IMP for PHYSICS HSC BOARD EXAM 2019

Chapter 1: Circular Motion

A: Theory

1. A cycle - wheel is rotating with uniform angular velocity. What is the nature of the graph between tangential velocities of different points on a spoke and their distances from the axis?
2. What is the ratio of angular velocities of hour - hand of a clock and the spin motion of the earth?
3. A particle is performing U.C.M. along a circle of radius r. In half period of revolution, what is its displacement and corresponding distance?
4. Distinguish between UCM and Non UCM
5. Write application of principle of conical pendulum
6. The curved horizontal road is banked at an angle θ'. What will happen for vehicle moving along this road?

   If a) $\theta' > \theta$ b) $\theta' < \theta$ Where θ is angle of banking for given road

B: Numericals

1. Textbook page 21 (Q 10, 12, 13)

Chapter 2: Gravitation

A: Theory

1. State expressions for acceleration due to gravity at depth 'd' and altitude at height 'h' from the earth's surface. Draw a graph showing the variation of the gravitational acceleration with depth and altitude.
2. Derive an expression for gravitational acceleration on the earth's surface at latitude
3. What is period of satellite orbiting close to earth's surface?
4. Show that escape velocity of a body of mass 'm' from the surface of the earth is equal to $\sqrt{\frac{2FR}{m}}$ where F is gravitational force and R is radius of the earth.
5. Draw a diagram showing different stages of projection for an artificial satellite.

B: Numericals

1. Textbook page 35 (Q 16)
2. Calculate the work done in moving a body of mass 1000 kg from a height 2 R to a height 3 R above the surface of the earth.
3. At what angular speed should the earth rotate so that a body situated on the equator becomes weightless?

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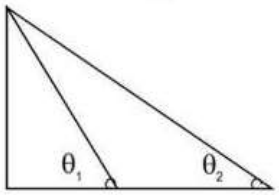
Chapter 3: Rotational Motion

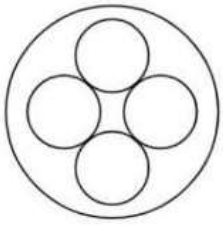
A: Theory

1. Is it possible to distinguish between a raw egg and hardboiled egg, by spinning each, once on a table? Justify your answer
2. Derive an expression for velocity/ acceleration of ring / solid cylinder/ solid sphere having same radii rolling down the smooth inclined plane without slipping.
3. Why does the grinding wheels or flywheel have large mass and moderate diameter?
4. A solid sphere rolls down, on two different inclined planes from same height, but different angles of inclinations θ_1 and θ_2. On which plane, sphere will take longer time to roll down?

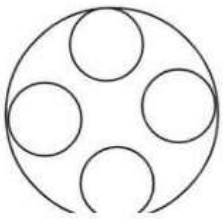


5. Two circular discs A and B having four identical small circular discs placed on them as shown in diagram, have same mass. When the discs are allowed to roll down on an inclined plane at the same instant, which disc will reach the bottom first ?

disc A



disc B



B. Numerical.

1. Textbook page 52 (Q9, 11)
2. Textbook page 55 (Q 12)

Chapter 4: Oscillation

A. Theory

1. For damped harmonic oscillator, show graphically the variation of displacement against time.
2. Using definition of linear SHM, derive an expression for angular frequency of the body.
3. Obtain an equation describing the motion of block under influence of damping force which is proportional to velocity.

B. Numerical

1. Textbook page 73 (Q 8, 11) 2. Textbook page 76 (Q 8)
3. A uniform rod of wood floats vertically in water with 14 cm of its length immersed in water. If it is depressed slightly and released, find its period of oscillations.

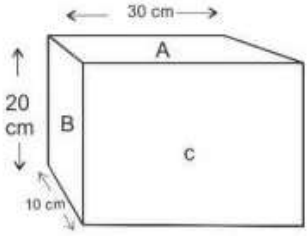
Chapter 5: Elasticity

A: Theory

1. Stress and pressure have the same dimensions but pressure is not the same as stress. Why?
2. Discuss the factors on which the bending of beam having rectangular cross-section, depend on, when beam is loaded at the centre.
3. A metallic rod is heated. Show that the thermal stress is directly proportional to its coefficient of linear expansion and Young's modulus of the material of rod.
4. Draw stress-strain curve for elastic tissue of Aorta and discuss the conclusions about elastic properties of aorta.
5. Why hollow circular pole or tube are preferred over solid circular poles?
6. Within elastic limit, prove that Young's modulus of material of wire is the stress required to double its length.
7. The block in the given diagram rests on the ground. Which face A, B or C experiences

   a) the largest stress

   b) the smallest stress when block is resting on it?

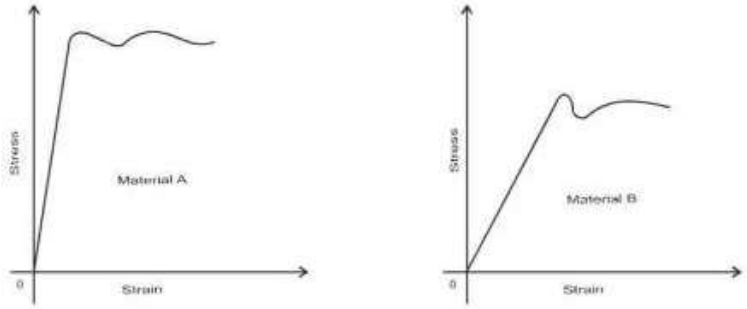


8. Answer the following questions with reference to the graph for material A and B.

   a) Which material has greater Young's modulus?

   b) Which material is more ductile?

   c) Which material is more strong?



B. Numerical

1. A wire of length 1.2 m and diameter 0.26 cm is stretched between two fixed supports. If the temperature of wire is decreased by 300C, calculate the tension created in wire.[Y= 1.6 x 10 to power 11 N/m^2, alpha = 2.4 x 10^{-5} /per C]
2. The average depth of Indian Ocean is about 3000 m. If the fractional compression of water at the bottom of the ocean is 1.5 %, find the compressibility of water.
3. A uniform wire of length 1 m and radius 0.028 cm is employed to raise a stone of density 2500 kg/m^3 immersed in water. Find the change in elongation of wire when the stone is raised out of water. [mass of stone = 5 kg, Y of material of wire = 2 x 10 to power 11 N/m^2]
4. When wire is subjected to a suitable load, volume of wire remaining unchanged, show that Poisson's ratio of material of wire is 0.5

Chapter 6: Surface Tension

A: Theory

1. Arun says that molecular forces do not obey the inverse square law of distance. Ashok says that molecular forces obey the inverse square law of distance. State your opinion.
2. Why there is a rise of liquid inside the capillary tube?
3. Draw diagram showing force due to surface tension at the liquid - solid, air –solid, air – liquid interface, in case of
   a) drop of mercury on a plane solid surface and
   b) drop of water on a plane solid surface. Discuss the variation of angle of contact.
4. i) What is end correction for height of liquid in capillary tube?
   ii) Explain rise of liquid in capillary tube in absence of gravity.
   iii) What is effect of temperature on surface tension of liquid?
5. Read summary on Page 103 in textbook.

B. Numerical

1. There is an air bubble of radius 1.0 mm in a liquid of surface tension 0.072 N/m and density 10^3 kg m^{-3}. The bubble is at a depth of 10 cm below the free surface of liquid. By what amount the pressure inside the bubble is greater than the atmospheric pressure?
2. Two soap bubbles A and B are kept in a closed chamber where air is maintained at pressure 8 N/m^2. The radii of bubbles A and B are 2 cm and 4 cm respectively. Surface tension of soap solution is 0.04 N/m. If nA and nB are the number of moles of air in bubbles A and B respectively then find the ratio nB : nA [Neglect the effect of gravity]
3. A glass capillary of radius 0.4 mm is inclined at 60° with vertical in water. Find the length (l) of water column in the capillary tube. [surface tension of water = 7 X 10^{-2} Nm^{-1}]
4. Textbook page 107 (Q.5)

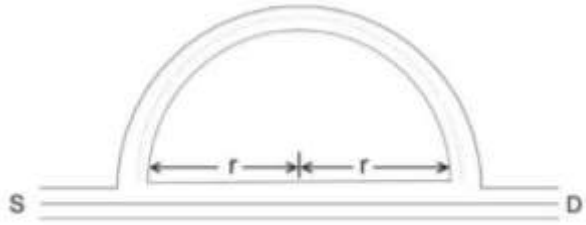
Chapter 7: Wave Motion

A. Theory

1. Which phenomenon is used in super heterodyne oscillator?
2. Represent graphically constructive interference when two identical progressive sound waves are superimposed.
3. State the limitations of Doppler Effect.
2. Explain the reflection of transverse and longitudinal waves from a denser medium and rarer medium.
3. Explain how Quincke 's tube experiment used to determine the wavelength of sound wave

B. Numerical

1. Two sitar strings 'A' and 'B' playing the note` Ga' are slightly out of tune and produces beats of frequency 6 Hz. The tension in the string 'A' is slightly reduced so that the beat frequency becomes 3 Hz. If the original frequency of 'A' is 324 Hz, find the frequency of string 'B.
2. A sound wave of wavelength 2.28 m enters the tube at 'S' as shown in fig. Find the radius of the circular path to hear minimum sound at D.



Chapter 8: Stationary Waves

A: Theory

1. You are given, 'Y' is Young's modulus, ' ρ is density and 'α' is coefficient of linear expansion of material of wire. Obtain expression for its fundamental frequency if the rise in temperature is 'dθ' for a wire of length 'L'.
2. State advantages and disadvantages of resonance.
3. An organ pipe open at both ends vibrate with a frequency -n' with its -Pth overtone. When one end of the same pipe is closed, it vibrates with a frequency N which is its qth overtone, show that

$$N = \frac{(2q+1)\,n}{2(P+1)} \quad \text{or} \quad n = \frac{2(P+1)}{(2q+1)}\,N$$

4. Define relative density. If 'd' is the relative density, n1 and n2 be the frequencies of string in air and liquid respectively, obtain the relation between them.
5. Assuming amplitude of stationary wave $A = 2a\cos\frac{2\pi x}{\lambda}$ where the symbols have their usual meanings. Obtain conditions for nodes and antinodes.
6. The displacement of the particle of medium when sound wave propagates is represented by y = A cos (ax + bt) where A, a and b are positive constants. The wave is reflected by an obstacle situated at x = O.
7. a) What is the wavelength and frequency of incident wave?
   b) Write the equation of the reflected wave.
8. A wire of length -L' is in unison with a tuning fork of frequency -n' when stretched by a load of density 'ρ' hanging vertically. The load is then immersed in water of density 'ρ'. By how much the length of the wire should be changed to bring it again in unison with the same tuning fork?

B. Numerical

1. Two sitar strings 'A' and 'B' playing the note` Ga' are slightly out of tune and produce beats of frequency 6 Hz. The tension in the string 'A' is slightly reduced so that the beat frequency becomes 3 Hz. If the original frequency of 'A' is 324 Hz, find the frequency of string 'B.
2. Textbook page 137 (Q 9, 10, 11)

Chapter 9: Kinetic Theory of gases and Radiation

A. Theory

1. What is Boltzmann constant?
2. Textbook page 158 (Q6)
3. Textbook page 159 (Q 12)
4. Which type of ideal gas will have the largest value for [CP-CV]?
5. What are degrees of freedom? Explain degrees of freedom of (a) a monoatomic and (b) a diatomic molecule.
6. What is coefficient of performance of a refrigerator? Derive an expression for it.
7. Equal masses of monoatomic and diatomic gases are supplied heat at the same temperature, pressure and volume. If same amount of heat is supplied to both the gases, which of them will undergo greater temperature rise? Why?

B. Numericals

1. Textbook page 156 (Q10)

2. A steam engine delivers 5.4 x 10^8 J of work per minute and absorbs 3.6 x 10^9 J of heat per minute from the boiler. What is the efficiency of the engine? How much heat is wasted per minute?

Ch 10: Wave theory of Light

A: Theory:

1. Textbook page 170 (Q 9)
2. What is Dichroism?
3. What are limitations of Brewster law?
4. In air, three media water, turpentine and glass are separated by parallel plane boundaries. They have refractive indices μ_w, μ_t and μ_g with respect to air. What is refractive index of glass with respect to turpentine?
5. A ray of light is incident on a medium at an angle 'i'. It is found that the reflected ray and refracted ray are perpendicular. What is the refractive index of the medium?

B: Numericals:

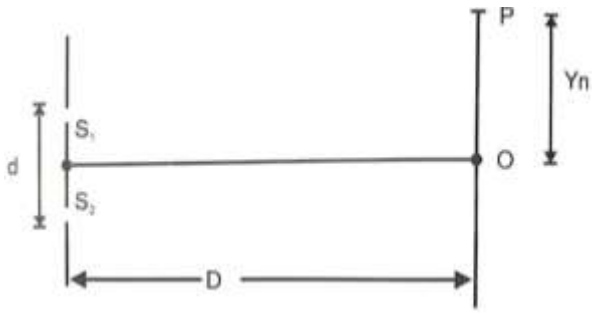
1. Textbook page 170 (Q.3, 6)
2. The speed of light in air is 3x10^8m/s. If the R.I of glass is 1.5, then find the time taken for light to travel a distance of 20 cm in glass.

Ch 11: Interference and Diffraction

A. Theory :

1. Obtain expression for intensity of two interfering wave having unequal amplitude.
2. Represent graphically the intensity distribution in the case of diffraction due to single slit.

3. Explain Fraunhofer's diffraction due to single slit to get diffraction pattern with necessary ray diagram.
4. The intensity at the central maxima (O) in a Young's double slit experiment is I_O. If the distance OP equals one-third of the fringe width of the pattern, then show that the intensity at point P would be $\frac{I_O}{4}$



B. Numerical

1. Textbook page 185 (Q 11, 12)
2. Textbook page 186 (Q 13)
3. Textbook page 188 (Q 12)
4. In an oil immersion objective microscope, oil of refractive index 1.414 is used. The wavelength of illuminating light is 4850 Angstorm and the semi vertical angle is 45^0. Find the limit of resolution and the resolving power.

Chapter 12 Electrostatics

A. Theory

1. If a coin charged in air..... (Intext question textbook page 195)
2. State uses of capacitor and Van de graff generator.
3. How does the energy stored in a capacitor change (a) if the battery is disconnected (b) if the plates of a charged capacitor are moved farther?
4. Two isolated metal spheres A and B have radius R and 2R respectively, and same charge q. Find which of the two spheres has greater energy density just outside the surface of the spheres.
5. Explain polarisation of a dielectric in an external electric field.

B: Numerical

1. Textbook page 212 (Q11)
2. Textbook page 211 (Q 10)
3. Textbook page 208 (Q 1)
4. Find the number of tubes of induction originating from a point charge of 35.4×10^{-8} C kept in the medium of dielectric constant 4.

Chapter 13 Current Electricity

A: Theory

1. State any one probable error while using meter bridge and how that error can be minimized?
2. What are advantages and disadvantages of potentiometer over voltmeter.
3. Why no power is consumed from the circuit containing unknown e.m.f when potentiometer is used to measure the unknown e.m.f?

Things you should know

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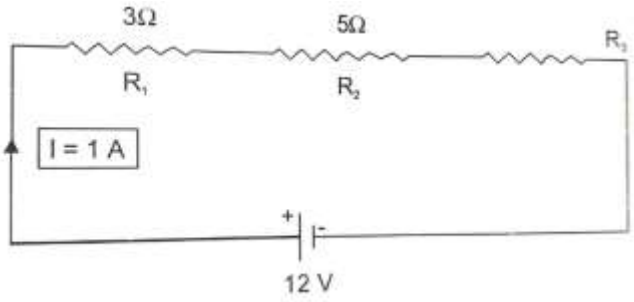
B. Numerical.

1. Textbook page 224 (Q 4)
2. Find the value of unknown resistance R_3 in the above the circuit using Kirchhoff's voltage law



Chapter 14 Magnetic effect of electric current

A: Theory

1. Derive an expression for magnetic induction at point along the axis of long straight solenoid.
2. Explain construction of cyclotron. Obtain an expression for magnetic resonance frequency in cyclotron.
3. There are two identical galvanometers. One is converted into voltmeter and the other into millivolt meter. Which meter will have smaller resistance?

B: Numerical

1. A moving coil galvanometer requires a current of 100 micro Ampere for a full scale deflection of 50 divisions. If galvanometer resistance is 1000 ohm, find the current and voltage sensitivity.
2. Textbook page 245 (Q 10, 11)

Chapter 15 Magnetism

A: Theory

1. Which magnetic materials have
   i) relative permeability > 1 ii) relative permeability < 1?
2. Explain magnetization of ferromagnetic material with the help of toroid. Hence obtain relation between relative permeability and magnetic susceptibility.
3. What is Meissenner effect?
4. What is Gyromagnetic ratio?
5. Show that percent increase in magnetic field of toroid in presence of core is susceptibility x 100?

B: Numerical

1. Textbook page 254 (Q 4)
2. Textbook page 255 (Q 5, 7)
3. If the magnetic moment of the revolving electron in an orbit of radius 0.5Å is 9×10^{-24} Am^2 then find the linear momentum of electron in that orbit (e/m = 1.76×10^{11}C/kg)

Chapter 16 Electromagnetic Induction

A. Theory

1. Textbook page 279 (Q13, 18, 19)
2. Self-Inductance is called measure of electrical inertia.... MCQ.
3. Explain electrical oscillations produced in a circuit that contains both a capacitor and an inductor.
4. What is a choke? Explain its use in the functioning of a fluorescent tube.
5. Distinguish between resistance and reactance

B: Numerical

1. Textbook page 278 (Q 11)
2. Textbook page 280 (Q 2)
3. A step down transformer works on 220 V a. c. mains. What is the efficiency of the transformer, when a bulb of 100 watt, 20 volt connected to A. C. mains and 0.5 A current flows through it?
4. A radio can tune over frequency range of medium wave band 400 kHz to 600 kHz. If LC circuit has an effective inductance of 0.2 mH, what must be the range of its variable capacitance of the capacitor?

Chapter 17: Electrons and Photons

A: Theory

1. Explain graphically or just draw graph (17.2, 17.3, 17.4, 17.5, 17.6 Textbook page 282-283)
2. Why alkali metals are the most suitable as photosensitive surfaces?
3. Why there is no effect of intensity of light on the kinetic energy of emitted photoelectrons?
4. Explain the particle nature of light on the basis of photon. Hence explain the photon picture of electromagnetic radiation.

B: Numerical

1. Textbook page 290 (Q 7)
2. Find the momentum and frequency of a photon of energy 3 eV.

Chapter 18: Atom, molecules and Nuclei

A: Theory

1. Find radius of carbon nuclei C-atom. (at. wt 12)
2. Show that 37% of radioactive substance decays in time equal to reciprocal of decay constant.
3. On the basis of de-Broglie hypothesis, obtain Bohr's quantization condition of angular momentum.
4. Explain graphically the K-alpha and K-beta wavelengths of X-rays.
5. Which quantity of orbiting electron has same dimension as that of h?

B: Numerical

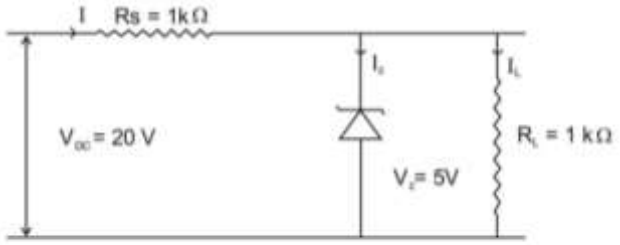
1. Textbook page 308 (Q 8, 10)
2. Calculate de Broglie wavelength of an electron moving with one third of the velocity of light in vacuum. Neglect the relativistic effect.

Chapter 19: Semiconductors

A: Theory

1. In what region should a transistor be operated to be used as switch? Textbook page 323
2. Write the formula for the voltage gain of an oscillator system. Exain different quantities. Hence explain Barkhausen criterion for sustained oscillation. Textbook page 324
3. Explain Output characteristics of C-E mode transistor. Textbook page 322
4. Define two current ratios of a transistor. Obtain. Relation between them. Textbook page 321
5. What are universal gates. Textbook page 326

B. Numerical

1. Calculate the current gain β of a transistor if the current gain $\alpha = 0.98$.
2. In a transistor, 1 mA change in emitter current, changes collector current by 0.99 mA. Determine the a.c. current gain.
3. 

In the above circuit calculate the value of I_z.
4. Textbook page 328.(Q25)

Chapter 20: Communication

A: Theory

1. Block diagram 20.1, 20.6, 20.7, 20.8, 20.9, 20.12 from textbook.
2. Define Transducer, Attenuation, modulation, bandwidth, space propagation, sky propagation, ground propagation, critical frequency.
3. Write application of AM, PM, FM.
4. What would be the modulation index for an A.M. wave for which the maximum amplitude is 'a', while the minimum amplitude is 'b'?
5. A carrier wave of peak 6V used to transmit a message signal. What should be the peak voltage of the modulating signal in order to have a modulation index of 75%?