



PHYSICS

BOOKS - NAVBODH PHYSICS (HINGLISH)

MODEL QUESTION PAPER FOR PRACTICE

Section A

1. Two cars, A and B, take the same time to go round around two concentric circular tracks of radii r_1 and r_2 , respectively. If $r_2 = 4r_1$, the ratio of the angular speed of car A to that of car B is

A. 4

B. $\frac{1}{4}$

C. 2

D. 1

Answer: D



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2. A single drop is formed by coalescing 1000 small droplets. The surface energy decreases in the ratio

A. 1 : 1

B. 10 : 1

C. 100 : 1

D. 1000 : 1

Answer: B



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3. A thin toroidal winding of mean circumference of 150 cm has 7500 turns and carries a current of 5 A. The magnetic intensity within the toroid at its mean radius is

A. $10A / m$

B. $250A / m$

C. $10^3 A / m$

D. $25 \times 10^3 A / m$

Answer: D



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4. If L is the angular momentum and I is the moment of inertia of a rotating body, then $\frac{L^2}{2I}$ represents its

- A. linear momentum
- B. total energy
- C. translational kinetic energy.

D.

Answer: B



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5. The stored energy per unit volume of a stretched wire is

A. $\sqrt{\frac{Y}{2u}}$

B. $\sqrt{\frac{2u}{Y}}$

C. $\sqrt{2uY}$

D. $\sqrt{\frac{2Y}{u}}$

Answer: C



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6. The angle between particle velocity and wave velocity in transverse wave is

A. zero

B. $\pi / 4$ rad

C. $\pi / 2$ rad

D. π rad.

Answer: C



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7. The polariser and analyser are inclined to each other at 60° . The intensity of polarised light emerging from polariser is I . The intensity of the unpolarised light incident on the polariser is

A. I_0

B. $\frac{3}{4}I_0$

C. $\frac{1}{2}I_0$

D. $\frac{1}{4}I_0$

Answer: D



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8. The energy spent by the cell in circulating unit charge once through the complete circuit is

A. the potential gradient

B. the Joule heat

C. the emf of the cell

D. the terminal p.d. Of the cell

Answer: D



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9. A Photo sensitive material would emit electrons if excited by photons beyond a

threshold. To overcome the threshold, one would increase -

- A. the intensity of light
- B. the frequency of light
- C. the wavelength of light
- D. the collector potential.

Answer: B



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10. In AM wave total power of side bands is given by :

- A. the entire AM band
- B. the modulated carrier wave
- C. the side bands
- D. the pulse amplitude.

Answer: C



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11. Van de Graaff generator is



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12. What is the nature of molecular forces?



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13. What was Hertz's observation of photoelectric effect.



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14. In a transistor, the collector current changes by 0.99 mA with a 1 mA change in the emitter current. What is the common-base current gain of the transistor?



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15. A body of mass 1 kg oscillates on a spring of force constant 16 N/m. Calculate the angular frequency.



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16. By measuring the period of revolution and orbital radius of a satellite around a planet, which of the two can we determine : the mass of the satellite or that of the planet?



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17. State Lenz's law of electromagnetic induction.



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18. Magnetic susceptibility of a diamagnetic substances



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Section B

1. Resolving power of a microscope depends upon



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2. Using the method of dimensions , derive an expressions for the energy of a body executing SHM , assuming this energy depends upon its mass m , frequency ν and amplitude of vibration r .



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3. The change in the angular momentum of the electron when it jumps from the fourth orbit to the first orbit in a H-atom is



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4. What is the changed in amplitude modulation?



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5. A body cools from $70^{\circ}C$ to $60^{\circ}C$ in 5 minutes and to $45^{\circ}C$ in the next 10 minutes. Calculate the temperature of the surroundings.



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6. Distinguish between harmonics and overtones.



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7. Two pipes closed at one end, 53 cm and 54 cm long, produce 3 beats per second when they are sounded together in their fundamental modes. Ignoring end correction, calculate the speed of sound in air.





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8. PARAMAGNETIC SUBSTANCES



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9. Keeping the angle of banking, if the radius of curvature is made four times, the percentage increase in the maximum speed with which a vehicle can travel on a circular road is



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10. State the modified Ampere's circuital law.

Explain each term involved in it.



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11. The photoelectric work function for aluminium is 4.2 eV. What is the stopping potential for radiation of wavelength 2500 Å ?



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12. A thin uniform rod- of length L , area of cross section A and density ρ - is rotated about an axis passing through a point at a distance $\frac{L}{6}$ from one end and perpendicular to its length. Derive its moment of inertia about this axis in terms of L , A and ρ .



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Section C

1. Obtain an expression for the linear acceleration of a particle in UCM.



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2. An $n - p - n$ transistor power amplifier in $C - E$ configuration gives.



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3. Define critical speed of a satellite. Derive an expression for it.



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4. Huygen's wave theory of light could not explain



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5. The amplitude of an alternating voltage is 240 V. What is its rms value?



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6. A torque of $160N \cdot m$ is applied to a flywheel initially at rest. If the flywheel acquires kinetic energy of 8 kJ in 5 s, its angular momentum at the end of 5 s is



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7. A steel wire of length 7 m and cross section 1mm^2 is suspended from a rigid support, with a steel weight of volume 10^3cm^3 hanging from its other end. Find the decrease in the length of the wire when the steel weight is completely immersed in water.

$$Y_{\text{steel}} = 2 \times 10^{11} \text{ N/m}^2 \quad \text{density of water} \\ = 10^3 \text{ kg/m}^3]$$



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8. Derive Laplace's law for a spherical membrane.



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9. A cube of amber, 1 cm on the side, is kept in an electric field of intensity 200 V//m. Determine the electrostatic energy contained in the cube of amber. [Dielectric constant of amber = 2.8]



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10. A battery of emf 3 V and internal resistance 1Ω is connected in parallel with a cell of emf 1.5 V and internal resistance 0.5Ω with their like poles together. The combination is used to pass a current through a resistor of resistance of 5Ω . Using Kirchhoff's circuital laws, find the current through the 5Ω resistor.



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1. Assuming the expression for the pressure exerted by an ideal gas, show that the rms speed of a gas molecule is directly proportional to the square root of its absolute temperature.

Calculate the kinetic energy of 10 grams of argon molecules at $127^{\circ}C$. [Atomic weight of argon = 40]



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2. Assuming the expression for the path difference between two interfering light waves for bright and dark fringes, obtain an expression for the fringe width.

The central fringe of a double-slit interference pattern produced by light of wavelength 6000\AA shifts to the position of the 5th bright fringe on introducing a thin glass plate of refractive index 1.5 in front of one of the slits. Calculate the thickness of the plate.



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3. Derive an expression for the current sensitivity of a moving-coil galvanometer.

A solenoid, 1.5 m long and 4 cm in diameter, has 10 turns/cm and carries a current of 5 A. Calculate the magnetic induction at its centre.



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4. Define linear simple harmonic motion.

Assuming the expression for displacement of a particle starting from extreme position,

explain graphically the variation of velocity and acceleration w.r.t. time.

A clock regulated by seconds pendulum, keeps correct time. During summer, length of pendulum increases to 1.005 m. How much will the clock gain or lose in one day ($g = 9.8 \text{ m/s}^2$ and $\pi = 3.142$).



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5. Explain the phenomenon of nuclear fusion with at least two examples.



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