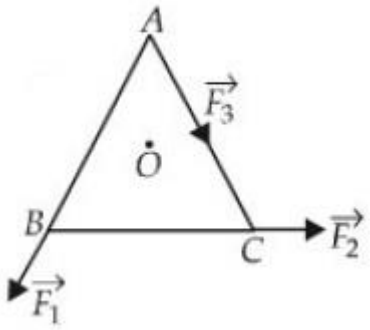


a. 16/5 mr^2
b. 4 mr^2
c. 11/5 mr^2
d. 3 mr^2

29. The ratio of radii of gyration of a circular ring and a circular disc, of the same mass and radius, about an axis perpendicular to their planes are

a. 1:$\sqrt{2}$
b. 3:2
c. 2:1
d. $\sqrt{2}:1$

30. ABC is an equilateral triangle with O as its centre. F1, F2, F3 are the three vector Forces acting along the sides AB, BC, and AC respectively. If the total torque about O is zero, then the magnitude of F3 is



a. F1 + F2
b. F1 - F2
c. (F1 +F2) / 2
d. 2 (F1 + F2)

31. A satellite of mass m is orbiting the earth (of radius R) at a height h from its surface. The total energy of the satellite in terms of g_0, the value of acceleration due to gravity at the earth surface is

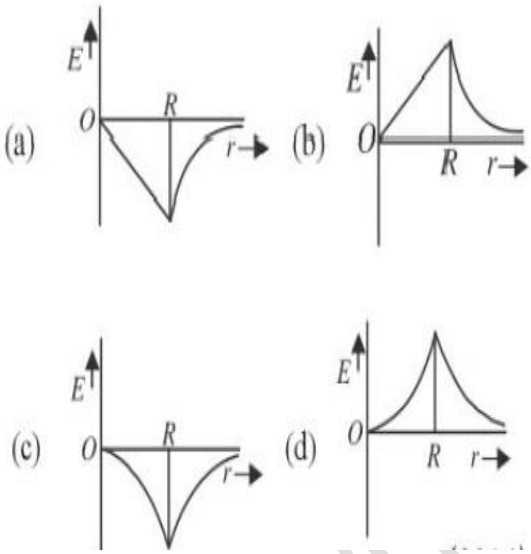
a. m g_0R^2 / 2(R+h)
b. - m g_0R^2 / 2(R+h)
c. 2m g_0R^2 / (R+h)
d. - 2m g_0R^2 / (R+h)

32. A satellite S is moving in an elliptical orbit around the earth. The mass of the satellite is

very small compared to the mass of the earth. Then,

a. The linear momentum of S remains constant in magnitude.
b. The acceleration of S is always directed towards the centre of te earth.
c. The angular momentum of S about the centre of the earth changes in direction, but its magnitude remains constant.
d. The total mechanical energy of S varies periodically with time.

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



34. A particle of mass 'm' is kept at rest at a height 3R from the surface of earth, where 'R' is radius of earth and 'M' is mass of earth. The minimum speed with which it should be projected, so that it does not return back, is (g is acceleration due to gravity on the surface of earth)

a. $(GM/2R)^{1/2}$
b. $(gR/4)^{1/2}$
c. $(2g/R)^{1/2}$
d. $(GM/R)^{1/2}$

35. If V_e is escape velocity and V_o is orbital velocity of a satellite for orbit close to the earth surface, then these are related by

a. $V_o = \sqrt{2}\, v_e$
b. $V_o = v_e$
c. $V_e = \sqrt{2\ v0}$
d. $V_e = \sqrt{2}\, v_0$

36. The bulk modulus of a sphere object is 'B'. If it is subjected to uniform pressure 'P', the fractional decrease in radius is

a. B/3P
b. 3P/B
c. P/3B
d. P/B

37. Three liquids of densities ϱ1, ϱ2 and ϱ3 (ϱ1> ϱ2 > ϱ3) , having same value of surface tension T, rise to the same height in three identical capillaries. The angles of contact Θ1, Θ2, Θ3 obey

a. $\frac{\pi}{2} > \Theta1 > \Theta2 > \Theta3 > = 0$
b. $0 < \Theta1 < \Theta2 < \Theta3 < \frac{\pi}{2}$
c. $\frac{\pi}{2} < \Theta1 < \Theta2 < \Theta3 < \pi$
d. $\pi > \Theta1 > \Theta2 > \Theta3 > \frac{\pi}{2}$

38. Coefficient of linear expansion of brass and steel rods are α1 and α2. Lengths of brass and steel rods are L1 and L2 respectively. If (L1 – L2) is maintained same at all temoeratures, which one of the following relations hold good?

a. $\alpha1^2\ L2 = \alpha2^2\ L1$
b. $\alpha1\ L1 = \alpha2\ L2$
c. $\alpha1\ L2 = \alpha2\ L1$
d. $\alpha1\ L2^2 = \alpha2\ L1^2$

39. Two non-mixing liquids of densities ϱ and nϱ (n>1) are put in a container. The height of each liquid is h. A solid cylinder of length L and density d is put in this container. The cylinder floats with its axis vertical and length pL (p<1) in the denser liquid. The density d is equal to

a. { 2 + (n-1)p)} ϱ
b. {1+(n-1)p)} ϱ
c. {1+(n+1)p)} ϱ
d. { 2 + (n+1)p)} ϱ

40. The value of coefficient of volume expansion of glycerin is $5*10^{-4} K^{-1}$. The fractional change in the density of glycerin for a rise of 40®C in its temperature, is
    a. 0.025
    b. 0.010
    c. 0.015
    d. 0.020

41. A carnot engine having an efficiency of 1/10 as heat engine, is used as a refrigerator. If the work done on the system is 10 J, the amount of energy absorbed from the reservoir at lower temperature is
    a. 90 J
    b. 99 J
    c. 100 J
    d. 1 J

42. One mole of an ideal monatomic gas undergoes a process described by the equation PV^3 = Constant. The heat capacity of the gas during this process is
    a. 3/2 R
    b. 5/2 R
    c. 2R
    d. R

43. A given sample of an ideal gas occupies a volume V at a pressure P and absolute temperature T. the mass of each molecule of the gas is m. Which of the following gives the density of the gas?
    a. P/ (kT)
    b. Pm/(kT)
    c. P/(kTV)
    d. mkT

44. The molecules of a given mass of a gas have r.m.s velocity of 200 m s^{-1} at 27®C and $1.0 * 10^5$ N m^{-2} pressure. When a temperature and pressure of the gas are 127®C and $0.05 * 10^5$ N m^{-2} , the r.m.s. velocity of its molecules in m s^{-1} is
    a. $100\frac{\sqrt{2}}{3}$
    b. 100 / 3
    c. $100\sqrt{2}$
    d. $\frac{400}{\sqrt{3}}$

45. An ideal gas is compressed to half its initial volume by means of several processes. Which of the processes results in the maximum work done on the gas?
    a. Isochoric
    b. Isothermal
    c. Adiabatic
    d. Isobaric

46. A spring of force constant K is cut into lengths of ratio 1:2:3. They are connected in series and the new force constant is K'. then they are connected in parallel and force constant is K''. Then K':K'' is
    a. 1:9
    b. 1:11
    c. 1:14
    d. 1:6

47. A particle executes linear simple harmonic motion with an amplitude of 3 cm. When the particle is at 2 cm from the mean position, the magnitude of its velocity is equal to that of its acceleration. Then its time period in seconds is
    a. $\frac{\sqrt{5}}{2\pi}$
    b. $\frac{4\pi}{\sqrt{5}}$
    c. $\frac{2\pi}{\sqrt{3}}$
    d. $\frac{\sqrt{5}}{\pi}$

48. A body of mass m is attached to the lower end of a spring whose upper end is fixed. The spring has negligible mass. When a mass m is slightly pulled down and released, it oscillates with a time period of 3 s. When the mass m is

increased by 1 kg, the time period of oscillations becomes 5 s. The value of m in Kg is

a. 3/4
b. 4/3
c. 16/9
d. 9/16

49. A particle is executing a simple harmonic motion. Its maximum acceleration is α and maximum velocity is β. Then, its time period of vibration will be

a. β^2 / α
b. $2\pi\ \beta / \alpha$
c. β^2 / α^2
d. α / β

50. A particle is executing SHM along a straight line. Its velocities at distances x1 and x2 from the mean position are V1 and V2, respectively. Its time period is

a. $2\pi\ ((V1^2 + V2^2)/ (x1^2 + x2^2))^{1/2}$
b. $2\pi\ ((V1^2 - V2^2)/ (x1^2 - x2^2))^{1/2}$
c. $2\pi\ ((x1^2 + x2^2)/ (V1^2 + V2^2))^{1/2}$
d. $2\pi\ ((x1^2 - x2^2)/ (V1^2 - V2^2))^{1/2}$