NEET PHYSICS 2018-19 - Chennai

Test ID : 038

Number of questions: 150 **Test date: 16.04.2019**

Name: _____ **Time**: 3HRS

ID No: _____

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

1. The potential energy of a particle in a force field is U= $\frac{A}{r2}$ - $\frac{B}{r}$ 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) $\frac{B}{2A}$
   b) $\frac{2A}{B}$
   c) $\frac{A}{B}$
   d) $\frac{B}{A}$

2. A solid cylinder of mass 3 kg is rolling on a horizontal surface with velocity 4 ms^{-1}. It collides with a horizontal spring of force constant 200 N m^{-1}. The maximum compression produced in the spring will be
   a) 0.5 m
   b) 0.6 m
   c) 0.7 m
   d) 0.2 m

3. Two spheres A and B of masses m_1 and m_2 respectively collide. A is at rest initially and B is moving with velocity v along x-axis. After collision B has a velocity in a direction perpendicular to the original direction. The mass A moves after collision in the direction
   a) same as that of B
   b) opposite to that of B
   c) $\theta = tan^{-1}(\frac{1}{2})$ to the x-axis
   d) $\theta = tan^{-1}(-\frac{1}{2})$ to the x-axis

4. A car of mass m starts from rest and accelerates so that the instantaneous power delivered to the car has a constant magnitude P_0. The instantaneous velocity of this car is proportional to
   a) t^2P_0
   b) $t\frac{1}{2}$
   c) $t\frac{-1}{2}$
   d) $\frac{t}{\sqrt{m}}$

5. 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.

6. The ratio of radii of gyration of a circular ring and a circular disc, of the same mass and radius, about an axis passing through their centres and perpendicular to their planes are
   a) 1:√2
   b) 3:2
   c) 2:1
   d) √2:1

7. Two discs are rotating about their axes, normal to the discs and passing through the centres of the discs. Disc D_1 has 2 kg mass and 0.2 m radius and initial angular velocity of 50 rad s^{-1}. Disc D_2 has 4 kg mass, 0.1 m radius and initial angular velocity of 200 rad s^{-1}. The two discs are brought in contact face to face, with their axes of rotation coincident. The final angular velocity (in rad s^{-1}) of the system is
   a) 60
   b) 100
   c) 120
   d) 40

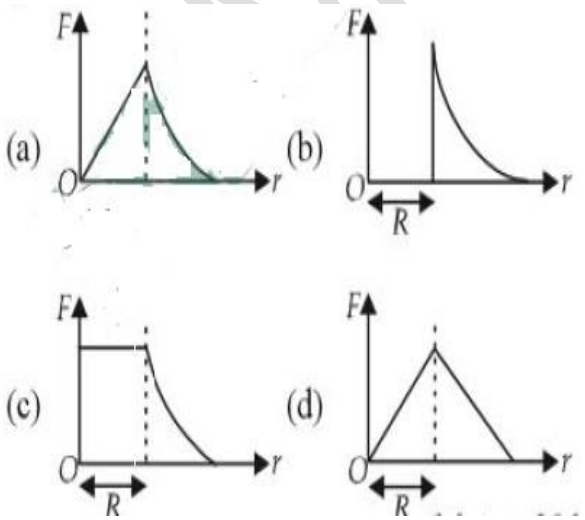
8. When a mass is rotating in a plane about a fixed point, its angular momentum is diredted along
   a) a line perpendicular to the plane of rotation
   b) the line making an angle of 45◦ to the plane of rotation
   c) the radius
   d) the tangent to the orbit

9. Two persons of masses 55 kg and 65 kg respectively, are at the opposite ends of a boat. The length of the boat is 3.0 m and weighs 100 kg. The 55 kg man walks upto the 65 kg man and sits with him. If the boat is in still water the center of mass of the system shifts by
   a) 3.0m
   b) 2.3m
   c) zero
   d) 0.75m

10. A car of mass 1000 kg negotiates a banked curve of radius 90 m on a frictionless road. If the banking angle is 45◦, the speed of the car is
   a) 20 ms^{-1}
   b) 30 ms^{-1}
   c) 5 ms^{-1}
   d) 10 ms^{-1}

11. If v_e is escape velocity and v_0 is orbital velocity of a satellite for orbit close to the earth's surface, then these are related by
   a) $v_0=\sqrt{2}v_e$
   b) $v_0=v_e$
   c) $v_e=\sqrt{2}v_0$
   d) $v_e=\sqrt{2}v_0$

12. 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)



13. A planet moving along an elliptical orbit is closest to the sun at a distance r_1 and farthest away at a distance of r_2. If v_1 and v_2 are the linear velocities at these points respectively, then the ratio $\frac{v1}{v2}$is
   a) $(\frac{r1}{r2})_2$
   b) $\frac{r2}{r1}$
   c) $(\frac{r2}{r1})_2$
   d) $\frac{r1}{r2}$

14. A particle of mass m is thrown upwards from the surface of the earth, with a velocity u. The mass and the radius of the earth are respectively, M and R. G is gravitational constant and g is acceleration due to gravity on the surface of the earth. The minimum valu of u so that the particle does not return back to earth is,
    a) $\sqrt{\frac{2GM}{R2}}$
    b) $\frac{2GM}{R}$
    c) $\sqrt{\frac{2gM}{R2}}$
    d) $\sqrt{2gR^2}$

15. A particle of mass M is situated at the center of a spherical shell of same mass and radius a. The magnitude of the gravitational potential at a point situated at a/2 distance from the centre, will be
    a) $\frac{GM}{a}$
    b) $\frac{2GM}{a}$
    c) $\frac{3GM}{a}$
    d) $\frac{4GM}{a}$

16. 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}

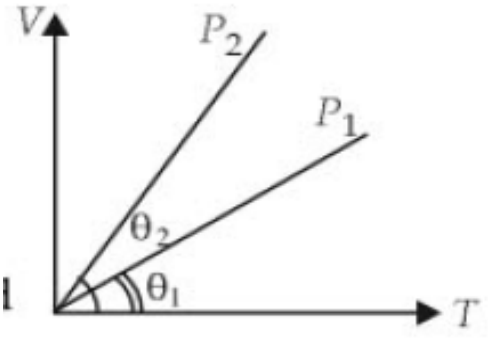
17. Copper of fixed volume V is drawn into wire of length l. When this wire is subjected to a constant force F, the extension produced in the wire is Δl. Which of the following graphs is a straight line?
    a) Δl versus $1/l$
    b) Δl versus l^2
    c) Δl versus l/l^2
    d) Δl versus l

18. A certain number of spherical drops of a liquid of radius r coalesce to form a single drop of radius R and volume V. If T is the surface tension of the liquid, then
    a) energy = $4VT(\frac{1}{r} - \frac{1}{R})$ is released
    b) energy = $3VT(\frac{1}{r} + \frac{1}{R})$ is absorbed
    c) energy = $3VT(\frac{1}{r} - \frac{1}{R})$ is released
    d) energy is neither released nor absorbed

19. Steam at 100 ◦C is passed into 20 g of water at 10◦C. When water acquires a temperature of 80◦C, the mass of water present will be
    [Take specific heat of water = 1 cal g^{-1} $◦C^{-1}$ and latent heat of steam = 540 cal g^{-1}]
    a) 24g
    b) 20◦C
    c) 42◦C
    d) 10◦C

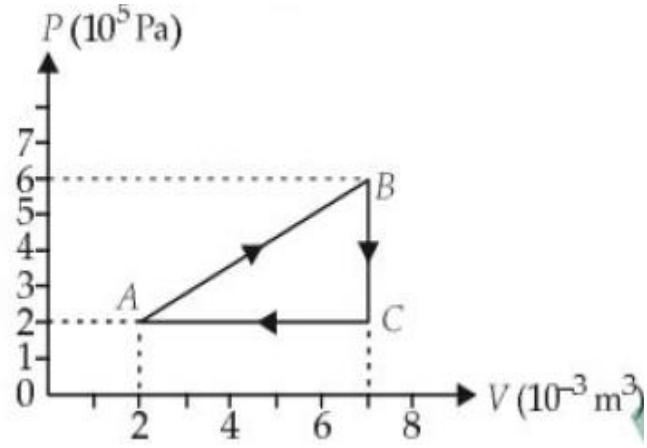
20. Certain quantity of water cools from 70◦C to 60◦C in the first 5 minutes and to 54◦C in the next 5 minutes. The temperature of the surroundings is
    a) 45◦C
    b) 20◦C
    c) 42◦C
    d) 10◦C

21. In the given (V-T) diagram, what is the relation between pressures P_1 and P_2?



    a) $P_2 < P_1$
    b) cannot be predicted
    c) $P_2 = P_1$
    d) $P_2 > P_1$

22. A gas is taken through the cycle A → B → C→ A, as shown. What is the net work done by the gas?



a) Zero
b) -2000 J
c) 2000 J
d) 1000 J

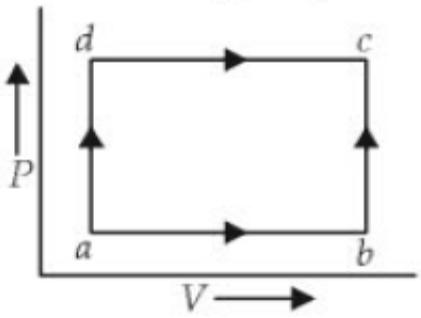
23. During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its temperature. The ratio of $\frac{cp}{cv}$ for the gas isV
a) $\frac{5}{3}$
b) $\frac{3}{2}$
c) $\frac{4}{3}$
d) 2

24. The amount of heat energy required to raise the temperature of 1 g of Helium at NTP, from T_1K to T_2K is

(a) $\frac{3}{4}N_a k_B(T_2-T_1)$ (b) $\frac{3}{4}N_a k_B\left(\frac{T_2}{T_1}\right)$

(c) $\frac{3}{8}N_a k_B(T_2-T_1)$ (d) $\frac{3}{2}N_a k_B(T_2-T_1$

25. A system is taken from state a to state c by two paths adc as shown in the figure. The internal energy at a is U_a= 10 J. Along the path adc the amount of heat absorbed dQ_1= 50J and the work obtained dW_1=20J Whereas along the path abc the heat absorbed dQ_2= 36 J. The amount of work along the path abc is



a) 10J
b) 12J
c) 36J
d) 6J

26. A rectangular block of mass m and area of cross-section A floats in a liquid of density ρ. If it is given a small vertical displacement from equilibrium it undergoes with a time period T, then

(a) $T \propto \frac{1}{\sqrt{m}}$ (b) $T \propto \sqrt{\rho}$

(c) $T \propto \frac{1}{\sqrt{A}}$ (d) $T \propto \frac{1}{\rho}$

27. The circular motion of a particle with constant speed is
a) periodic but not simple harmonic
b) simple harmonic but not periodic
c) period and simple harmonic
d) neither periodic not simple harmonic

28. A particle executing simple harmonic motion of amplitude 5 cm has maximum speed of 31.4 cm/s. the frequency of its oscillation is
a) 4 Hz
b) 3 Hz
c) 2 Hz
d) 1 Hz

29. Two springs of spring constants k_1 and k_2 are joined in series. The effective spring constant of the combination is given by
    a) $\sqrt{k_1+k_2}$
    b) $(k_1+k_2)/2$
    c) k_1+k_2
    d) $k_1k_2/(k_1+k_2)$

30. Which one of the following statements is true for the speed v and the acceleration a of a particle executing simple harmonic motion?
    a) When v is maximum, a is maximum
    b) Value of a is zero, whatever may be the value of v
    c) When v is zero, a is zero
    d) When v is maximum, a is zero

31. When a string is divided into three segments of length l_1,l_2 and l_3 the fundamental frequencies of these three segments are v_1,v_2 and v_3 respectively. The original fundamental frequency (v) of the string is
    (a) $\sqrt{\upsilon} = \sqrt{\upsilon_1} + \sqrt{\upsilon_2} + \sqrt{\upsilon_3}$
    (b) $\upsilon = \upsilon_1 + \upsilon_2 + \upsilon_3$
    (c) $\frac{1}{\upsilon} = \frac{1}{\upsilon_1} + \frac{1}{\upsilon_2} + \frac{1}{\upsilon_3}$
    (d) $\frac{1}{\sqrt{\upsilon}} = \frac{1}{\sqrt{\upsilon_1}} + \frac{1}{\sqrt{\upsilon_2}} + \frac{1}{\sqrt{\upsilon_3}}$

32. Two sources of sound placed close to each other, are emitting progressive waves given by
    $y_1 = 4\sin 600\pi t$ and $y_2 = 5\sin 608\pi t$
    An observer located near these two sources of sound will hear
    a) 4 beats per second with intensity ratio 25: 16 between waxing and waning
    b) 8 beats per second with intensity ratio 25: 16 between waxing and waning
    c) 8 beats per second with intensity ratio 81: 1 between waxing and waning
    d) 4 beats per second with intensity ratio 81: 1 between waxing and waning

33. The equation of a simple harmonic wave is given by $y=3\sin\frac{\pi}{2}(50t-x)$,
    where x and y are in metres and t is in seconds. The ratio of maximum particle velocity to the wave velocity is
    a) 2π
    b) $\frac{3}{2}\pi$
    c) 3π
    d) $\frac{2}{3}\pi$

34. A train moving at a speed of 220 ms^{-1} towards a stationary object, emits a sound of frequency 1000 Hz. Some of the sound reaching the object gets reflected back to the train as echo. The frequency of the echo as detected by the driver of the train is (Speed of sound in air is 330 ms^{-1})
    a) 3500 Hz
    b) 4000 Hz
    c) 5000 Hz
    d) 3000 Hz

35. Two waves are represented by the equations $y_1=a\sin(\omega t + kx + 0.57)$ m and $y_2=a\cos(\omega t + kx)$ m, where x is in meter and t in sec. The phase difference between them is
    a) 1.0 radian
    b) 1.25 radian
    c) 1.57 radian
    d) 0.57 radian

36. Four point charges –Q,-q,2q and 2Q are placed, one at each corner of the square. The relation between Q and q for which the potential at the centre of the square is zero is
    a) Q=-q
    b) Q=-$\frac{1}{q}$
    c) Q=q
    d) Q=$\frac{1}{q}$

37. What is the flux through a cube of side a if a point charge of q is at one of its corner?
    a) $\frac{2q}{\epsilon 0}$
    b) $\frac{q}{8\epsilon 0}$
    c) $\frac{q}{\epsilon 0}$
    d) $\frac{q}{2\epsilon 0}6a^2$

38. A parallel plate capacitor has a uniform electric field E in the space between the plates. If the distance between the plates is d and area of each plate is A, the energy stored in the capacitor is
    a) $\frac{1}{2}\varepsilon_0 E^2$
    b) $\frac{E2Ad}{\varepsilon 0}$
    c) $\frac{1}{2}\varepsilon_0 E^2 Ad$
    d) $\varepsilon_0 EAd$

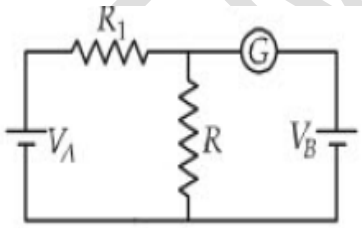
39. Two metallic spheres of radii 1 cm and 3 cm are given charges of -1×10^{-2}C and 5×10^{-2}C, respectively. If these are connected by a conducting wire, the final charge on the bigger sphere is
    a) 2×10^{-2} C
    b) 3×10^{-2} C
    c) 4×10^{-2} C
    d) 1×10^{-2} C

40. A charge Q is enclosed by a Gaussian spherical surface of radius R. If the radius is doubled, then the outward electric flux will
    a) increase four times
    b) be reduced to half
    c) remain the same
    d) be doubled

41. A 12cm wire is given a shape of a right angled triangle ABC having sides 3 cm,4 cm and 5 cm as shown in the figure. The resistance between two ends (AB, BC, CA) of the respective sides are measured one by one by a multi-meter. The resistances will be in the ratio
    a) 9:16:25
    b) 27:32:35
    c) 21:24:25
    d) 3:4:5

42. Ten identical cells connected in series are needed to heat a wire of length one meter and radius 'r' by 10◦C in time 't'.How many cells will be required to heat the wire of length two meter of the same radius by the same temperature in time 't'?
    a) 20
    b) 30
    c) 40
    d) 10

43. In the circuit shown the cells A and B have negligible resistances. For V_A=12 V, R_1=500 Ω and R = 100 Ω the galvanometer (G) shows no deflection. The value of V_B is



    a) 4 V
    b) 2 V
    c) 12 V
    d) 6 V

44. A ring is made of a wire having a resistance R_0=12 Ω.find the points A and B as shown in the figure, at which a current carrying conductor should be connected so that the resistance R of the sub circuit between these points is equal to $\frac{8}{3}$ Ω.
    a) $\frac{l1}{l2} = \frac{5}{8}$
    b) $\frac{l1}{l2} = \frac{1}{3}$
    c) $\frac{l1}{l2} = \frac{3}{8}$
    d) $\frac{l1}{l2} = \frac{1}{2}$

45. If voltage across a bulb rated 220 volt-100 watt drops by 2.5 % of its rated value by which the power would decrease is
    a) 20 %
    b) 2.5 %
    c) 5 %
    d) 10 %

46. A uniform lectric field and a uniform magnetic field are acting along the same direction in a certain region. If an electron is projected in the region such that its velocity is pointed along the direction of fields, then the electron
    a) will turn towards right of direction of motion
    b) speed will decrease
    c) speed will increase
    d) will turn towards left of direction of motion

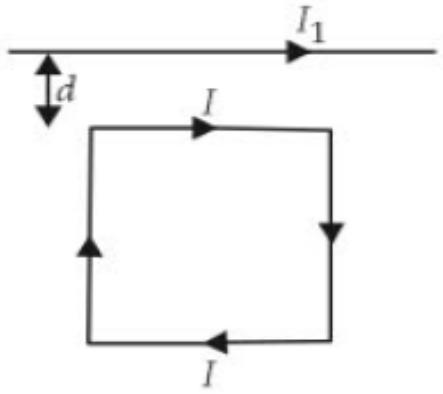
47. A galvanometer of resistance, G, is shunted by a resistance S ohm. To keep the main current in the circuit unchanged, the resistance to be put in series with the galvanometer is

    (a) $\frac{G}{(S+G)}$ (b) $\frac{S^2}{(S+G)}$

    (c) $\frac{SG}{(S+G)}$ (d) $\frac{G^2}{(S+G)}$

48. Charge q is uniformly spread on a thin ring of radius R. The ring rotates about its axis with a uniform frequency fHz. The magnitude of magnetic induction at the center of the ring is
    a) $\frac{\mu 0qf}{2\pi R}$
    b) $\frac{\mu 0qf}{2R}$
    c) $\frac{\mu 0q}{2fR}$
    d) $\frac{\mu 0q}{2\pi fR}$

49. A square loop, carrying a teady current I, is placed in a horizontal plane near a long straight conductor carrying a steady current I_1 at a distance d from the conductor as shown in figure. The loop will experience



    a) a net attractive force towards the conductor
    b) a net repulsive force away from the conductor
    c) a net torque acting upward perpendicular to the horizontal plane
    d) a net torque acting downward normal to the horizontal plane

50. A galvanometer has a coil of resistance 100 ohm and gives a full scale deflection for 30 mA current. If it is to work as a voltmeter of 30 volt range, the resistance required to be added will be
    a) 900 Ω
    b) 1800 Ω
    c) 500 Ω
    d) 1000 Ω