SRIGAYATRI EDUCATIONAL INSTITUTIONS

INDIA

Time: 3 Hours **NEET TOT GT-5** **Max. Marks: 720 M**

PHYSICS

1. A uniform circular disc of radius R lies in the X-Y plane with its centre coinciding with the origin of the coordinate system. Its moment of inertia about an axis lying in the X-Y plane, parallel to the X-axis and passing through a point on the Y-axis at a distance y=2R is I_1. Its moment of inertia about an axis lying in a plane perpendicular to X-Y plane passing through a point on the X-axis at a distance x=d is I_2. If $I_1 = I_2$, the value of d is

1) $\frac{\sqrt{19}}{2}R$ 2) $\frac{\sqrt{17}}{2}R$ 3) $\frac{\sqrt{15}}{2}R$ 4) $\frac{\sqrt{13}}{2}R$

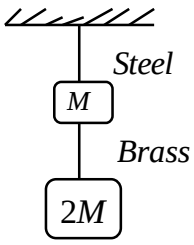
2. A $1.5\mu F$ capacitor is charged of 60 V. The charging battery is then disconnected and a 15mH coil is connected in series with the capacitor so that LC oscillations occurs. Assuming that the circuit contains no resistance, the maximum current in this coil shall be close to

1) 1.4 A 2) 1.2 A 3) 0.8 A 4) 0.6 A

3. The initial velocity of a particle is $u\left(at\ t=0\right)$ and the acceleration f is given by at^2. Its velocity v at time t is.

1) $v = v + at^3$ 2) $v = v + at^3/3$ 3) $v = v + at^3/2$ 4) $v = v + at$

4. If the ratio of lengths, radii and Young's modulus of steel and brass wires in the figure are a, b and c respectively, then the corresponding ratio of increase in their lengths would be



1) $\frac{2a^2c}{b}$ 2) $\frac{3a}{2b^2c}$ 3) $\frac{2ac}{b^2}$ 4) $\frac{3c}{2ab^2}$

5. The force acting on a window of area $50cm \times 50cm$ of a submarine at a depth of 2000 m in an ocean, the interior of which is maintained at sea level atmospheric pressure is (Density of sea water = $10^3 kg\,m^{-3}, g = 10 m\,s^{-2}$)

1) $5\times10^5 N$ 2) $25\times10^5 N$ 3) $5\times10^6 N$ 4) $25\times10^6 N$

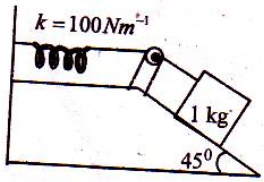
6. The electric field associated with an electromagnetic wave in vacuum is given by $\vec{E} = 40\cos\left(kZ - 6\times10^{8}t\right)\hat{i}$, where E, z and t are in volt per meter, meter and second respectively. The value of wave vector k is

1) $2m^{-1}$ 2) $0.5m^{-1}$ 3) $6m^{-1}$ 4) $3m^{-1}$

7. A quantity X is given by $\varepsilon_0 L\frac{\Delta V}{\Delta T}$ where ε_0 is the permittivity of the free space, L is a length, ΔV is a potential difference and Δt is a time interval. The dimensional formula for X is the same as that of

1) Resistance 2) Charge 3) Voltage 4) Current

8. A 1kg block situated on a rough incline is connected to a spring of negligible mass having spring constant $100Nm^{-1}$ as shown in the figure. The block is released from rest with the spring in the unstretched position. The block moves 10cm down the incline before coming to rest. The coefficient of friction between the block and the incline is nearly (take g=10 ms^{-2} and assume that the pulley is frictionless)

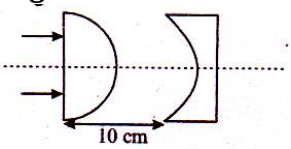


1) 0.2 2) 0.3 3) 0.5 4) 0.6

9. The focal length of the lenses of an astronomical telescope are 50 cm and 5 cm. The length of the telescope when the image is formed at the least distance of distinct vision is

1) 45 cm 2) 55 cm 3) $\frac{275}{6}cm$ 4) $\frac{325}{6}cm$

10. In the given figure, the radius of curvature of curved surface for both the plano-convex and plano-concave lens is 10 cm and refractive index for both is 1.5. The location of the final image after all the refractions through lenses is



1) 15 cm from plano-concave lens 2) 20 cm from plano-concave lens
3) 25 cm from plano-convex lens 4) 40 cm from plano-convex lens

11. An object 2cm high is placed at a distance of 16cm from a concave mirror, which produces a real image 3cm high. The focal length of the mirror is

1) -9.6 cm 2) -3.6 cm 3) -6.3 cm 4) -8.3 cm

12. A car is travelling with linear velocity v on a circular road of radius R. If its speed is increasing at the rate of a m/s^2, then the net acceleration will be

1) $\frac{v^2}{R}+a$ 2) $\frac{v^2}{R}-a$ 3) $\sqrt{\left(\frac{v^2}{R}\right)^2+a^2}$ 4) $\sqrt{\left(\frac{v^2}{R}\right)^2-a^2}$

13. 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, where v is its escape velocity from the surface of the earth, the value of f is

1) $\sqrt{2}$ 2) $1/\sqrt{2}$ 3) $1/3$ 4) $1/2$

14. Water is used as a coolant because

1) It has lower density 2) It has low specific heat
3) It has high specific heat 4) It is easily available

15. A heat engine has an efficiency η. Temperatures of source and sink are each decreased by 100K. The efficiency of the engine

1) Increases 2) Decreases 3) Remains constant 4) Becomes 1

16. Two rods of equal length and diameter have thermal conductivities 3 and 4 units respectively. If they are joined in series, the thermal conductivity of the combination in the given units would be.

1) 3.43 2) 4.43 3) 5.43 4) 2.43

17. A gas is filled in a container at pressure P_0. If the mass of molecules is halved and their rms speed is doubled, then the resultant pressure would be

1) $2P_0$ 2) $4P_0$ 3) $\frac{P_0}{4}$ 4) $\frac{P_0}{2}$

18. A solenoid has core of a material with relative permeability 500 and its windings carry a current of 1A. The number of turns of the solenoid is 500 per metre. The magnetization of the material is nearly

1) $2.5\times10^3\,Am^{-1}$ 2) $2.5\times10^5\,Am^{-1}$ 3) $2.0\times10^3\,Am^{-1}$ 4) $2.0\times10^5\,Am^{-1}$

19. A metallic surface irradiated by a monochromatic light of frequency v_1 and stopping potential is found to be V_1. If the light of frequency v_2 irradiates the surface, the stopping potential will be

1) $V_1+\frac{h}{e}(v_1+v_2)$ 2) $V_1+\frac{h}{e}(v_2-v_1)$ 3) $V_1+\frac{e}{h}(v_2-v_1)$ 4) $V_1-\frac{h}{e}(v_1+v_2)$

20. A triply ionized beryllium $\left(Be^{3+}\right)$ has the same orbital radius as the ground state of hydrogen. Then the quantum state n of Be^{3+} is

1) n=1 2) n=2 3) n=3 4) n=4

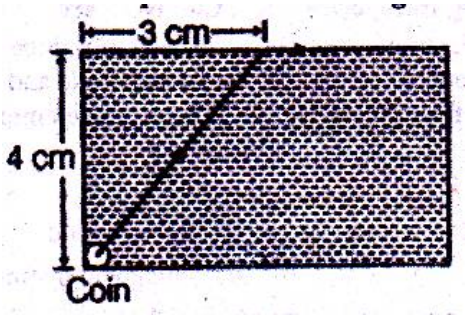
21. A body of mass 0.4 kg starting at origin at t=0 with a speed of $10ms^{-1}$ in the positive x-axis direction is subjected to a constant force F=8N towards negative x- axis. The distance travelled by body in 25 s is

1) 6005 m 2) 6000 m 3) 5995 m 4) 6002.5 m

22. Two samples X and Y contain equal amount of radioactive substances. If $\frac{1}{16}th$ of the sample X and $\frac{1}{256}th$ of the sample Y, remain after 8 hours, then the ratio of half life periods of X and Y is

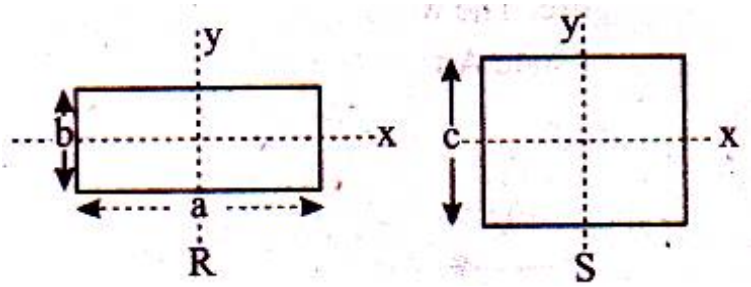
1) 2:1 2) 1:2 3) 1:4 4) 4:1

23. A small coin is resting on the bottom of a beaker filled with a liquid. A ray of light from the coin travels upto the surface of the liquid and moves along its surface. How fast is the light travelling in the liquid?



1) $1.8\times10^{8}ms^{-1}$ 2) $2.4\times10^{8}ms^{-1}$ 3) $3.0\times10^{8}ms^{-1}$ 4) $1.2\times10^{8}ms^{-1}$

24. A uniform rectangular plate R of sides a and b and a uniform square plate S of side c have same masses and area as shown in the figure x-y axes are in the planes of plates. If I is moment of inertia, then

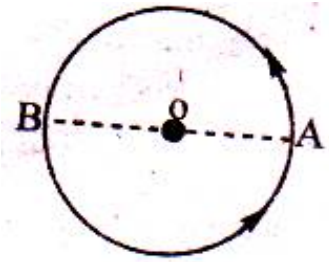


I. $\frac{I_{XR}}{I_{XS}}<1$ **II.** $\frac{I_{YR}}{I_{YS}}>1$

Which of the above relations is correct

1) I only 2) II only 3) Both I and II 4) Neither I or II

25. A particle is moving on a circular path of radius R with constant speed v. During motion of the particle from point A to point B



1) Average speed is v/2

2) The magnitude of average velocity is $\frac{v}{\pi}$

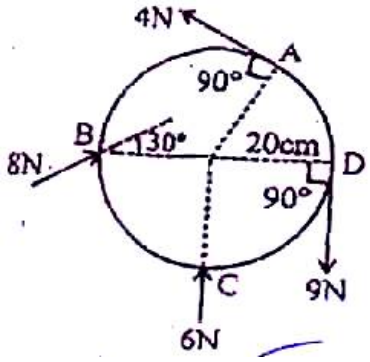
3) The magnitude of average acceleration is $\frac{2v^2}{\pi R}$

4) Average velocity is zero

26. A uniform disc of mass M and radius R is mounted on an axis supported in frictionless bearings. A light cord is wrapped around the rim of the disc and a steady downward pull T is exerted on the cord. The angular acceleration of the disc is

1) $\frac{MR}{2T}$ 2) $\frac{2T}{MR}$ 3) $\frac{T}{MR}$ 4) $\frac{MR}{T}$

27. A wheel of radius 20 cm has forces applied to it as shown in figure. The net torque produced by the forces 4 N at A, 8N at B, 6N at C and 9 N at D angles indicated is



1) 5,4 N-m (anticlock wise) 2) 1.8 N-m (clock wise)

3) 2.0 N-m (clock wise) 4) 5.4 N-m (clock wise)

28. The breakdown in a reverse biased p-n junction diode is more likely to occur due to

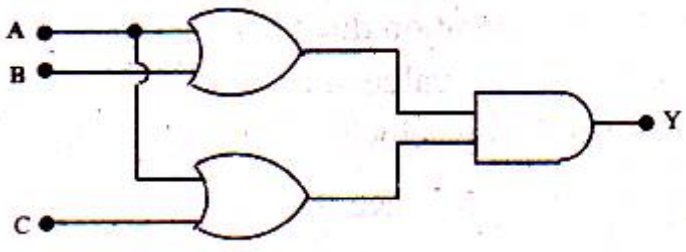
1) Large velocity of the minority charge carriers if the doping concentration is small

2) Large velocity of the minority charge carriers if the doping concentration is large

3) Strong electric field in a depletion region if the doping concentration is small

4) None of these

29. The output of given logic circuit is

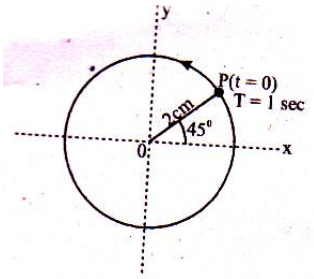


1) A. (B+C) 2) A.(B. C) 3) (A +B). (A+C) 4) A+B+C

30. Two radioactive materials A and B have decay constants 10λ and λ respectively. If initially they have the same number of nuclei, then the ratio of the number of nuclei of A to that of B will be 1/e after a time

1) $\frac{1}{10\lambda}$ 2) $\frac{1}{11\lambda}$ 3) $\frac{11}{10\lambda}$ 4) $\frac{1}{9\lambda}$

31. Figure shows the circular motion of a particle. The radius of the circle, the period, sense of revolution and the initial position are indicated in the figure. The simple harmonic motion of the x-projection of the radius vector of the rotating particle P is



1) $x = 2\cos\left(2\pi t + \frac{\pi}{4}\right)$ 2) $x = 2\sin\left(2\pi t + \frac{\pi}{4}\right)$

3) $x = 2\sin\left(2\pi t - \frac{\pi}{4}\right)$ 4) $x = 2\cos\left(2\pi t - \frac{\pi}{4}\right)$

32. A train, standing in a station yard, blows whistle of frequency 400 Hz in still air. The wind starts blowing in the direction from the yard to the station with a speed of $10 ms^{-1}$. Which of the following statements is correct? (Speed of sound in still air is 340 ms^{-1})

1) The frequency of sound as heard by an observer standing on the plat form is 400 Hz

2) The speed of sound for the observer standing on the platform is 330 ms^{-1}

3) The frequency of sound as heard by the observer standing on the platform will increase

4) The frequency of sound as heard by the observer standing on the platform will decrease

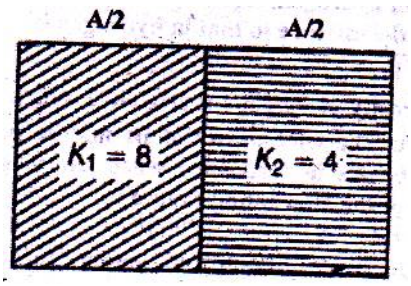
33. The tension of a stretched string is increased by 69%. In order to keep its frequency of vibration constant, its length must be increased by

1) 30 % 2) 20% 3) 69% 4) $\sqrt{69\%}$

34. In Young's double slit experiment distance between two sources is 0.1 mm. The distance of screen from the source is 20cm. Wavelength of light used is 5460 A^0. Then angular position of the first dark fringe is approximately.

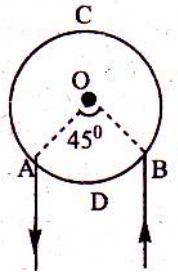
1) 0.08^0 2) 0.16^0 3) 0.20^0 4) 0.31^0

35. A capacitor having capacitance $1\mu F$ with air, is filled with two dielectrics as shown below. How many times capacitance will increase?



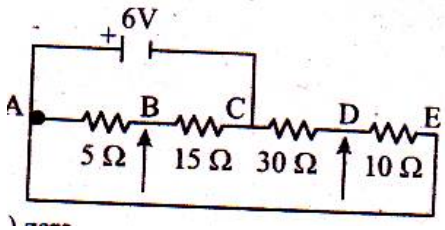
1) 12 2) 6 3) 8/ 3 4) 3

36. A and B are two points on a uniform ring of resistance 15Ω. The $\angle AOB = 45^0$. The equivalent resistance between A and B is



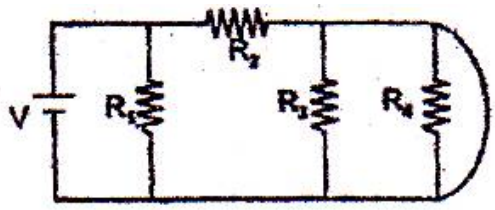
1) 1.64Ω 2) 2.84Ω 3) 4.57Ω 4) 2.64Ω

37. Four resistors are connected as shown in the figure. A 6V battery of negligible resistance is connected across terminals A and C. The potential difference across terminals B and D will be



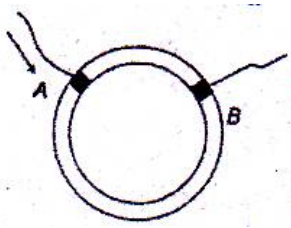
1) Zero 2) 1.5 V 3) 2 V 4) 3 V

38. In the circuit shown current is zero through



1) R_4 only 2) R_2, R_3 *and* R_4 *only* 3) R_1, R_2, R_4 only 4) R_3 *and* R_4 only

39. A ring is made of a wire having a resistance $R_0 = 12\Omega$ 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 or the sub- circuit between these points is equal to 8/3 Ω



1) $\frac{\ell_1}{\ell_2} = \frac{5}{8}$ 2) $\frac{\ell_1}{\ell_2} = \frac{1}{3}$ 3) $\frac{\ell_1}{\ell_2} = \frac{3}{8}$ 4) $\frac{\ell_1}{\ell_2} = \frac{1}{2}$

40. The magnitude of torque experienced by a square coil of side 12 cm which consists of 25 turns and carries a current 10 A suspended vertically and the normal to the plane of coil makes an angle of 30^0 with the direction of a uniform horizontal magnetic field of magnitude 0.9 T is

1) 1.62 Nm 2) 1.22 Nm 3) 1.42 Nm 4) 1.82 Nm

41. When a positively charged particle enters a uniform magnetic field with uniform velocity its trajectory can be (i) a straight line (ii) a circle (iii) a helix

1) (i) only 2) (i) or (ii) only

3) (i) or (iii) only 4) Any one of (i),(ii) and (iii)

42. Identify the wrong statement

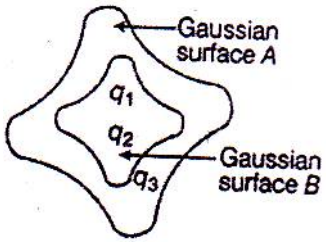
1) Eddy currents are produced in a steady magnetic field

2) Eddy currents can be minimized by using laminated core

3) Induction furnace uses eddy currents to produce heat

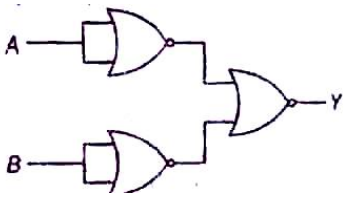
4) Eddy currents can be used to produce breaking force in moving trains.

43. The electric flux for Gaussian surface A that encloses the charged particles in free is (given , $q_1 = -14nC, q_2 = 78.85nC, q_3 = -56nC$)



1) $10^3 Nm^2C^{-1}$ 2) $10^3 CN^{-1}m^{-2}$ 3) $6.32\times10^3 Nm^2C^{-1}$ 4) $6.32\times10^3 CN^{-1}m^{-2}$

44. For the given digital circuit, identify the logic gate if



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

45. Oxygen is 16 times heavier than hydrogen. Equal volumes of hydrogen and oxygen are mixed. The ratio of speed of sound in the mixture to that in hydrogen is

1) $\sqrt{8}$ 2) $\sqrt{2/17}$ 3) $\sqrt{1/8}$ 4) $\sqrt{32/17}$

CHEMISTRY

46. The wavenumber of a spectral line for a given transition is $x\,cm^{-1}$ for He^+ , then its value for Be^{+3} for the same transition is $\left[cm^{-1}\right]$

1) x 2) $4x$ 3) $\frac{x}{4}$ 4) $16x$

47. The de- Broglie wavelength of an electron travelling with velocity equal to 10 % of velocity of light is

1) 242.4 pm 2) 24.2 pm 3) 2.42 pm 4) 2424 pm

48. Identify the incorrect statement among the following

1) Among isoelectronic species smaller the positive charge, smaller the radius

2) Among isoelectronic species greater the negative charge, larger the radius

3) Atomic radius increases down the group and decreases across a period

4) The decrease in radius is less in d- block due to poor screening effect of d- orbital