

CBSE Class 11 Physics Set 5

PHYSICS PAPER

CLASS: XI

TIME : 3 Hrs

MAX MARKS : 70

General Instructions:

Part-A (question numbers 1 to 5) carry 1 mark each.

Part-B (question numbers 6 to 10) carry 2 marks each.

Part-C (question numbers 11 to 22) carry 3 marks each.

Part-D (question number 23) is value based question carries 4 marks.

Part-E (question numbers 24 to 26) carry 5 marks each.

PART-A

1. If two row- boats happen to sail -parallel, and close to each other, they experience a force which pulls them towards each other. Give reasons for it.
2. Why Newton's Law of gravitation is said to be universal Law?
3. Why is Brownian motion significant?
4. A harmonic oscillation is represented by $y=0.34 \cos(3000t+0.74)$, where y and t are in s. Deduce (i) the amplitude (ii) angular frequency (iii) the period and (iv) the initial phase.
5. Why Length, mass and time is chosen as base quantities in mechanics?

PART- B

6. What is binding energy of a satellite?
7. A ball rolled on ice formed on the surface of a frozen lake with an initial speed of 1.8m/s goes on moving for a total distance of 12m before stopping. Find the value of the coefficient of rolling friction for ball-ice pair.
8. A railway carriage moves over a straight track with acceleration a . A passenger in the carriage drops a stone. What is the acceleration of the stone w.r.t the carriage and the earth?
9. During a total solar eclipse, the moon almost entirely covers the sphere of the sun. write the relation between the distances and sizes of the sun and moon?
10. Briefly explain on the basis of kinetic theory, why do the pressure of a gas is increased when the gas is heated?

PART – C

11. A disc of moment of inertia $5 \times 10^{-4} \text{ kg/m}^2$ is rotating freely about an axis passing through its Centre and perpendicular to its plane at 40 rpm. Calculate its new angular speed in revolutions per minute, if some wax of mass 0.02 kg is dropped gently onto the disc 0.08m from its axis.
12. Draw a diagram and with its help, show that surface energy per unit area numerically equals to the surface tension.
13. Give the reasons for the following questions.
 - (i) The motion of an artificial satellite around the earth cannot be taken as SHM.
 - (ii) A passing aeroplane sometimes causes the rattling of the windows of house.
 - (iii) The time period of a simple pendulum will get doubled if its length is increased four times.
14. Explain the principle of conservation of energy.
15. a) Define degree of freedom. How will you account for degree of freedom in diatomic molecules?

b) Derive the relation for work done in an isothermal process.

16. Show that the path followed by a projectile is a parabolic, when it is projected at an angle θ with the horizontal. Also, find the expression for a) time of flight and b) maximum height.

17. With the help of suitable diagrams, show that the elastic force of a spring is a conservative force.

18. Define standing wave. Displacement of a string in which standing wave is formed is given as $y = (20 \sin 157t \cos 314t)$. Find

(i) amplitude of individual waves

(ii) velocity of wave.

19. Differentiate clearly between three modes of heat transmission.

20. Define the terms beats. How are they formed? Determine the speed of sound in a gas in which two waves of length 2.04 m and 2.08 m produce 20 beats in 6s.

21. State Archimedes' Principle.

If a solid body floating in water has $1/6^{\text{th}}$ of the volume above surface, then determine the fraction of its volume that will project upwards if it floats in a liquid of specific gravity 1.2.

22. Explain in brief about Poisson's ratio. Write an expression for it. Determine the Poisson's ratio of the material of a wire whose volume remains constant under an external normal stress.

PART-D

23. Raju was always jealous of Kumar as Kumar was better in studies for which everybody praised him. One day, Raju challenged Kumar to defeat him in the race-uphill. They were both good runners but running uphill was difficult. Raju ran very fast and was ahead of Kumar. After sometime, Raju became breathless and started coughing. Kumar who was following him saw his condition and went to help him forgetting their challenge. Then, Raju realized why everyone praised Kumar and they became the friends forever.

a) What values of Kumar do you appreciate?

b) If the mass of bag is 0.3 kg and is taken up on an inclined plane of length 10m and height 5m, then allowed to slide down to bottom. The coefficient of friction between the body and plane is 0.15, What is the

(i) work done by gravitational force over the round trip?

(ii) Work done by applied force on upward journey?

PART – E

24. a) Describe Carnot engine. Explain how Carnot's cycle work with the heat flow diagram.

b) A refrigerator freezes 5kg of water at 0°C into ice at 0°C in a time interval of 20 minutes. Assume that room temperature is 20°C . Calculate the minimum power needed to accomplish it.

25. Define stationary waves. Write a note on (a) node (b) antinodes.

Explain the term

- (i) Transverse stationary waves.
- (ii) Longitudinal stationary waves.

Discuss the necessary condition for the formation of stationary waves.

26. (i) Explain the phenomenon of capillarity. Derive an expression for the rise of liquid in a Capillary tube.

(ii) Explain in brief what will happen, if the length of the capillary tube is smaller than the height to which the liquid rises?