

INTERNATIONAL INDIAN SCHOOL DAMMAM

MODEL EXAMINATION - JAN 2013

Time Allowed : 3 Hrs

PHYSICS

Maximum Marks :70

CLASS 11

General Instructions:

- (i) All questions are compulsory. Use of calculators is not permitted.
- (ii) There are 30 questions in total. Questions 1 to 8 carry one mark each, questions 9 to 18 carry 2 marks each, questions 19 to 27 carry 3 marks each & the questions 28 to 30 carry 5 marks each.
- (iii) There is no overall choice, However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each. You have to attempt only one of the given choices in such questions.

SET- B

- Q.1 Water rises in a capillary tube but mercury falls in the same tube. Why?
- Q.2 Give one example where a body has zero velocity but a non-zero acceleration.
- Q.3 Write the dimensional formulae of physical quantities a) Spring constant b) Power
- Q.4 What is the effect on coefficient of static friction when side length of a cube of 5 cm is doubled to original?
- Q.5 What is the effect of increase in temperature on viscosity of gases?
- Q.6 A steel wire of length 50 cm has a mass of 5×10^{-3} kg. If the wire is under a tension of 36 N, calculate the speed of transverse wave produced on the wire.
- Q.7 State Wein's displacement law of black body radiations.
- Q.8 Explain Why passengers are moved backward from their seats when a stationary car starts suddenly?
- Q.9 Two straight lines drawn on the same displacement - time graph making angles 30° and 60° with time axis respectively. Which line represents greater velocity? What is the ratio of the two velocities?
- Q.10. Explain Why a horse cannot pull a cart and run in empty space.

OR

In a tug of war, the team that pushes harder against the ground wins. Why?

- Q.11 State the conditions necessary for a satellite to appear stationary? What is approximate height of such satellites from surface of earth.
- Q.12. A light body and a heavy body have the same kinetic energy. Which one will have greater momentum? Show your work to explain answer.
- Q.13 Define the angular momentum. Give its SI unit and dimension.

Q. 14 At what temperature is the rms speed of Helium molecule equal to that of an Argon molecule at 227°C ?
Given -Atomic mass of Helium is 4 u and Argon 40 u .

Q. 15. Derive an expression for the work done during an isothermal process.

Q.16 A transverse harmonic wave on a string is described by $Y(x, t) = 8\sin(66t + 0.045x + \pi/6)$
Where x and y are in cm and t in sec. The positive direction of x is from left to right.

- Is this a travelling or a stationary wave? If it is travelling, what is the direction of its propagation?
- What are its amplitude and frequency?

Q.17. A ball of mass 50 g is thrown vertically upward with a speed of 20 m/s . Calculate a) Maximum height attained
b) time taken to reach at highest point. Take $g = 10\text{ m/s}^2$.

Q.18 Write Newton's Formula for the speed of sound in air. What correction was made by Laplace in this formula?

Q.19. A physical quantity P is related to four observables a, b, c and d as follow. $P = ab^2/c^3\sqrt{d}$. Give expression of relative error and compute percentage error in the quantity P . Given percentage errors in a, b, c and d are

$1\%, 2\%, 1\%$ and 4% respectively.

Q. 20 State 1st Law of thermodynamics and give equation of state for
a) an isochoric process b) an Adiabatic process

Q.21. Define friction coefficient. What are the ways to minimise friction.

OR

State the principle of conservation of linear momentum. Explain why the gun recoils when a bullet is fired from it.

Q.22 A bob of mass m is suspended by a light string of length L , is imparted a horizontal velocity V_0 at the lowermost point such that it completes a circular path in vertical plane. Obtain expression for (i) V_0 (ii) speed at highest point (iii) tension at lowermost point of the path during motion.

Q.23 Show that the pressure exerted by a gas is two - third of the average kinetic energy per unit volume of the gas molecules.

Q.24 What are the factors affect moment of Inertia of a body. The M. I. of a ring about a tangent to the circle of the ring is $(3/2)MR^2$, Where M is mass and R is radius of the ring. Find the M.I. of the ring about its diameter.

Q.25 Show that the value of 'g' decreases with depth? Name any other two factors affect its magnitude.

Q.26. A liquid drop of diameter 8 mm breaks into 64 droplets of equal size. Calculate the amount of work done in the process.
(The surface tension of the liquid is 0.07 N/m at 20°C)

Q.27. What is meant by elastic collision? Show that in case of one dimensional elastic collision of two bodies, the relative velocity of separation after the collision is equal to the relative velocity of approach before the collision.

- Q.28. a) A body of mass m is executing SHM with displacement – time relation $y = A \sin \omega t$. Derive relation for velocity and acceleration and draw the graphs to show the variation of displacement, velocity and acceleration as function of time.
- b) What is the effect on time period of a pendulum of length 1 m and time period 2 s , when length increases to double of its original length.

OR

- a) Derive expressions for the kinetic energy and potential energy of a particle of mass m executing SHM of which Displacement – time relation is given as $y = A \sin \omega t$. Show that total energy is conserved in SHM. Draw the graphs to show the variation of KE and PE as function of displacement.
- b) At what distance from mean position Kinetic energy and potential energy of a body executing SHM is equal in magnitude.

- Q.29 (a) State Stoke's Law. A metallic ball of radius r and density ρ is falling through a liquid of density η then derive the relation for terminal velocity?

- (b) In a hydrolic lift the cross section area of smaller and larger pistons are 20 cm^2 and 3 m^2 respectively. What will be The force experienced by a car kept on larger piston when a force of 20 kN applied on smaller side.

OR

- (a) Describe stress- strain relationship for a loaded steel wire and hence explain its various portions briefly.
- (b) The average depth of Indian ocean is about 3000 m . calculate the fractional compression, $\Delta V/V$, of water at the bottom of ocean. Given that the bulk modulus of water is $2.2 \times 10^9\text{ N m}^{-2}$. Take $g = 10\text{ ms}^{-2}$.

- Q.30 (a) Deduce expressions using vector diagrams for velocity and acceleration of an object in uniform circular motion.
- (b) An insect trapped in a circular groove of radius 21 cm moves along the groove steadily and completes 14 revolutions in 100 seconds. Calculate angular speed, linear speed and centripetal acceleration.

OR

- (a) Show that for two complementary angles of projection of a projectile thrown with the same velocity, the horizontal ranges are equal.
- (b) A cricket ball is thrown at a speed of 28 m/s in a direction 30° above the horizontal. Calculate Maximum height attained and time taken by the ball to return to the same level.
