NEET PHYSICS 2018-19 - Chennai

Periodic Test : 03 **Test ID : 015**

Number of questions: 150 **Test date: 22.03.2019**

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 100 g. 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, is
   (a) coulomb/newton-metre
   (b) newton-metrekoulomb^2
   (c) coulomb^2/newton-metre
   (d) coulomb^2/(newton-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 there
   (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 boy standing at the top of a tower of 20 m height drops a stone. Assuming g= 10 m s^{-2}, the velocity with which it hits the ground is
   (a) 10.0 m/s
   (b) 20.0 m/s
   (c) 40.0 m/s
   (d) 5.0 m/s

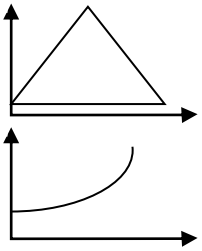
7. A particle moving along x-axis has acceleration f, at time t, given by $f = f_0(1 - \frac{t}{T})$, where f_0 and T are constants. The particle at t = 0 has zero velocity. In the time interval between t = 0 and the instant when f = 0, the particle's velocity (v_x) is
   (a) $^1/_2 f_0 T^2$
   (b) $f_0 T^2$
   (c) $^1/_2 f_0 T$
   (d) $f_0 T$

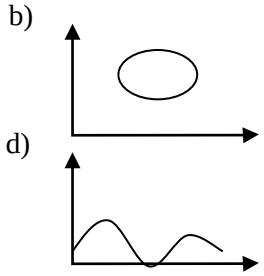
8. A man throws balls with the same speed vertically upwards one after the other at an interval of 2 seconds. What should be the speed of the throw so that more than two balls are in the sky at any time ? (Given g = 9.8 m/s^2)
   (a) more than 19.6 m/s
   (b) at least 9.8 m/s
   (c) any speed less than 19.6 m/s
   (d) only with speed 19.6 m/s.

9. A body dropped from a height *h* with initial velocity zero, strikes the ground with a velocity 3 m/s. Another body of same mass dropped from the same height *h* with an initial velocity of 4 m/s. The final velocity of second mass, with which it strikes the ground is
   (a) 5 m/s
   (b) 12 m/s
   (c) 3 m/s
   (d) 4 m/s.

10. Which of the following curve does not represent motion in one dimension?

a) b)





c) d)

11. The position vector of a particle $\vec{R}$ as a function of time is given by $\vec{R}$ = 4sin(2πt)$\hat{\imath}$+ 4cos(2πt) $\hat{\jmath}$ Where R is in meters, t is in seconds and $\hat{\imath}$ and $\hat{\jmath}$ denote unit vectors along x-and y-directions, respectively. Which one of the following statements is wrong for the motion of particle?
    (a) Magnitude of the velocity of particle is 8 meter/second.
    (b) Path of the particle is a circle of radius 4 meter.
    (c) Acceleration vector is along - $\vec{R}$
    (d) Magnitude of acceleration vector is v^2/R. Where v is the velocity of particle.

12. The horizontal range and the maximum height of a projectile are equal. The angle of projection of the projectile is v
    (a) $\theta = \tan^{-1}(1/4)$
    (b) $\theta = \tan^{-1}(4)$
    (c) $\theta = \tan^{-1}(2)$
    (d) $\theta = 45^0$

13. A particle has initial velocity (3 $\hat{\imath}$ + 4$\hat{\jmath}$) and has acceleration (0.4 $\hat{\imath}$ +.0.3$\hat{\jmath}$). Its speed after 10 s is
    (a) 7 units
    (b) $7\sqrt{2}$ units
    (c) 8.5 units
    (d) 10 units

14. $\vec{A}$ and $\vec{B}$ are two vectors and θ is the angle between them, if I $\vec{A}$x$\vec{B}$ I =$\sqrt{3}$ ($\vec{A}$.$\vec{B}$) , the value of θ is
    (a) 45^0
    (b) 30^0
    (c) 90°
    (d) 60°.

15. If the angle between the vectors $\vec{A}$ and $\vec{B}$ is θ, the value of the product ($\vec{B}$ x $\vec{A}$) . $\vec{A}$ is equal to
    (a) $BA^2\sin\theta$
    (b) $BA^2\cos\theta$
    (c) $BA^2\sin\theta\cos\theta$
    (d) Zero

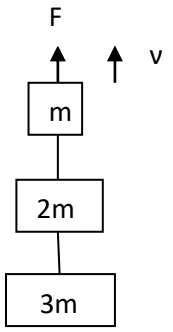
16. A car is negotiating a curved road of radius R. The road is banked at an angle θ. The coefficient of friction between the tyres of the car and the road is μ_s. The maximum safe velocity on this road is
    (a) $\sqrt{\frac{g}{R}\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$
    (b) $\sqrt{\frac{g}{R^2}\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$
    (c) $\sqrt{gR^2\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$
    (d) $\sqrt{gR\frac{\mu_s+\tan\theta}{1-\mu_s\tan\theta}}$

17. A block A of mass m_1 rests on a horizontal table. A light string connected to it passes over a frictionless pully at the edge of table and from its other end another block B of mass m_2 is suspended. The coefficient of kinetic friction between the block and the table is μ_k.When the block A is sliding on the table, the tension in the string is
    (a) $\frac{m_1m_2(1+\mu_k)g}{(m_{1+}m_2)}$
    (b) $\frac{m_1m_2(1-\mu_k)g}{(m_{1+}m_2)}$
    (c) $\frac{(m_{2+}\mu_k m_1)g}{(m_{1+}m_2)}$
    (d) $\frac{(m_{2-}\mu_k m_1)g}{(m_{1+}m_2)}$

18. Three blocks with masses m, 2m and 3m are connected by strings, as shown in the figure. After an upward force F is applied on block m, the masses move upward at constant speed v.

What is the net force on the block of mass 2m? (g is the acceleration due to gravity)

(a) 3mg
(b) 6tng
(c) zero
(d) 2mg



19. A person holding a rifle (mass of person and rifle together is 100 kg) stands on a smooth surface and fires 10 shots horizontally, in 5 s. Each bullet has a mass of 10 g with a muzzle velocity of 800 m s^{-1}. The final velocity acquired by the person and the average force exerted on the person are
    (a) -0.08 ms^{-1},16 N
    (b) -0.8 ms^{-1},8N
    (c) -1.6 ms^{-1},16N
    (d) -1.6 ms^{-1},8N

20. A conveyor belt is moving at a constant speed of 2 ms^{-1}. A box is gently dropped on it. The coefficient of friction between them is $\mu = 0.5$. The distance that the box will move relative to belt before coming to rest on it, taking g= 10 ms^{-1}, is
    (a) 0.4 m
    (b) 1.2 m
    (c) 0.6 m
    (d) Zero

21. A bullet of mass 10 g moving horizontally with a velocity of 400 ms^{-1} strikes a wood block of mass 2 kg which is suspended by light, inextensible string of length 5 m. As a result, the centre of gravity of the block found to rise a vertical distance of 10 cm. The speed of the bullet after it emerges out horizontally from the block will be
    (a) 100 ms^{-1}
    (b) 80 ms^{-1}
    (c) 120 ms^{-1}
    (d) 160 ms^{-1}

22. A particle moves from a point $(-2\hat{\imath} + 5\hat{\jmath})$to $(4\hat{\jmath} + 4\hat{k})$ 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

23. A body of mass 1 kg begins to move under the action of a time dependent force $P = (2t\,\hat{\imath} + 3t^2\hat{\jmath})$ N, where $\hat{\imath}$ and $\hat{\jmath}$ are unit vectors along x and y axis. What power will be developed by the force at the 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

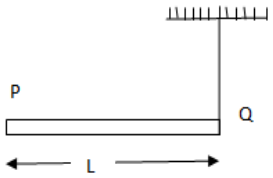
24. Two particles A and B, move with constant velocities $\overrightarrow{v_1}$ and $\overrightarrow{v_2}$. At the initial moment their position vectors are $\overrightarrow{r_1}$ and $\overrightarrow{r_2}$ respectively. The condition for particles A and B for their collision is
    (a) $\overrightarrow{r_1} \times \overrightarrow{r_2} = \overrightarrow{r_2} \times \overrightarrow{v_2}$
    (b) $\overrightarrow{r_1} - \overrightarrow{r_2} = \overrightarrow{v_1} - \overrightarrow{v_2}$
    (c) $\frac{\overrightarrow{r_1} - \overrightarrow{r_2}}{|\overrightarrow{r_1} - \overrightarrow{r_2}|} = \frac{\overrightarrow{v_2} - \overrightarrow{v_1}}{|\overrightarrow{v_2} - \overrightarrow{v_1}|}$
    (d) $\overrightarrow{r_1} \cdot \overrightarrow{v_1} = \overrightarrow{r_2} \cdot \overrightarrow{v_2}$

25. A ball is thrown vertically downwards from a height of 20 m with an initial velocity v_0. It collides with the ground, loses 50 percent of its energy in collision and rebounds to the same height. The initial velocity v_0 is (Take g = 10 ms^{-2})
    (a) 28 ms^{-1}
    (b) 10 ms^{-1}
    (c) 14 ms^{-1}
    (d) 20 ms^{-1}

26. A uniform circular disc of radius 50 cm at rest is free to turn about an axis which is perpendicular to its plane and passes through its centre. It is subjected to a torque which produces a constant angular acceleration of 2.0 rad s^{-2}. Its net acceleration in ms^{-1} at the end of 2.0 s is approximately

(a) 6.0
(b) 3.0
(c) 8.0
(d) 7.0

27. A rod PQ of mass M and length L is hinged at end. P. The rod is kept horizontal by a massless string tied to point Q as shown in figure. When string is cut, the initial angular acceleration of the rod is



(a) $\frac{2g}{L}$
(b) $\frac{2g}{2L}$
(c) $\frac{3g}{2L}$
(d) $\frac{8}{L}$

28. 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 kg m^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) 2π s
(d) $\frac{\pi}{2}$s

29. From a circular disc of radius R and mass **9**M, a small disc of mass M and radius $\frac{R}{3}$ is removed concentrically. The moment of inertia of the remaining disc about an axis perpendicular to the plane of the disc and passing through its centre is

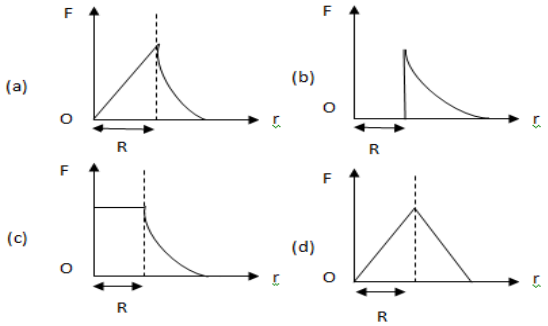
(a) $\frac{40}{9}$ MR^2
(b) MR^2
(c) $4MR^2$
(d) $\frac{4}{9}$ MR^2

30. A particle of mass m moves in the XY plane with a velocity v along the straight line AB. If the angular momentum of the particle with respect to origin O is L_A when it is at A and L_B when it is at B, then
(a) $L_A = L_B$
(b) the relationship between L_A and L_B depends upon the slope of the line AB
(c) $L_A < L_B$
(d) $L_A > L_B$

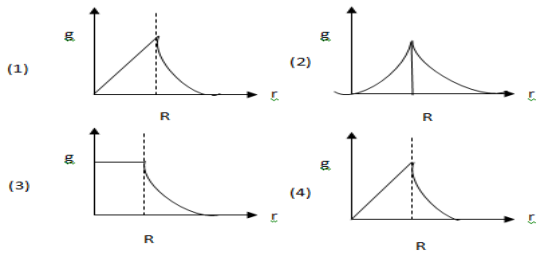
31. A remote-sensing satellite of earth revolves in a circular orbit at a height of 0.25 x 10^6 m above the surface of earth. If earth's radius is 6.38 x 10^6 m and g = 9.8 ms^{-2}, then the orbital speed of the satellite is
(a) 9.13 km s^{-1}
(b) 6.67 km s^{-1}
(c) 7.76 km s^{-1}
(d) 8.56 km s^{-1}

32. A body of mass 'm' is taken from the earth's surface to the height equal to twice the radius (R) of the earth. The change in potential energy of body will be
(a) 3mgR
(b) $\frac{1}{3}$ mgR
(c) $mg2R$
(d) $\frac{2}{3}$ mgR

33. Which one of the following plots represents the variation of gravitational field on a particle with distance r due to a thin spherical shell of radius R? (r is measured from the centre of the spherical shell)



34. The dependence of acceleration due to gravity g on the distance r from the centre of the earth, assumed to be a sphere of radius R of uniform density is as shown in figures below



he correct figure is
(a) (4)
(b) (1)
(c) (2)
(d) (3)

35. The density of a newly discovered planet is twice that of 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) 2R
(b) 4R
(c) $\frac{1}{4}$R
(d) $\frac{1}{2}$R

36. A rectangular film of liquid is extended from (4 cm x 2 cm) to (5 cm x 4 cm). If the work done is $3X10^{-4}$ J, the value of the surface tension of the liquid is
(a) 0.250 Nm^{-1}
(b) 0.125 Nm^{-1}
(c) 0.2 Nm^{-1}
(d) 8.0 Nm^{-1}

37. A piece of ice fails from a height h so that it melts completely. Only one-quarter of the heat produced is absorbed by the ice and all energy of ice gets converted into heat during its fall. The value of h is [Latent heat of ice is 3.4×10^5 J/ kg and g = 10 N/kg]
(a) 136 km
(b) 68 km
(c) 34 km
(d) 544 km

38. 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

39. The approximate depth of an ocean is 2700 m. The compressibility of water is 45.4×10^{-11} Pa^{-1} and density of water is 10^3 kg/m^3. What fractional compression of water will be obtained at the bottom of the ocean?
(a) 1.2×10^{-2}
(b) 1.4×10^{-2}
(c) 0.8×10^{-2}
(d) 1.0×10^{-2}

40. A piece of iron is heated in a flame. It first becomes dull red then becomes reddish yellow and finally turns to white hot. The correct explanation for the above observation is possible by using
(a) Kirchhoff 's Law
(b) Newton's Law of cooling
(c) Stefan's Law
(d) Wien's displacement Law

41. A gas mixture consists of 2 moles of O_2, and 4 moles of A_r at temperature T. Neglecting all vibrational modes, the total internal energy of the system is
(a) 15 RT
(b) 9 RT
(c) 11 RT
(d) 4 RT

42. 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 a s e following gives the density of the gas ?
(a) P/(kT)
(b) Pm/(kT)
(c) P/(kTV)
(d) mkT

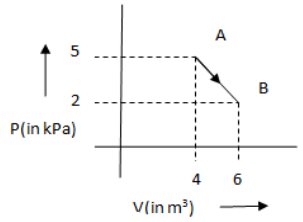
43. A refrigerator works between 4°C and 30°C. It is required to remove 600 calories of heat every second in order to keep the temperature of the refrigerated space constant. The power required is (Take 1 cal = 4.2 Joules)
(a) 236.5 W
(b) 2365 W
(c) 2.365 W
(d) 23.65 W

44. The coefficient of performance of a refrigerator is 5. If the temperature inside freezer is -20°C, the

temperature of the surroundings to which it rejects heat is

(a) 11°C
(b) 21°C
(c) 31°C
(d) 41°C

45. One mole of an ideal diatomic gas undergoes a transition from A to B along a path AB as shown in the figure.



The change in internal energy of the gas during the transition is

(a) 20 J
(b) -12 kJ
(c) 20 kJ
(d) -20 Kj

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 in is attached the lower end of a spring whose upper end is fixed. The spring has negligible mass. When the mass m is slightly pulled down and released, it oscillates with a time period of 3 s. When the mass in is increased by 1 kg, the time period of oscillation becomes 5 s. The value of m in kg is

(a) $\frac{3}{4}$
(b) $\frac{4}{3}$
(c) $\frac{16}{9}$
(d) $\frac{9}{16}$

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) $\frac{\beta^2}{\alpha}$
(b) $\frac{2\pi\beta}{\alpha}$
(c) $\frac{\beta^2}{\alpha^2}$
(d) $\frac{\alpha}{\beta}$

50. A particle is executing SHM along a straight line. Its velocities at distances x_1 and x_2 from the mean position are ,V_1 and V_2 respectively. Its time period is

(a) $2\pi\sqrt{\frac{{V_1}^2+{V_2}^2}{{x_1}^2+{x_2}^2}}$
(b) $2\pi\sqrt{\frac{{V_1}^2-{V_2}^2}{{x_1}^2-{x_2}^2}}$
(c) $2\pi\sqrt{\frac{{x_1}^2+{x_2}^2}{{V_1}^2+{V_2}^2}}$
(d) $2\pi\sqrt{\frac{{x_1}^2-{x_2}^2}{{V_1}^2-{V_2}^2}}$