

ANNUAL EXAMINATION, 2018-19

PHYSICS

Time : 3 hrs.

Class - XI

M.M. : 70

Date – 11.02.2019 (Monday)

Name of the student _____ Section _____

General Instructions :

- There are **27** questions in total. All the questions are compulsory.
- This question paper has four sections : A, B, C and D.
- Section A contains **5** questions of **1** mark each, Section B contains **7** questions of **2** marks each, Section C contains **12** questions of **3** marks each and Section D contains **3** questions of **5** marks each.
- There is no overall choice. However, an internal choice has been provided in **two** questions of **1** mark, **two** question of **2** marks, **four** questions of **3** marks and all **three** questions of **5** marks each. You have to attempt only one of the given choices in such questions.
- **Use of calculator is not permitted.**
- You may use log book if necessary.

Section - A

- Q.1 Write the characteristics of elastic collision.
- Q.2 At what place on earth, the value of g does not change due to its rotational motion ?

OR

At what place on the earth, the centripetal force is maximum ?

- Q.3 The paints and lubricating oils have low surface tension, why ?

OR

Define coefficient of linear expansion. Write its unit.

- Q.4 What is the change in the internal energy of a gas, which is compressed isothermally ?
- Q.5 Two sound sources produce 12 beats in 4 seconds. By how much do their frequencies differ ?

Section - B

- Q.6 What are the magnitude and direction of the net force acting on :
- a) a wooden block of mass 5g floating on a water.
- b) a kite skillfully held stationary in the sky.
- Q.7 How will the momentum of a body change if its kinetic energy is doubled ?

OR

What is the amount of work done by :

- a) a weight- lifter in holding a weight of 120kg on his shoulder for 30 second
- b) a locomotive against gravity, if it is travelling on a level plane ?
- Q.8 A diver jumping from the spring board exhibits somersaults in air before touching the water surface. Explain.
- Q.9 Derive expression for variation of ' g ' value with depth.

OR

State Kepler's laws of planetary motion.

- Q.10** If the coefficient of performance of a refrigerator is 5 and operates at room temperature (27°C), find the temperature inside the refrigerator.
- Q.11** Draw labelled diagram of an astronomical telescope and write the expression for magnifying power when final image is formed at least distance of distinct vision.
- Q.12** What is total internal reflection ? Write two conditions for total internal reflection.

Section - C

- Q.13** Assuming that the volume of a liquid flowing per second (V) through a cylindrical tube depends on (i) the pressure gradient (p/l), (ii) the radius of the tube (r) and (iii) the coefficient of viscosity of liquid η , find by the method of dimensions, how it depends on these quantities.
- Q.14** The head and tail of 200m train moving with a constant acceleration, crosses an electric pole on the track side with velocities 'u' and 'v' respectively. Show that the velocity with which the middle point of the train crosses the electric pole is $\sqrt{\frac{u^2 + v^2}{2}}$.

OR

Chandigarh and Ambala are connected with a regular bus service. A bus leaving in either direction every T minutes. A boy cycling with a speed of 10km/hr from Chandigarh to Ambala notices that a bus crosses him after every 15 min. towards Ambala and after every 5 min. towards Chandigarh. Calculate the time T and the speed of the buses. Assume the speed of buses is constant.

- Q.15** A train is moving along a horizontal track. A pendulum suspended from the roof makes an angle of 4° with the vertical. Calculate the acceleration of the train. Take $g = 10 \text{ m/s}^2$.
- Q.16** A ball falls under gravity from a height of 10m with an initial downward velocity u . It collides with the ground, loses 50% of its energy in collision and then rises back to the same height. Find the initial velocity u .
- Q.17** What is centre of mass of a system ? Obtain an expression for the centre of mass of a system of two particles.
- Q.18** A solid cylinder of radius R and mass M rolling down a plane inclined at an angle θ with the horizontal. If the cylinder is rolling without slipping, derive the expression for the acceleration possessed.
- Q.19** Show that the velocity, with which an object is to be projected from the surface of the earth to overcome the gravitational pull of earth, must have a maximum value $\sqrt{2GM/R}$. Also name the velocity.

OR

What is gravitational potential energy of a body ? Derive an expression for it, when a body of mass 'm' is situated at a distance 'r' from the centre of the earth.

- Q.20** Derive an expression for the excess of pressure inside a soap bubble.

OR

State and prove Newton's law of cooling.

- Q.21** A 'thermocole' ice box is a cheap and efficient method for storing small quantity of cooked food in summer in particular. A cubical ice box (made of thermocole) of 30cm side has a thickness of 5cm. If 4kg of ice are put in the box, estimate the amount of ice remaining after 6 hrs. The outside temperature is 45°C and coefficient of thermal conductivity of thermocole = $0.01 \text{ JS}^{-1}\text{m}^{-1}\text{C}^{-1}$. Heat of fusion of water = $335 \times 10^3 \text{ K Kg}^{-1}$.

- Q.22** Show that the liquid in the limbs of U-tube moves in S.H.M, if the frictional forces are neglected. Find expression for time-period.

OR

What are beats ? Discuss the formation of beats analytically. Prove that the number of beats per second is equal to the difference between frequencies of two superposing waves.

- Q.23** Transverse harmonic wave on a string is described by :

$$y(x, t) = 2.0 \sin(36t + 0.018x + \pi/4)$$

Where x, y are in cm and t in sec. The positive direction of x is from left to right.

- a) Is this a travelling or a stationary wave ? If it is travelling, what are the speed and direction of its propagation ?
- b) What are its amplitude and frequency ?
- c) What is the least distance between two successive crests in the wave ?
- Q.24** Draw a graph to show the variation of the angle of deviation δ with that of the angle of incidence 'i' for a monochromatic ray of light passing through a glass prism of refracting

angle A. Hence derive the relation
$$\mu = \frac{\sin\left(\frac{\delta_m + A}{2}\right)}{\sin\left(\frac{A}{2}\right)}$$

Section - D

- Q.25** State Bernoulli's theorem. Prove that the total energy possessed by a flowing ideal liquid is conserved, stating assumption used.

OR

Show that a liquid having density ρ , angle of θ contact and surface tension T rises in a capillary tube of radius 'r' to a height 'h' given by
$$h = \frac{2T \cos \theta}{r\rho g}$$
.

- Q.26** a) Define two specific heats of a gas.
- b) Why is $C_p > C_v$?
- c) Show that for an ideal gas $C_p - C_v = R$.

OR

Discuss the four steps of a Carnot Cycle, and show that the efficiency of a Carnot's Cycle is given by $\eta = 1 - \frac{T_2}{T_1}$, where T_1 and T_2 are the temperatures of the heat source and heat sinks respectively.

- Q.27** What is simple Harmonic Motion ? Derive expressions for displacement, velocity, acceleration and Time period of a body executing S.H.M.

OR

Discuss the formation of standing waves in a string fixed at both the ends and the different modes of vibrations.

