Chinmaya Vidyalaya P.A.C.R. Mat. Hr. Sec. School, Rajapalayam

Std: XI

Physics Model Questions

Two & Three Marks Questions

1. Nature of the Physical World and Measurement

1. Define: second, metre, kilogram.(or) Define SI unit of time, length, mass.
2. Differentiate scalar and vector quantities.
3. What is light year?
4. What are the limitations of dimensional analysis?
5. The length of a rod is measured as (25.0 cm or 50 cm) using a scale having an accuracy of 0.1 cm. Determine the percentage error in length.
6. Why SI system is considered superior to other systems? OR What are the special features of SI system?
7. What are gross errors? How are they minimised?
8. Check whether the equation $\lambda = \frac{h}{mv}$ is dimensionally correct.
9. What are the uses of dimensional analysis?
10. Define the unit of length?
11. If mass of an electron is 9.11×10^{-31} kg how many electrons would weigh 1 kg?
12. Distinguish between fundamental units and derived units.
13. Show that ½ gt^2 has the same dimensions of length.
14. Explain laser pulse method.
15. State the principle of homogeneity of dimensions.
16. Distinguish between fundamental units and derived units.
17. Give the SI standard for candela.
18. Add 17.35 kg, 25.8 kg and 9.423 kg. Give the answer correct to significant figure.
19. Define: Astronomical unit.

2. Kinematics

1. What are elastic and inelastic collisions?
2. State Newton's second law of motion?
3. What is centripetal force?
4. State Lami's theorem.
5. How much energy required to lift a mass of 50 kg to a height of 10 m.
6. What are co-planar forces?
7. Compute the (i) distance travelled and (ii) displacement made by the student when he travels a distance of 4km eastwards and then a further distance of 3 km northwards.
8. An elevator is required to lift a body of mass 65 kg. Find the acceleration of the elevator, which could cause a reaction of 800 N on the floor.
9. What is inelastic collision? Give examples.
10. What is centrifugal reaction?
11. What is a projectile? Give two examples.
12. Two forces of magnitude 12 N and 8 N are acting at a point. If the angle between the two forces is 60°, determine the magnitude of the resultant force?
13. What is the (i) distance travelled and (ii) displacement produced by a cyclist when he completes one revolution?
14. State parallelogram law of vectors.
15. What is meant by Range of a projectile? Give the equation of range of a projectile when it is thrown horizontally?
16. What is meant by Banking of tracks?
17. A truck of weight 2 tonnes is slipped from a train travelling at 9 kmph and comes to rest in 2 minutes. Find the retarding force on the truck.
18. What is an Equilibrant?

19. A body is projected at such an angle that the horizontal range is 3 times the greatest height. Find the angle of projection.
20. Define momentum.
21. A body is thrown vertically up from the ground with a velocity of 39.2 m s^{-1}. At what height will its kinetic energy be reduced to one – fourth of its original kinetic energy?
22. What are the conservative forces? Give two examples.
23. What is meant by retardation?
24. Define impulse of a force?
25. Define moment of a force?
26. Differentiate between speed and velocity of a body.
27. A man weighing 60 kg runs up a flight of stairs 3m high in 4 s. Calculate the power developed by him.
28. Define acceleration and state its unit.
29. State Newton's first law of motion.
30. Define centripetal force.

3. Dynamics of Rotational Motion

1. Define centre of mass?
2. Calculate the moment of inertia of a rotating body of mass 10 kg and its radius of gyration is equal to 25cm.
3. State the law of conservation of angular momentum. Give its units.
4. What is meant by stable equilibrium?
5. What is meant by centre of gravity of the body?
6. Define radius of gyration? Give its unit.
7. What is a rigid body?
8. Starting from rest, the flywheel of a motor attains an angular velocity 100 rad/s from rest in 10 s. Calculate (i) angular acceleration and (ii) angular displacement in 10 seconds.
9. A cat is able to land on its feet after a fall. Which principle of physics is being used? Explain.
10. Compare linear motion with rotational motion. (Any 3)
11. Compute the rotational kinetic energy of a 2 kg wheel rotating at 6 revolutions per second if the radius of gyration of the wheel is 0.22 m.
12. Write the equations of rotational motion.
13. Define a moment of a force.
14. What are the different types of equilibrium?
15. State parallel axis theorem.
16. State perpendicular axis theorem.
17. Define angular momentum.

4. Gravitation and Space Science

1. Define gravitational potential.
2. The moon has no atmosphere. Why?
3. What are called geo-stationary satellites?
4. What is the value of acceleration due to gravity at an altitude of 500 km? The radius of the Earth is 6400 km.
5. What are constellations?
6. State the universal law of Gravitation. What is its formula?
7. Why a man can jump higher on the moon than on the Earth?
8. Define gravitational field intensity?
9. What is a solar system?
10. Two spheres of masses 10 kg and 20 kg are 5 m apart. Calculate the force of attraction between the masses.
11. What are the conditions for life on any planet?
12. State Kepler's III law of motion.
13. The temperature of Venus is high. Why?
14. A disc of radius 5 cm has moment of inertia of 0.02 kg m2.A force of 20 N is applied tangentially to the surface of the disc. Find the angular acceleration produced.
15. What are asteroids?
16. What is orbital velocity?

17. How will you calculate the distance of a heavenly body in the solar system?
18. The acceleration due to gravity at the moon's surface is 1.67 m s^{-2}. If the radius of the moon is 1.74×10^6 m. Calculate the mass of the moon.
19. What is albedo? Mention the albedo value for the planets Venus and Mercury.
20. The acceleration due to gravity at the Earth's surface is 9.8 m s^{-2}. If the radius of the earth is 6.38×10^6 m, calculate the mass of the Earth.
21. Why do the astronauts feel weightlessness inside the orbiting spacecraft?
22. Mention the different types of stars.
23. Calculate the speed with which a body has to be projected vertically from the Earth's surface, so that it escapes the Earth's gravitational influence. ($R = 6.4 \times 10^3$ km; g = 9.8 m s^{-2}).
24. Define gravitational field intensity at a point.

5. Mechanics of Solids and Fluids

1. What is critical velocity of a liquid?
2. State Hooke's law.
3. Define cohesive force and adhesive force. Give examples.
4. What is Reynold's number?
5. Define angle of contact.
6. A hydraulic automobile lift is designed to lift cars with a maximum mass of 3000 kg. The area of cross−section of the piston carrying the load is 425×10^{-4} m^2. What maximum pressure would the piston have to bear?
7. Define coefficient of viscosity. Mention its unit and dimensional formula.
8. Determine the velocity for air flowing through a tube of 10^{-2} m radius. For air $\rho = 1.3$ kg m^{-3} and $\eta = 187 \times 10^{-7}$ N s m^{-2}.
9. Define: elastic limit.
10. Calculate the excess pressure inside a water drop of radius 10 cm. Given surface tension of water is 0.075 Nm^{-1}
11. State Pascal's law with effect of gravity.
12. What is terminal velocity?
13. Give four examples of practical application of surface tension.
14. A sphere contracts in volume by 0.01% when taken to the bottom of sea 1 km deep. if the density of sea water is 10^3 kg m^{-3}, find the bulk modulus of the material of the sphere.
15. State Bernoulli's theorem.
16. Which is more elastic, rubber or steel? Support your answer.
17. In a hydraulic lift, the piston P_2 has a diameter of 50 cm and that of P_1 is 10 cm. What is the force on P_2 when 1 N of force is applied on P_1?
18. Why the blood pressure in humans is greater at the feet than at the brain?
19. Why hot water is preferred to cold water for washing clothes?
20. Determine the height to which water will rise in a capillary tube of 0.5×10^{-3} m diameter. Given for water, surface tension is 0.074 N m^{-1}.
21. State the applications of viscosity.
22. Define stress and strain.

6. Oscillations

1. Define Resonance.
2. Define simple harmonic motion. Give its units.
3. Define force constant. State its unit and dimension.
4. Define phase of a simple harmonic motion .Explain the term phase difference.
5. What are Forced Oscillations? Give example.
6. Obtain an equation for the SHM of a particle whose amplitude is 0.05 m and frequency 25 Hz. The initial phase is $\pi/3$.
7. A particle executes a simple harmonic motion of time period T. Find the time taken by the particle to have a displacement from mean position equal to one half of the amplitude.
8. State the laws of simple pendulum.
9. What are damped oscillations? Give examples.
10. Calculate the length of seconds pendulum at a place where g =9.8 ms^{-1}.

11. What are the advantages and disadvantages of Resonance?
12. What is a free oscillation? Give two examples.
13. Define: I. Time period II. Frequency
14. What is a spring factor?
15. On What factors does the natural frequency of a body depend on?
16. Show graphically the variation of displacement and velocity of a particle executing SHM with time.
17. Illustrate an example to show that resonance is disastrous sometimes.

7. Wave Motion

1. Differentiate Transverse wave motion and longitudinal wave motion.
2. What do you understand by decibel?
3. On what factors does the intensity of sound depend?
4. What is meant by end correction?
5. Sound travels faster on rainy days. Why?
6. What is Doppler Effect?
7. What are called transverse waves? Give examples.
8. How does Humidity affect velocity of sound?
9. What is the wave length of sound produced by a tuning fork of having frequency 256 Hz? (velocity of sound in air = 350 m/s)
10. What are beats?
11. Define Wave motion?
12. Give any three properties of progressive wave.
13. State the principle of super position.
14. Sound travels faster on rainy day .Why?
15. What are nodes and antinodes?
16. The velocity of sound at 27°C is 347 m s^{-1}. Calculate the velocity of sound in air at 627° C.
17. What are longitudinal waves? Give an example.
18. A string of mass 0.5 kg and length 50 m is stretched under a tension of 400 N. Find the velocity of transverse wave travels through the wire.

8. Heat and Thermodynamics

1. Define molar specific heat at constant pressure.
2. Distinguish between reversible process and irreversible process with example.
3. Define absorptive power.
4. The surface temperature of a spherical hot body is 1000 K. Calculate the rate at which energy is radiated.(Given $\sigma = 5.67 \times 10^{-8}$ W m^{-2} K^{-4}).
5. Define specific heat capacity. Give its units.
6. Define Wien's displacement law.
7. Define Stefan's law.
8. Define solar constant.
9. What are degrees of freedom?
10. Define Black body.
11. In a refrigerator heat from inside at 277 K is transferred to a room at 300 K. Calculate COP of a refrigerator.
12. Why are ventilators provided in our house?
13. Define clausious statement.
14. A Carnot engine has the same efficiency, when operated, (i) between 100 K and 500 K (ii) between T K and 900 K .Find the value of T
15. The wavelength with maximum energy emitted from a certain star in our galaxy is 1.449×10^{-5}cm. Calculate the temperature of star.
16. State the law of equipartition of energy?
17. Write any three properties of thermal radiation.
18. At what temperature will the RMS velocity of a gas be tripled its value at NTP?
19. Calculate the number of degrees of freedom in 15 cm^3 of nitrogen at NTP.(22400 cm^3 of a gas at NTP contains 6.02×10^{23} molecules).

9. Ray Optics

1. Distinguish between primary rainbow and secondary rainbow.
2. A ray passes through an equilateral prism such that the angle of incidence is equal to the angle of emergence and the later is equal to 3/4 of the angle of prism. Find the angle of deviation.
3. Define power of lens.
4. A needle of size 5 cm is placed 45 cm from a lens produced an image on a screen placed 90 cm away from the lens. Identify the type of the lens and calculate its focal length and size of the image.
5. What is a spectrometer?
6. What are the conditions for total internal reflection to occur?
7. Define dispersive power of prism.
8. Light of wavelength 5000 Å falls on a plane reflecting surface. Calculate the wavelength and frequency of reflected light.
9. State the law of reflection.
10. Two lenses of power +12 and -2 dioptre are placed in contact. Find the focal length of the combination.
11. Write a note on optical fibre.
12. Define critical angle.
13. Give any three importance of velocity of light.
14. What is meant by magnification?

10. Magnetism

1. State coulombs inverse square law in magnetism.
2. State tangent law.
3. A bar magnet of mass 90 g has magnetic moment 3 A m^2. If the intensity of magnetisation of the magnet is 2.7×10^5 A m^{-1}, find the density of the material of the magnet.
4. Define: unit pole.
5. A magnet of volume 25 cm^3 has a magnetic moment of 12.5×10^{-4} A m^2. Calculate the intensity of magnetisation.
6. What is Tan A position.
7. What is Curie temperature?
8. The intensity of magnetisation of an iron bar of mass 72 g, density 7200 kg m^{-3} is 0.72 A m^{-1}. Calculate the magnetic moment.
9. What is meant by hysteresis?
10. Define magnetic susceptibility.
11. A magnetising field of 50 A m^{-1} produces a magnetic field of induction 0.024 T in a bar of length 8 cm and area of cross section 1.5 cm^2. Calculate (i) the magnetic permeability (ii) the magnetic susceptibility.

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5 Marks Questions

1. Nature of the Physical World and Measurement

1. Write a note on the basic forces in nature.
2. Convert 76 cm of mercury pressure into N m-2 using the method of dimensions.
3. Check the correctives of the following equation by dimensional analysis.
   i. $\lambda = \frac{h}{mv}$ ((λ - wavelength, h - Planck's constant, m - mass, v - velocity).
   ii. $n = \frac{1}{2\pi}\sqrt{\frac{g}{l}}$ where n is frequency, g is acceleration due to gravity and l is length.
   iii. $F = \frac{mv^2}{r^2}$ where F is force, m is mass, v is velocity and r is radius.
   iv. $S = ut + \frac{1}{2} at^2$ where S is distance, u is velocity, t is time, a is acceleration.
   v. $v^2 = u^2 + 2as$, (v-final velocity, u initial velocity, a is acceleration, S is distance).
4. Describe the various types of errors in measurement.
5. Derive the formula for the period of a simple pendulum using dimensional analysis.
6. Write about Gross error and Random errors in measurement.

7. Mention the limitations and the uses of dimensional analysis.
8. What are gross errors? How are they minimised?

2. Kinematics

1. State Newton's law of motion.
2. Two equal forces are acting at a point with an angle of 60° between them. If the resultant force is equal to 20√3 N, find the magnitude of each force.
3. Two masses of 2 kg and 5 kg are moving with equal kinetic energies. Find the ratio of magnitudes of respective linear momentum.
4. Derive an expression for the time of flight of the projectile.
5. Derive an expression for the kinetic energy of a body in motion.
6. The horizontal range of a projectile is 4√3 times its maximum height. Find the angle of projection.
7. Show that force acting on a body is measured by the product of mass of the body and acceleration produced by the force on a body.

   Or

   State Newton's second law of motion. Using it derive the equation of force.
8. Derive the relation between linear velocity and angular velocity.
9. The pilot of an aeroplane flying horizontally at a height of 2000 m with a constant speed of 540 km p h wishes to hit a target on the ground. At what distance from the target should release the bomb to hit the target?
10. A man weighing 60 kg runs up a flight of stairs 3m high in 4 s. Calculate the power developed by him.
11. A body is projected upwards with a velocity of 30 m s-1 at an angle of 30° with the horizontal. Determine (a) the time of flight (b) the range of the body and (c) the maximum height attained by the body.
12. Define centripetal force and give 3 examples.
13. Prove that for a given velocity of projection, the horizontal range is same for two angles of projection α and (90o – α).
14. Expaain with any five examples, the Newton's third law of motion.
15. Derive the expression for the distance travelled in nth second.
16. A stone is dropped from the top of the tower 50 m high. At the same time another stone is thrown up from the foot of the tower with a velocity of 25 m s^{-1} . At what distance from the top and after how much time the stones cross each other?
17. State and prove law of conservation of linear momentum.
18. Determine the initial velocity and acceleration of particle travelling with uniform acceleration in a straight line if it travels 55 m in the 8th second and 85 m in the 13th second of its motion.
19. A body is projected at such an angle that the horizontal range is 3 times the greatest height . Find the angle of projection.
20. Explain the different types of inertia with example.
21. Obtain an expression for the resultant of concurrent forces.
22. The sum of two forces inclined to each other at an angle is 18 kg wt and their resultant which is perpendicular to the smaller force is 12 kg wt Find the forces and the angle between them.
23. Obtain an expression for the angle of lean when a cyclist takes a curved path.
24. What is resolution of vector? How it is resolved in to two rectangular components.
25. A horse pulling a cart exerts a steady horizontal pull of 300 N and walks at the rate of 4.5 km p h. How much work is done by the horse in 5 minutes?
26. Two forces of magnitude 12 N and 8 N are acting at a point. If the angle between the two forces is 60°, determine the magnitude of the resultant force?

27. The radius of curvature of a railway line at a place when a train is moving with a speed of 72 km p h is 1500 m. If the distance between the rails is 1.54 m, find the elevation of them outer rail above the inner rail so that there is no side pressure on the rails.

3. Dynamics of Rotational Motion

1. Obtain an expression for angular momentum of a rotating rigid body.
2. Derive an equation of rotational motion.
3. What are the different types of Equilibrium?
4. State and prove parallel axes theorem of moment of inertia.
5. Starting from rest, the flywheel of a motor attains an angular velocity 100 rad/s from rest in 10 s. Calculate (i) angular acceleration and (ii) angular displacement in 10 seconds.
6. Prove moment of inertia of a rigid body is twice the rotational kinetic energy.
7. Compute the rotational kinetic energy of a 2 kg wheel rotating at 6 revolutions per second if the radius of gyration of the wheel is 0.22 m.
8. The cover of a jar has a diameter of 8 cm. Two equal, but oppositely directed, forces of 20 N act parallel to the rim of the lid to turn it. What is the magnitude of the applied torque?
9. Derive the relation connecting torque and angular acceleration.
10. State and prove the law of conservation of angular momentum.
11. State and prove perpendicular axes theorem of moment of inertia.

4. Gravitation and Space Science

1. Explain uses of satellites.
2. Write a note on Milky Way.
3. State Kepler's laws of planetary motion.
4. Explain how the acceleration due to gravity varies with altitude
5. Derive an expression for gravitational potential at a point.
6. A stone of mass 12 kg falls on the Earth's surface. If the mass of the Earth is about 6×10^{24} kg and acceleration due to gravity is 9.8 m s^{-2}, calculate the acceleration produced on the Earth by the stone.
7. Determine the escape speed of a body on the moon.
   Given : radius of the moon is 1.74×10^{6} m and mass of the moon is 7.36×10^{22} kg.
8. Calculate the height above the Earth's surface at which the value of acceleration due to gravity reduces to half its value on the Earth's surface. Assume the Earth to be a sphere of radius 6400 km.
9. State and prove the law of areas based on law of conservation of momentum.
10. Show that orbital radius of geo-stationary satellite is 36000 km.
11. Jupiter has a mass 318 times that of the Earth and its radius is 11.2 times the radius of the Earth. Calculate the escape speed of a body from Jupiter's surface. (Given : escape speed on Earth is 11.2 km/s).
12. A geo-stationary satellite is orbiting the Earth at a height of 6R above the surface of the Earth. Here R is the radius of the Earth. What is the time period of another satellite at a height of 2.5 R from the surface of the Earth?
13. What is meant by rocket? Explain its principle.
14. Deduce the law of periods from the law of gravitation.

5. Mechanics of Solids and Fluids

1. Establish the relation between surface tension and surface energy.
2. Calculate the diameter of a capillary tube in which mercury is depressed by 2.219 mm. Given T for mercury is 0.54 N m^{-1}, angle of contact is 140° and density of mercury is 13600 kg m^{-3}.

3. A wire of diameter 2.5 mm is stretched by a force of 980 N. If the Young's modulus of the wire is 12.5×10^{10} N m^{-2}, find the percentage increase in the length of the wire.
4. Calculate the minimum pressure required to force the blood from the heart to the top of the head (a vertical distance of 0.5 m). Given density of blood = 1040 kg m^{-3}. Neglect friction.
5. Explain the principle, construction and working of hydraulic brakes.
6. Derive an expression for terminal velocity of a small sphere falling through a viscous liquid.
7. Calculate the force required to remove a flat circular plate of radius 0.02 m from the surface of water. Assume surface tension of water is 0.07 N m^{-1}.
8. A sphere contracts in volume by 0.01% when taken to the bottom of sea 1 km deep. If the density of sea water is 10^3 kg m^{-3}, find the bulk modulus of the material of the sphere.
9. Determine the velocity for air flowing through a tube of 10^{-2} m radius. For air ρ = 1.3 kg m^{-3} and $\eta = 187 \times 10^{-7}$ N s m^{-2}.
10. A 50 kg mass is suspended from one end of a wire of length 4 m and diameter 3 mm whose other end is fixed. What will be the elongation of the wire? Take q = 7×10^{10} N m^{-2} for the material of the wire.
11. Obtain Poiseuille's equation by dimensional method.
12. Derive an expression for excess pressure inside a liquid drop.
13. Describe an experiment to determine the coefficient of viscosity of high viscous liquid.
14. Give four examples of practical applications of surface tension.

6. Oscillations

1. Derive an expression for the time period of a body when it executes angular SHM.
2. State the laws of pendulum.
3. Derive the differential form of SHM.
4. A body executes SHM with an amplitude 10 cm and period 2 s. Calculate the velocity and acceleration of the body when the displacement is i) zero and ii) 6 cm.
5. A mass m attached to a spring oscillates every 4 seconds. If the mass is increased by 4 kg, the period increases by 1 s. find its initial mass m.
6. Derive an expression for the time period of a body when it executes angular SHM.
7. The velocities of a particle executing SHM are 4 cm s^{-1} and 3 cm s^{-1}, when its distance from the mean position is 2 cm and 3 cm respectively. Calculate its amplitude and time period.
8. A bob of a simple pendulum oscillates with amplitude of 4 cm and time period 1 s. Find (i) length of the pendulum and (ii) velocity of the bob in the mean position.
9. Explain the oscillations of a mass attached to a horizontal spring. Hence deduce an expression for its time period.
10. Explain the vertical oscillation s of a loaded spring .Calculate its time period and frequency.
11. Show graphically the variation of displacement, velocity and acceleration of the particle executing SHM.
12. If two springs are connected in series, what is its equivalent spring constant?
13. The equation of a particle executing SHM is y = 5 $\sin(\pi t + \frac{\pi}{3})$.Calculate (i) amplitude (ii) period (iii) maximum velocity and (iv) velocity after 1 second (y is in metre).
14. Compare the acceleration due to gravity at two places if the times for 100 oscillations of a simple pendulum are 8 minutes 2 seconds and 8 minutes 20 seconds respectively of the two places.
15. A particle executes a simple harmonic motion of time period T. Find the time taken by the particle to have a displacement from mean position equal to one half of the amplitude.
16. Obtain an equation for the SHM of a particle of amplitude 0.5 m, frequency 50 Hz. The initial phase is $\frac{\pi}{2}$. Find the displacement at t = 0.
17. Show that the projection of a Uniform circular motion on the diameter of a circle is SHM.
18. Derive expression for time period for oscillation of liquid column in a U tube.

7. Wave Motion

1. Define the term wavelength and frequency in wave motion. Prove that v =n ʎ.
2. For air at NTP, the density is 0.001293 g cm^{-3}. Calculate the velocity of longitudinal wave (i) using Newton's formula (ii) Laplace's correction.
3. The velocity of sound at (27°C or 20^{0} C) is 347 m s^{-1}. Calculate the velocity of sound in air at 627° C.
4. Derive Laplace Equation.
5. Distinguish between transverse and longitudinal wave motion.
6. Prove that in a pipe closed at one end, frequencies of harmonics are in the ratio 1:3:5.
7. Write down the uses of Doppler Effect.
8. Show that the velocity of sound increases by 0.61 m s-1 for every degree rise of temperature.
9. Two tuning forks A and B when sounded together produce 4 beats. If A is in unison with the 0.96 m length of a sonometer wire under a tension, B is in unison with 0.97 m length of the same wire under same tension. Calculate the frequencies of the forks.
10. What are the important Characteristics of wave motion?
11. Explain the dynamics of harmonic oscillations
12. What are the characteristics of progressive waves?
13. The equation of a progressive wave is y = 0.50 sin (500 t - 0.025x), where y, t and x are in cm, second and metre. Calculate (i) amplitude (ii) angular frequency (iii) period (iv) wave length and (v) speed of propagation of wave.
14. What are the characteristics of Stationary waves?
15. Obtain an equation for plane progressive waves.
16. State the Newton's formula for the velocity of sound in gases.

8. Heat and Thermodynamics

1. At what temperature will the RMS velocity of a gas be tripled its value at NTP.
2. Describe the working of Pyrheliometer.
3. Derive an expression for the average kinetic energy of the molecule of gas.
4. State the postulates of kinetic theory of gases.
5. Derive Meyer's relation. (Cp-Cv).
6. State Kirchhoff's law in thermodynamics. Mention its applications.
7. Differentiate isothermal and adiabatic process.
8. Explain Prevost theory of heat exchanges.
9. Explain Fery's concept of a perfect black body.
10. Mention the properties of thermal radiation.

9. Ray Optics

1. Write a note on optical fibres.
2. Give the importance of velocity of light.
3. Obtain an expression for dispersive power of the material of the prism.
4. Explain the formation of rainbow.

10. Magnetism

1. Derive an expression for torque on a bar magnet placed in a uniform magnetic field.
2. A magnet of volume 25 cm^3 has a magnetic moment of 12.5×10^{-4} A m^2. Calculate the intensity of magnetisation.
3. Give the properties of ferromagnetic materials.

4. A short bar magnet is placed with its north pole pointing north. The neutral point is 10 cm away from the centre of the magnet. If $B = 4 \times 10^{-5}$ T, calculate the magnetic moment of the magnet.
5. Give the properties of diamagnetic substances.
6. Two magnetic poles, one of which is twice stronger than the other, repel one another with a force of 2×10^{-5} N, when kept separated at a distance of 20 cm in air. Calculate the strength of each pole.
7. State and prove tangent law.
8. A magnetic intensity of 2×10^{3} A/m produces a magnetic induction of 4π Wb/m^2 in a bar of iron. Calculate the relative permeability and susceptibility.
9. State the properties of magnetic lines of force.
10. A magnetising field of 50 A m^{-1} produces a magnetic field of induction 0.024 T in a bar of length 8 cm and area of cross section 1.5 cm^2. Calculate (i) the magnetic permeability (ii) the magnetic susceptibility.
11. Write the properties of paramagnetic substances.
12. Obtain the expressions for the magnetic induction at a point on the (i) axial line and (ii) equatorial line of a bar magnet.
13. Explain Hysteresis.
14. Distinguish between the dia, para and ferro magnetic material.

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Direct Five Mark Questions

1. Give the rules and conventions followed while writing SI units.
2. Derive equation of motion for uniformly accelerated motion.
3. State and explain parallelogram law of vectors.
4. Derive expression for (I) maximum height reached by the projectile (ii) time of flight (iii) horizontal range for a projectile projected at an angle.
5. How will you experimentally verify the triangle law, parallelogram law and Lami's theorem.
6. Derive an expression for critical velocity when the object is rotating in vertical circle.
7. State and prove work energy theorem.
8. Prove that in the case of one dimensional elastic collision between two bodies of equal masses, they interchange their velocities after collision.
9. Prove that acceleration due to gravity will vary with (i) height (ii) depth.
10. What is escape velocity? Derive an expression for it.
11. State and explain orbital velocity.
12. Explain the origin of universe.
13. Explain how to calculate the surface tension by capillary rise method.
14. State and prove Bernoulli's theorem.
15. Show that the oscillations of a simple pendulum are simple harmonic. Hence deduce the expression for the time period.
16. What is Doppler Effect? Derive the formula for the change in frequency (i) when the source is approaching and receding from the observer and (ii) when the source is stationary and observer is moving towards and away from the source.
17. How will you calculate velocity of sound in air by resonance air column apparatus?
18. Derive expression for pressure exerted by a gas.
19. With the help of ray diagram explain the phenomenon of total internal reflection. Give the relation between critical angle and refractive index.
20. Prove the mirror formula for reflection of light from a concave mirror producing real image.

21. Explain Michelson's method of determining velocity of light.

22. Derive lens maker's formula for a thin biconvex lens.

23. Derive the relation μ = $\frac{\sin\frac{(A+B)}{2}}{\sin\frac{A}{2}}$

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ELANGOVAN.A
CHINMAYA VIDYALAYA PACR MAT HSS
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