SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

Time: 3 Hours | **NEET TOT GT-9** | **Max. Marks: 720 M**

PHYSICS

1. Turpentine oil is flowing through a tube of length l and r. The pressure difference between the two ends of the tube is P. The viscosity of oil is given by $\eta = \frac{P\left(r^2 - x^2\right)}{4vl}$ where v is the velocity of oil at a distance x from the axis of the tube. The dimensions of η are

1) $\left[M^0L^0T^0\right]$ 2) $\left[MLT^{-1}\right]$ 3) $\left[ML^2T^{-2}\right]$ 4) $\left[ML^{-1}T^{-1}\right]$

2. The displacement x of a particle vaties with time as $x = ae^{\alpha t} + be^{\beta t}$, where a, b α and β are positive constants. The velocity of the particle will

1) be independent of β 2) drop to zero when $\alpha = \beta$

3) go on decreasing with time 4) go on increasing with time

3. The position vector of a particle $\vec{R}$ as a function of time is given by $\vec{R} = 4\sin(2\pi t)\hat{i} + 4\cos(2\pi t)\hat{j}$. Where R is in meters, t is in seconds and $\hat{i}$ and $\hat{j}$ denote unit vectors along x- and y- directions respectively. Which one of the following statements is wrong for the motion of particle?

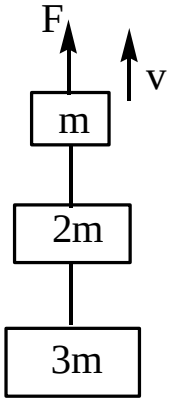
1) Magnitude of the velocity of particle is 8 meter/second

2) Path of the particle is a circle of radius 4 meter

3) Acceleration vector is along $-\vec{R}$.

4) Magnitude of acceleration vector is $\frac{v^2}{R}$, Where v is velocity of particle.

4. 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)

1) 3 mg 2) 6 mg 3) zero 4) 2 mg

5. 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

1) $\sqrt{\frac{g\,(\mu_s + \tan\theta)}{R(1 - \mu_s \tan\theta)}}$ 2) $\sqrt{\frac{g\,(\mu_s + \tan\theta)}{R^2(1 - \mu_s \tan\theta)}}$ 3) $\sqrt{gR^2\,\frac{(\mu_s + \tan\theta)}{(1 - \mu_s \tan\theta)}}$ 4) $\sqrt{gR\,\frac{(\mu_s + \tan\theta)}{(1 - \mu_s \tan\theta)}}$

6. A mass m moving horizontally (along the x-axis) with velocity v collides and sticks to a mass of 3m moving vertically upward (along the y-axis) with velocity 2v. The final velocity of the combination is

1) $\frac{3}{2}v\hat{i}+\frac{1}{4}v\hat{j}$ 2) $\frac{1}{4}v\hat{i}+\frac{3}{2}v\hat{j}$ 3) $\frac{1}{3}v\hat{i}+\frac{2}{3}v\hat{j}$ 4) $\frac{2}{3}v\hat{i}+\frac{1}{3}v\hat{j}$

7. The potential energy between two atoms, in a molecule, is given by $U(x)=\frac{a}{x^{12}}-\frac{b}{x^{6}}$ where a and b are positive constants and x is the distance between the atoms. The atom is in stable equilibrium, when

1) $x=\left(\frac{2a}{b}\right)^{1/6}$ 2) $x=\left(\frac{11a}{5b}\right)^{1/6}$ 3) x = 0 4) $x=\left(\frac{a}{5b}\right)^{1/6}$

8. A thin hollow sphere of mass m is completely filled with a liquid of mass m. When the sphere rolls with a velocity v, kinetic energy of the system is equal to

1) $\frac{1}{2}mv^2$ 2) mv^2 3) $\frac{4}{3}mv^2$ 4) $\frac{4}{5}mv^2$

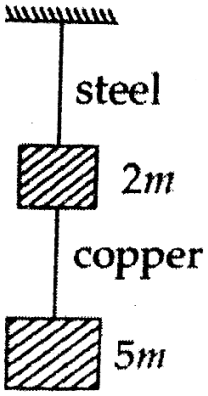
9. A rod of weight W is supported by two parallel knife edges A and B and is in equilibrium in a horizontal position. The knives are at a distance d from each other. The centre of mass of the rod is at distance x from A. The normal reaction on A is

1) $\frac{W(d-x)}{x}$ 2) $\frac{W(d-x)}{d}$ 3) $\frac{Wx}{d}$ 4) $\frac{Wd}{x}$

10. Infinite number of bodies, each of mass 2 kg are situated on x–axis at distances 1m 2m 4m 8m ……., respectively, from the origin. The resulting gravitational potential due to this system at the origin will be

1) $-\frac{4}{3}G$ 2) $-4G$ 3) $-G$ 4) $-\frac{8}{3}G$

11. If the ratio of diameters, lengths and Young's modulus of steel and copper wires shown in the figure are p, q and s respectively, then the corresponding ratio of increase in their lengths would be

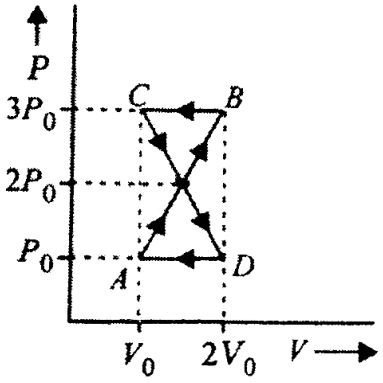


1) $\frac{5q}{(7sp^2)}$ 2) $\frac{7q}{(5sp^2)}$ 3) $\frac{2q}{(5sp)}$ 4) $\frac{7q}{(5s^2p)}$

12. Two non-mixing liquids of densities ρ and $n\rho(n>1)$ are put in a container. The height of each liquids 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

1) $\{2+(n-1p)\}\rho$ 2) $\{1+(n-1)p\}\rho$ 3) $\{1+(n+1)p\}\rho$ 4) $\{2+(n+1)p\}\rho$

13. A thermodynamic system undergoes cyclic process ABCDA as shown in figure. The work done by the system in the cycle is

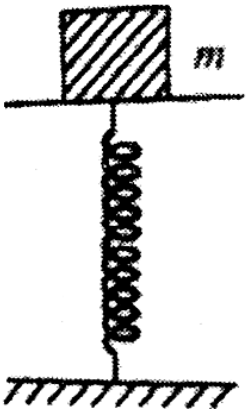


1) P_0V_0 2) $2P_0V_0$ 3) $\frac{P_0V_0}{2}$ 4) Zero

14. Three containers of the same volume contain three different gases. The masses of the molecules are m_1, m_2 and m_3 and the number of molecules in their respective containers are N_1, N_2 and N_3. The gas pressure in the containers are P_1, P_2 and P_3 respectively. All the gases are now mixed and put in one of theses containers. The pressure P of the mixture will be

1) $P < (P_1 + P_2 + P_3)$ 2) $P = \frac{P_1 + P_2 + P_3}{3}$ 3) $P = P_1 + P_2 + P_3$ 4) $P > (P_1 + P_2 + P_3)$

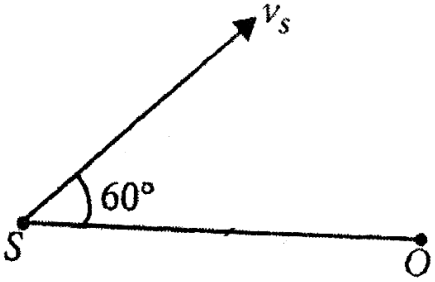
15. A mass of 2 kg is put on a flat pan attached to a vertical spring fixed on the ground as shown in the figure. The mass of the spring and the pan is negligible.



When pressed slightly and released the mass executes a simple harmonic motion. The spring constant is 200 N/m. What should be the minimum amplitude of the motion so that the mass gets detached from the pan (take g= 10 m/s^2)

1) 10.0 cm 2) any value less than 12.0 cm
3) 4.0 cm 4) 8.0 cm

16. A source of sound S emitting waves of frequency 100 Hz and an observer O are located at some distance from each other. The source is moving with a speed of 19.4 ms^{-1} at an angle of 60^0 with the source observer line as shown in the figure. The observer is at rest. The apparent frequency observed by the observer (velocity of sound in air 330 ms^{-1}), is



1) 106 Hz 2) 97 Hz 3) 100 Hz 4) 103 Hz

17. A standing wave having 3 nodes and 2 antinodes is formed between two atoms having distance 1.21 A^0 between them the wavelength of the standing wave is

1) $6.05A^0$ 2) $2.42A^0$ 3) $1.21A^0$ 4) $3.63A^0$

18. The electric potential at a point [x, y, z] is given by $V = -x^2y - xz^2 + 4$. The electric field at that point is

1) $\overline{E} = \hat{i}2xy + \hat{j}\left(x^2 + y^2\right) + \hat{k}\left(3xz - y^2\right)$ 2) $\overline{E} = \hat{i}z^3 + \hat{j}xyz + \hat{k}z^2$

3) $\overline{E} = \hat{i}(2xy - z^3) + \hat{j}xy^2 + \hat{k}3z^2x$ 4) $\overline{E} = \hat{i}(2xy + z^3) + \hat{j}x^2 + \hat{k}3xz^2$

19. Three point charges +q, -2q and +q are placed at points (x=0, y=a, z=0), (x=0, y=0, z=0) and (x=a, y=0, z=0) respectively. The magnitude and direction of the electric dipole moment vector of this charge assembly are

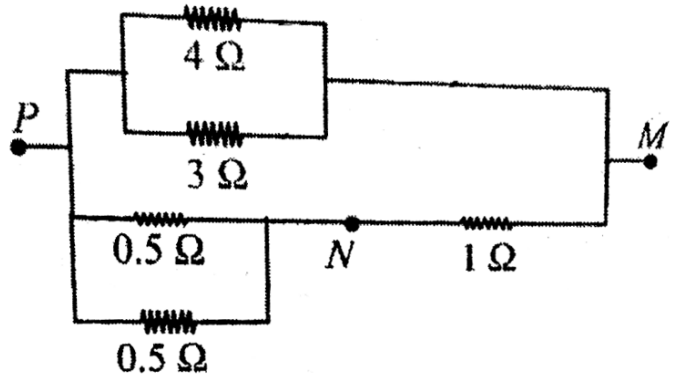
1) $\sqrt{2}qa$ along the line joining points (x=0,y=0,z=0) and (x=a, y=a, z=0)

2) qa along the line joining points (x=0, y=0, z=0) and (x=a, y=a, z=0)

3) $\sqrt{2}qa$ *along* $+x$ *direction*

4) $\sqrt{2}qa$ *along* $+y$ *direction*

20.



In the circuit shown, the current through the 4Ω resistor is 1 amp when the points P and M are connected to a d.c. voltage source. The potential difference between the points M and N is

1) 0.5 volt 2) 3.2 volt 3) 1.5 volt 4) 1.0 volt

21. A potentiometer circuit has been set up for finding the internal resistance of a given cell. He main battery, used across the potentiometer wire, has an emf of 2.0 V and a negligible internal resistance. The potentiometer wire itself is 4 m long. When the resistance R, connected cross the given cell, has values of

I) Infinity

II) 9.5Ω

The balancing lengths on the potentiometer wire are found to be 3 m and 2.85m, respectively. The value of internal resistance of the cell is

1) 0.475Ω 2) 0.95Ω 3) 0.5Ω 4) 0.25Ω

22. 40 electric bulbs are connected in series across a 220 V supply. After one bulb is fused the remaining 39 are connected again in series across the same supply. The illumination will be

1) More with 40 blubs than with 39 2) More with 39 bulbs than with 40

3) Equal in both the cases 4) In the ratio $40^2;39^2$

23. An alternating electric field, of frequency v, is applied across the dees (radius=R) of a cyclotron that is being used to accelerate protons (mass= m). The operating magnetic field (B) used in the cyclotron and the kinetic energy (K) of the proton beam, produced by it, are given by

1) $B = \frac{mv}{e}$ *and* $K = 2m\pi^2v^2R^2$ 2) $B = \frac{2\pi mv}{e}$ *and* $K = m^2\pi vR^2$

3) $B = \frac{2\pi mv}{e}$ *and* $K = 2m\pi^2v^2R^2$ 4) $B = \frac{mv}{e}$ *and* $K = m^2\pi vR^2$

24. A galvanometer having a coil resistance of 60Ω shows full scale deflection when a current of 1.0 amp passes through it. It can be converted into an ammeter to read currents up to 5.0 amp by

1) putting in series a resistance of 15 Ω
2) putting in series a resistance of 240 Ω
3) putting in parallel a resistance of 15Ω
4) putting in parallel a resistance of 240Ω

25. A gas undergoes a process in which its pressure p and volume V are related as Vp^n =constant, the bulk modulus for the gas in this process is

1) np 2) $p\frac{1}{n}$ 3) $\frac{1}{n}$ 4) p^n

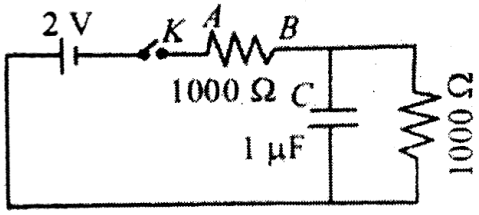
26. The ratio of specific heats at constant pressure & volume of a gas is 9/7, then the number of degrees of freedom of the gas molecules is :

1) 3 2) 5 3) 6 4) 7

27. Curie temperature is that above which

1) Paramagnetic material becomes ferromagnetic material
2) Ferromagnetic material becomes diamagnetic material
3) Ferromagnetic material becomes paramagnetic material
4) Paramagnetic material becomes diamagnetic material

28. When the key K is pressed at time t = 0, then which of the following statement about the current I in the resistor AB of the given circuit is true?



1) I oscillates between 1 mA and 2 mA
2) at t= 0, I= 2 mA and with time it goes to 1 mA
3) I= 1 mA at all t.
4) I = 2 mA at all t.

29. A condenser of capacity C is charged to a potential difference of V_1. The plates of the condenser are then connected to an ideal inductor of inductance L. The current through the inductor when the potential difference across the condenser reduces to V_2 is

1) $\left(\frac{C(V_1-V_2)}{L}\right)^{\frac{1}{2}}$ 2) $\frac{C\left(V_1^2-V_2^2\right)}{L}$ 3) $\frac{C\left(V_1^2+V_2^2\right)}{L}$ 4) $\left(\frac{C\left(V_1^2-V_2^2\right)}{L}\right)^{\frac{1}{2}}$

30. In a region of magnetic induction $B=10^{-2}$ tesla, a circular coil of radius 30 cm and resistance π^2 ohm is rotated about an axis which is perpendicular to the direction of B and which forms a diameter of the coil. If the coil rotates at 200 rpm the amplitude of the alternating current induced in the coil is

1) $4\pi^2\ mA$ 2) $30\ mA$ 3) $6\ mA$ 4) $200\ mA$

31. The space between the plates of a parallel plate capacitor is filled completely with a dielectric substance having dielectric constant 4 and thickness 3 mm. The distance between the plates in now increased by inserting a second sheet of thickness 5 mm and dielectric constant K. If the capacitance of the capacitor so formed is one-half of the original capacitance, the value of K is

1) 10/3 2) 20/3 3) 5/3 4) 15/3

32. Light with an energy flux of $25\times10^4 Wm^{-2}$ falls on a perfectly reflecting surface at normal incidence. If the surface area is 15 cm^2, the average force exerted on the surface is

1) $1.25\times10^{-6}N$ 2) $2.50\times10^{-6}N$ 3) $1.20\times10^{-6}N$ 4) $3.0\times10^{-6}N$

33. A linear aperture whose width is 0.02 cm is placed immediately in front of a lens of focal length 60 cm. The aperture is illuminated normally by a parallel beam of wavelength 5×10^{-5} cm. The distance of the first dark band of the diffraction pattern from the centre of the screen is

1) 0.10 cm 2) 0.25 cm 3) 0.20 cm 4) 0.15 cm

34. The intensity at the maximum in a Young's double slit experiment is I_0. Distance between two slits is $d=5\lambda$, where λ is the wavelength of light used in the experiment. What will be the intensity in front of one of the slits on the screen placed at a distance D = 10d?

1) $\frac{3}{4}I_0$ 2) $\frac{I_0}{2}$ 3) I_0 4) $\frac{I_0}{4}$

35. A biconvex lens $(\mu=1.5)$ has a radius of curvature of magnitude 20 cm. Which one of the following options describes best the image formed of an object of height 2 cm placed 30 cm from the lens?

1) Virtual, upright, height = 1 cm
2) Virtual, upright, height = 0.5 cm
3) Real, inverted, height = 4 cm
4) Real, inverted, height = 1 cm

36. In the Davisson and Germer experiment, the velocity of electrons emitted from the electron gun can be increased by

1) Increasing the potential difference between the anode and filament
2) Increasing the filament current
3) Decreasing the filament current
4) Decreasing the potential difference between the anode and filament

37. The work functions for metals A, B and C are respectively 1.92 eV, 2.0 eV and 5 eV. According to Einstein's equation the metals which will emit photoelectrons for a radiation of wavelength 4100 A^0 is/are

1) A only 2) A and B only 3) All the three metals 4) None

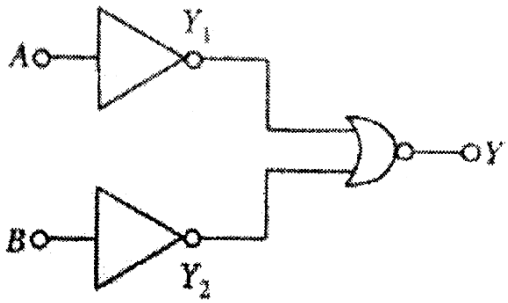
38. In a Rutherford scattering experiment when a projectile of charge z_1 and mass M_1 approaches a target nucleus of charge z_2 and mass M_2, the distance of closest approach is r_0. The energy of the projectile is

1) directly proportional to z_1z_2 2) Inversely proportional to z_1
3) directly proportional to mass M_1 4) directly proportional to $M_1\times M_2$

39. Two radioactive substance A and B have decay constants 5λ and λ respectively. At t=0 they have the same number of nuclei. The ratio of number of nuclei of A to those of B will be $(1/e)^2$ after a time interval

1) 4λ 2) 2λ 3) $1/2\lambda$ 4) $1/4\lambda$

40. Which logic gate is represented by the following combination of logic gates?



1) AND 2) NOR 3) OR 4) NAND

41. The input signal given to a CE amplifier having a voltage gain of 150 s $V_t=2\cos\left(15t+\frac{\pi}{3}\right)$. The corresponding output signal will be

1) $2\cos\left(15t+\frac{5\pi}{6}\right)$ 2) $300\cos\left(15t+\frac{4\pi}{3}\right)$ 3) $300\cos\left(15t+\frac{\pi}{3}\right)$ 4) $75\cos\left(15t+\frac{2\pi}{3}\right)$

42. A p–n photodiode is made of a material with a band gap of 2.0 eV. The minimum frequency of the radiation that can be absorbed by the material is nearly

1) $1\times10^{14}\,Hz$ 2) $20\times10^{14}\,Hz$ 3) $10\times10^{14}\,Hz$ 4) $5\times10^{14}\,Hz$

43. The apparent depth of water in cylindrical water tank of diameter 2R cm is reducing at the rate of x cm/minute when water is being drained out at a constant rate. The amount of water drained in cc per minute is :
(n_1 = refractive index of air, n_2 = refractive index of water)

1) $\frac{x\pi R^2 n_1}{n_2}$ 2) $\frac{x\pi R^2 n_2}{n_1}$ 3) $\frac{2\pi R n_1}{n_2}$ 4) $\pi R^2 x$

44. A thin prism P_1 with angle 4^o made from glass of refractive index 1.54 is combined with another thin prism P_2 made from glass of refractive index 1.72 to produce dispersion without deviation. The angle of the prism P_2 is

1) 5.33^o 2) 4^o 3) 3^o 4) 2.6^o

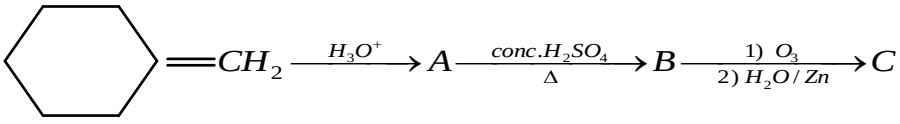
45. A closely wound solenoid of 2000 turns and are of cross-section $1.5\times10^{-4}m^2$ carries a current of 2.0 A. It is suspended through its centre and perpendicular to its length, allowing it to turn in a horizontal plane in a uniform magnetic field 5×10^{-2} tesla making an angle of 30^0 with the axis of the solenoid. The torque on the solenoid will be

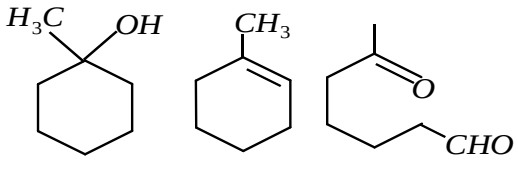
1) $3\times10^{-3}\,Nm$ 2) $1.5\times10^{-3}\,Nm$ 3) $1.5\times10^{-2}\,Nm$ 4) $3\times10^{-2}\,Nm$

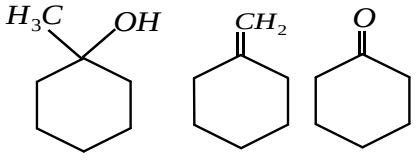
CHEMISTRY

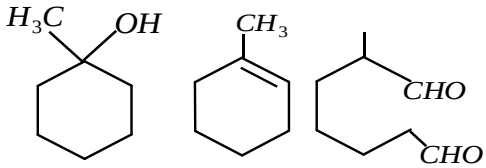
46. Which of the following statements about open chain structure of glucose are correct?
A) It contains one –CHO group **B) It contains one primary –OH group**
C) It contains four secondary –OH groups **D) It contains six –OH groups**
1) A,B,D only 2) A,B,C,D 3) B,C,D only 4) A,B,C only

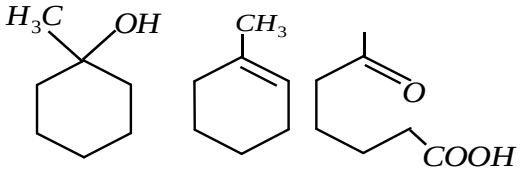
47. A,B and C in the following reaction are



1) 

2) 

3) 

4) 

48. Which of the following is false about Lithium?
1) It can directly react with Nitrogen 2) It cannot react with Ethyne
3) It is a very weak reducing agent 4) It cannot form Alums

49. $MSO_4 \xrightarrow[excess]{BaCl_2} MCl_2 + BaSO_4\downarrow;$
$MCO_3 \xrightarrow[excess]{BaCl_2} MCl_2 + BaCO_3\downarrow;$

These are the conformation tests of sulphate salts and carbonate salts respectively. If $BaSO_4$ is insoluble in Conc. HCl then $BaCO_3$ will be

1) Soluble in dilute HCl 2) Insoluble in dilute HCl
3) does not react with HCl 4) Cannot be predicted