SATISH SCIENCE ACADEMY

DHANORI PUNE-411015

PHYSICS

NEET-UG - Physics

Time Allowed: 1 hour **Maximum Marks: 180**

General Instructions:

- For each correct response, the candidate will get 4 marks.
- For each incorrect response, one mark will be deducted from the total scores.

PHYSICS (Section-A)

1. Given that M is the mass suspended from a spring of force constant K. The dimension of the formula for $(M/K)^{\frac{1}{2}}$ is same as that for: **[4]**

   a) wavelength b) time period

   c) frequency d) velocity

2. The mass and volume of a body are found to be 5.00 ± 0.05 kg and 1.00 ± 0.05 m^3 respectively. Then the maximum possible percentage error in its density is: **[4]**

   a) 6% b) 3%

   c) 10% d) 7%

3. A very large number of balls are thrown vertically upwards in quick succession in such a way that the next ball is thrown when the previous one is at the maximum height. If the maximum height is 5 m, then the number of balls thrown per minute is: (g = 10 ms^{-2}) **[4]**

   a) 120 b) 40

   c) 80 d) 60

4. The position vector of particle changes with time according to the relation $\vec{r}(t) = 15t^2\,\hat{\mathbf{i}} + \left(4 - 20t^2\right)\hat{\mathbf{j}}$. What is the magnitude of the acceleration (in ms^{-2}) at t = 1? **[4]**

   a) 25 b) 50

   c) 40 d) 100

5. The trajectory of a projectile in a vertical plane is: **[4]**

   $y = ax - bx^2$

   Where a and b are constants and x and y are respectively the horizontal and vertical distances of the projectile from the point of projection. The maximum height attained is:

   a) $\frac{a^2}{2gb}$ b) $\frac{a^2}{8a}$

   c) $\frac{a^2}{2a}$ d) $\frac{a^2}{2b}$

6. Two particles A and B are moving in uniform circular motion in concentric circles of radii r_A and r_B with speed **[4]**

V_A and V_B respectively. Their time period of rotation is the same. The ratio of angular speed of A to that of B will be:

a) $v_A : v_B$ b) $r_A : r_B$

c) $r_B : r_A$ d) 1 : 1

7. A body of mass 200 g is tied to a spring of spring constant 12.5 N/m, while the other end of spring is fixed at point O. If the body moves about O in a circular path on a smooth horizontal surface with constant angular speed 5 rad/s, then the ratio of extension in the spring to its natural length will be: **[4]**

a) 1 : 1 b) 2 : 3

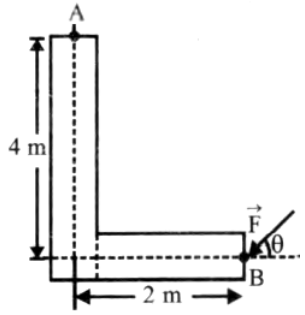
c) 1 : 2 d) 2 : 5

8. A rubber ball is dropped from a height of 5 m on a plane, where the acceleration due to gravity is not shown. On bouncing, it rises to 1.8 m. The ball loses its velocity on bouncing by a factor of: **[4]**

a) $\frac{16}{5}$ b) $\frac{3}{5}$

c) $\frac{9}{25}$ d) $\frac{2}{5}$

9. A force of 40 N acts on a point B at the end of an L-shaped object, as shown in the figure. The angle θ that will produce maximum moment of the force about point A is given by: **[4]**



a) $\tan\theta = 2$ b) $\tan\theta = 4$

c) $\tan\theta = \frac{1}{4}$ d) $\tan\theta = \frac{1}{2}$

10. A rod of mass M and length L is suspended freely from its end and it can oscillate in the vertical plane about the point of suspension. It is pulled to one side and then released. It passes through the equilibrium position with angular speed ω. What is its kinetic energy while passing through the mean position? **[4]**

a) $\frac{ML^2\omega^2}{4}$ b) $\frac{ML^2\omega^2}{12}$

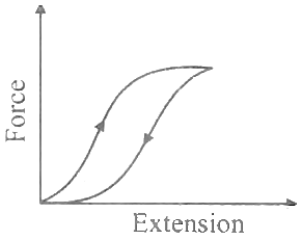
c) $\frac{ML^2\omega^2}{6}$ d) $ML^2\omega^2$

11. The percentage decrease in the acceleration due to gravity at a depth of 160 km below the surface of the earth is (Given that radius of the earth is R = 6400 km) **[4]**

a) 0.75% b) 2.5%

c) 0.25% d) 1%

12. The diagram shows a force-extension elastic hysteresis for a type of rubber. Which one of the following statements cannot be deduced from the graph? **[4]**



a) The rubber exhibits elastic after effect

b) Energy is dissipated in the form of heat during one complete cycle of stretching and unstretching

c) Hooke's law is not obeyed even for small stresses

d) Stress lags behind the strain

13. A uniform solid brass sphere is rotating with angular speed ω_0 about a diameter. If its temperature is now increased by 100°C, what will be its new angular speed? (Given $\alpha_B = \frac{2.0\times10^{-5}}{^{\circ}C}$) **[4]**

a) $0.824\omega_0$

b) $1.1\omega_0$

c) $0.996\omega_0$

d) $1.01\omega_0$

14. Ice at -20°C is added to 50 g of water at 40°C, when the temperature of the mixture reaches 0°C, it is found that 20 g of ice is still unmelted. The amount of ice added to the water was close to: **[4]**
(Specific heat of water = 4.2 J/g/°C
Specific heat of Ice = 2.1 J/g/°C
Heat of fusion of water at 0°C = 334 J/g)

a) 100g

b) 60g

c) 40g

d) 50g

15. An ideal gas at pressure P is adiabatically compressed so that its density becomes five times the initial value. The final pressure of the gas will be: **[4]**

a) 5γP

b) 2.5γP

c) 5(γ - 1)P

d) 5(γ + 1)P

16. The specific heat capacity for water is **[4]**

a) $\frac{5}{2}$R

b) 9R

c) 3R

d) 6R

17. A particle is executing simple harmonic motion with amplitude A. When the ratio of its kinetic energy to the potential energy is $\frac{1}{4}$ its displacement from its mean position is: **[4]**

a) $\frac{1}{4}A$

b) $\frac{2}{\sqrt{5}}A$

c) $\frac{3}{4}A$

d) $\frac{\sqrt{3}}{2}A$

18. A second harmonic has to be generated in a string of length L stretched between two rigid supports. The points where the string has to be plucked and touched, are: **[4]**

a) plucked at $\frac{L}{2}$ and touched at $\frac{3L}{4}$

b) plucked at $\frac{L}{4}$ and touched at $\frac{L}{2}$

c) plucked at $\frac{L}{4}$ and touched at $\frac{3L}{2}$

d) plucked at $\frac{L}{2}$ and touched at $\frac{L}{2}$

19. A closed organ pipe of length 20 cm is sounded with tuning fork in resonance. What is the frequency of tuning **[4]**

fork? (v = 332m/s)

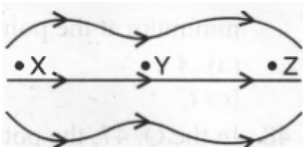
a) 350 Hz

b) 300 Hz

c) 375 Hz

d) 415 Hz

20. In this figure, electric field lines in a certain region are shown. The figure suggests that: **[4]**



a) $E_x < E_y < E_z$

b) $E_x = E_z < E_y$

c) $E_x > E_y > E_z$

d) $E_x = E_y = E_z$

21. The area of the plates of a parallel plate condenser is 100 cm^2. The paper (K = 2.5) of thickness 0.005 cm is put in between the plates. If the paper can tolerate a field of 5×10^7 volt/m, the maximum potential upto which the condenser can be charged is: **[4]**

a) 500 volt

b) 7500 volt

c) 10,000 volt

d) 2500 volt

22. When the car starts the illumination of the headlights decreases. This happens because of the: **[4]**

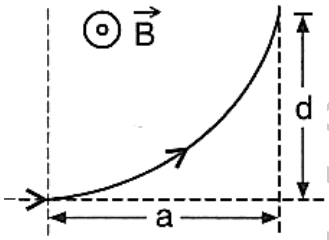
a) potential drop inside the battery increases

b) current drawn from the battery decreases

c) internal resistance of the battery increases

d) emf of the battery decreases

23. A charged particle q enters a region of uniform $\vec{B}$ (out of the page) and is deflected a distance d after travelling a horizontal distance a. The magnitude of the momentum of the particle is: **[4]**



a) $\frac{qB}{2}\left(\frac{a^2}{d}+d\right)$

b) $\frac{qBa}{2}$

c) zero

d) not possible to be determined as it keeps changing

24. A bar magnet with a magnetic moment 5.0 Am^2 is placed in. parallel position relative to a magnetic field of 0.4 T. The amount of required work done in turning the magnet form parallel to antiparallel position relative to the field direction is _____. **[4]**

a) 2 J

b) 4 J

c) 1 J

d) Zero

25. The temperature at and above which a ferromagnetic material becomes paramagnetic is called: **[4]**

a) inversion temperature

b) critical temperature

c) Debye temperature

d) Curie temperature

26. Two coils P and Q are separated by some distance. When a current of 3A flows through coil P, a magnetic flux **[4]**

of 10^{-3} Wb passes through Q. No current is passed through Q. When no current passes through P and a current of 2A passes through Q, the flux through P is

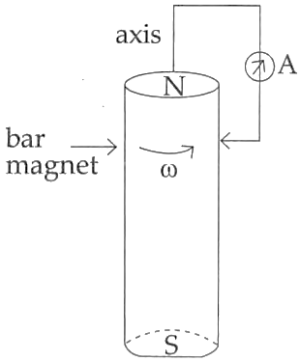
a) 3.67×10^{-3} W

b) 3.67×10^{-4} Wb

c) 6.67×10^{-4} Wb

d) 6.67×10^{-3} Wb

27. A cylindrical bar magnet is rotated about its axis as shown in the figure. A wire is connected from the axis and is made to touch the cylindrical surface through contact. Then: **[4]**



a) an alternating sinusoidal current flows through the ammeter A with a time period T = $\frac{2\pi}{\omega}$

b) a time varying non-sinusoidal current flows through the ammeter A.

c) no current flows through the ammeter A.

d) a direct current flows in the ammeter A.

28. A 10 μF capacitor is connected across a 200 V, 50 Hz AC supply. The peak current through the circuit is: **[4]**

a) $0.6\frac{\pi}{2}$ A

b) $\frac{0.6}{\sqrt{2}}$ A

c) $0.6\sqrt{2}$ A

d) 0.6 A

29. A free electron is placed in the path of a plane electromagnetic wave. The electron will start moving: **[4]**

i. along the electric field

ii. along the magnetic field

iii. along the direction of propagation of the wave

iv. in a plane containing the magnetic field and the direction of propagation

a) ii and iii

b) only i

c) iii and iv

d) iv and i

30. A ray of light travelling in a transparent medium of refractive index μ, falls on a surface separating the medium from air at an angle of incidence of 45°. For which of the following value of μ the ray can undergo total internal reflection? **[4]**

a) μ = 1.25

b) μ = 1.50

c) μ = 1.33

d) μ = 1.40

31. The bending of beam of light around corners of obstacles is called: **[4]**

a) polarisation

b) reflection

c) diffraction

d) refraction

32. An electron, accelerated by a potential difference V, has de Broglie wavelength λ. If the electron is accelerated by a potential difference 4V, its de Broglie wavelength will be: **[4]**

a) 2λ b) $\frac{\lambda}{4}$

c) $\frac{\lambda}{2}$ d) 4λ

33. Given that a photon of light of wavelength 10,000 angstrom has an energy equal to 1.23 eV. When light of wavelength 5000 angstrom and intensity I_0 falls on a photoelectric cell, the saturation current is 0.40×10^{-6} ampere and the stopping potential is 1.36 volt; if the intensity of light is made $4I_0$, if the cathode and the anode are kept at the same potential, the emitted electrons: **[4]**

a) all have the minimum KE equal to 1.36 eV b) all have the same KE equal to 1.36 eV

c) all have the average KE equal to $(\frac{1.36}{2})$ eV d) all have the maximum KE equal to 1.36 eV

34. Consider an electron in the nth orbit of a hydrogen atom in the Bohr's model. The circumstance of the orbit can be expressed in terms of the de Broglie wavelength λ of that electron as: **[4]**

a) (13.6) λ b) $\sqrt{n\lambda}$

c) 0.529 nλ d) nλ

35. A star initially has 10^{40} deuterons. It produces energy via the processes, and ${}_1H^2 + {}_1H^3 \rightarrow {}_1H^3 + p$. If the average power radiated by the star is 10^{16} W, the deuteron supply of the star is exhausted in a time of the order of:- **[4]**

The masses of the nuclei are as follows:

$M(H^2) = 2.014$ amu;

$M(H^2) = 1.007$ amu; M(n) = 1.008 amu; $M(He^4) = 4.001$amu.

a) 10^{16} s b) 10^6 s

c) 10^8 s d) 10^{12} s

PHYSICS (Section-B)

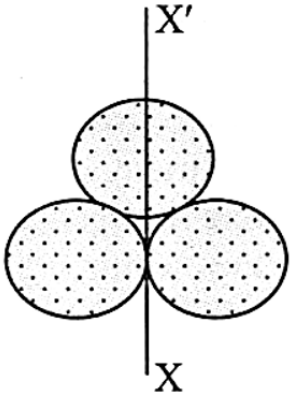
Attempt any 10 questions

36. A person holds a bucket of weight 60 N. He walks 7 m along the horizontal path and then climbs up a vertical distance of 5 m. The work done by the man is: **[4]**

a) 720 N-m b) 420 N-m

c) 300 N-m d) 200 N-m

37. Three identical spherical shells, each of mass m and radius r are placed as shown in the figure. Consider an axis XX' which is touching to two shells and passing through the diameter of the third shell. The moment of inertia of the system consisting of these three spherical shells about XX' axis is **[4]**



a) $4mr^2$ b) $\frac{11}{5}mr^2$

c) $\frac{16}{5}mr^2$ d) $3mr^2$

38. A remote-sensing satellite of earth revolves in a circular orbit at a height of 0.25×10^6m above the surface of earth. If earth's radius is 6.38×10^6 m and g = 9.8 ms^{-2}, then the orbital speed of the satellite is: **[4]**

a) 7.76 km s^{-1} b) 8.56 km s^{-1}

c) 6.67 km s^{-1} d) 9.13 km s^{-1}

39. A vessel contains 10^{-1} kg of ice at 0°C. Now steam is passed into the vessel to melt ice. Neglecting the thermal capacity of the vessel, find the mass of water in the vessel when all ice melts into water: **[4]**

a) 112.5 gm b) 12.5 gm

c) 125 gm d) 100 gm

40. Which of the following equations represents a wave? **[4]**

a) y = a sin (at - bx + c) b) y = a sin ωt

c) y = a cos kx d) y = a(ωt - kx)

41. Two organ pipes give 4 beats when sounded together at 27°C. Calculate the number of beats at 127°C: **[4]**

a) 4 beats/sec b) 4.6 beats/sec

c) 3.9 beats/sec d) 5 beats/sec

42. A proton and an electron with equal momentum are entered in a magnetic field, then: **[4]**

i. both remain unaffected

ii. path of e^- will be more curved than a proton

iii. path of proton will be more curved than electron

iv. path of both particles will be equally curved

a) iv b) ii

c) iii d) i

43. Two identical magnets each of moment M are kept at an angle of 60^o, such that boles are touching each other. The magnetic moment of the combination will be: **[4]**

a) $\sqrt{3}M$ b) M

c) 2M d) $\sqrt{2}M$

44. In an AC generator, a coil with N turns, all of the same area A and total resistance R, rotates with frequency ω in a magnetic field B. The maximum value of emf generated in the coil is: **[4]**

a) NABRω b) NABω

c) NAB d) NABR

45. A transformer is used to light a 100 W and 110 V lamp from a 220 V mains. If the main current is 0.5 amp, the efficiency of the transformer is approximate: **[4]**

a) 90% b) 30%

c) 10% d) 50%

46. Indicate the correct statement in the following: **[4]**

a) The dispersive power depends upon the angle of prism.

b) The angular dispersion does not depend upon the dispersive power.

c) The angular dispersion depends upon the angle of prism.

d) The dispersive power in vacuum is one.

47. N plane mirrors are arranged parallel to one another each moving with a speed v. The linear velocity of the Nth image of a point an object placed in front of the first mirror is: **[4]**

a) $_{Nv^3}$

b) Nv

c) 2Nv

d) $_{Nv^2}$

48. The work function of metals is in the range of 2 eV to 5 eV. Find which of the following wavelength of light cannot be used for the photoelectric effect. (Consider, Planck constant = 4×10^{-15} eVs, velocity of light = 3×10^8 m/s) **[4]**

a) 400 nm

b) 510 nm

c) 650 nm

d) 570 nm

49. In a hydrogen-like, an atom electron makes the transition from an energy level with quantum number n to another with a quantum number (n - 1). If n >> 1, the frequency of radiation emitted is proportional to **[4]**

a) $\frac{1}{n^3}$

b) $\frac{1}{n^4}$

c) $\frac{1}{n}$

d) $\frac{1}{n^2}$

50. Two protons are at a distance of 1×10^{-10} cm from each other. The forces acting on them are: **[4]**

a) nuclear, coulomb and gravitational force

b) coulomb force and gravitational force

c) nuclear force and coulomb force

d) nuclear force and gravitational force