THE VILLAGE INTERNATIONAL SCHOOL
"We Nurture Dreams"

GRADE: XI Date:16/02/24	ANNUAL EXAMINATION 2023-24 PHYSICS	Marks: 70 Time: 3h

General Instructions:

(1) There are 35 questions. All questions are compulsory

(2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E. All the sections are compulsory.

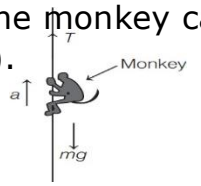
(3) Section A contains eighteen MCQ of 1 mark each, Section B contains seven questions of two marks each, Section C contains five questions of three marks each, section D contains three long questions of five marks each and Section E contains two case study-based questions of four marks each.

(4) There is no overall choice. However, an internal choice has been provided in section B, C and D and. You have to attempt only one of the choices in such questions.

(5) Use of calculators is not allowed.

Q. NO.		MARKS
1	The horizontal range of a projectile is maximum when the angle of projection is [a]0 [b]90 [c]60 [d]45	1
2	Which of the following is a derived quantity [a] Time [b] momentum [c] second [d] All of these	1
3	A dimensionless quantity [a]may have a unit [b] does not exist [c]never has a unit [d]always has a unit	1
5	A light and a heavy body have equal momenta. Which one has greater K.E. a) the light body b) the heavy body c)the K.E. are equal d) data is incomplete	1
6	At what temperature the Celsius and Fahrenheit	1

	temperature coincide a)-40^0 b)-41^0 c)-42^0 d)-43^0	
7	The escape velocity for a body projected vertically upwards from the surface of Earth is 11 km per second. if the bodyis projected at an angle of 45^0 with the vertical, the escape velocity will be a)$11\sqrt{2}$ km/s b)22 km/s c)11 km/s d)$11/\sqrt{2}$ km/s	1
8	What is the angle between the velocity vector and the acceleration vector in uniform circular motion [a]45^0 [b] 60^0 [c] 90^0 [d] 180^0	1
9	The number of significant figures in 0.002470 g cm^{-3} [a] 3 [b]4 [c]5 [d] 6	1
10	According to Stefan's law the total energy emitted per second per unit area of the surface E is proportional to (a) T (b)T^2 (c)T^3 (d)T^4	1
11	A mass m is moving with a constant velocity along a line parallel to the X-axis away from the origin, its angular momentum with respect to origin: a) is zero b) is constant c) goes on decreasing d) goes on increasing	1
12	A player caught a cricket ball of mass 200 g moving at a rate of 20 m/s. If the catching process is completed in 0·1 s, the force exerted by the ball on the hand of the player is equal to: a) 200 N b)4 N c)40 N d) 400 N	1
13	A bullet is dropped from the same height when another bullet is fired horizontally. They will hit the ground in such a way that, [a]the bullet which is dropped reached first [b]the bullet which is fired horizontally reached first [c]both will reach simultaneously [d] can't be predicted	1
14	The fastest mode of transmission of heat is	1

	a) Induction b) conduction c) convection d)radiation	
15	Distance between two consecutive node is [a]λ [b]2λ [c]λ/2 [d]λ/4	1
16	In a longitudinal wave, the particles of the medium move: a) Perpendicular to the direction of wave propagation b) Along the direction of wave propagation c) In random directions d) In circular orbits	1
Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below. a) Both A and R are true and R is the correct explanation of A b) Both A and R are true and R is not the correct explanation of A c) A is true but R is false d) A is false and R is also false		
17	ASSERTION: In an elastic collision between two bodies, the relative speed of the bodies after collision is equal to the relative speed before the collision. REASON: In an elastic collision the linear momentum of the system is conserved.	1
18	Assertion: Sine and cosine functions are periodic functions. Reason: Sinusoidal functions repeats it values after a definite interval of time.	1
	SECTION B	
19	A monkey of mass 25 kg is holding a vertical rope. The rope will not break when a mass of 30 kg is suspended from it, but will break if the mass exceeds 30 kg. What is the maximum acceleration with which the monkey can climb up along the rope? (Take g = 10 m/s^2).  	2
20	Draw pressure vs Volume graphs for isobaric and isochoricprocess.	2
21	Derive the expression to find the maximum height reached by a projectile	2

	OR	
	Find the orbital velocity of an artificial satellite of the earth given g= 10 /s^2, R=6400km	
22	Derive the expression for the potential energy stored in a spring? **OR** State and Prove Work – Energy theorem for a constant force.	2
23	Distinguish between damped and undamped oscillations	2
24	Derive the expression for displacement along x axis of an object executing SHM	2
25	Check the dimensional consistency of the following equation P=hdg Where p-pressure h-height d-distance g-acceleration due to gravity	2
	SECTION C	
26	State stock formula and derive the expression for maximum constant velocity acquired by the body (Terminal velocity) byfalling freely through a viscous medium	3
27	State pascals law and with the help of pascals law explain the working hydraulic lift and obtain a relation connecting mass of the object to be lifted and force applied	3
28	Distinguish between elastic and inelastic collision. Show that in one dimensional elastic collision of two objects, the velocityof separation of the two particles after collision is equal to the relative velocity of approach before collision	3
29	Find out the load to be suspended at the end of a wire of length8 meter to stretch it through 1 cm, diameter of the wire is 0.4mm and Young's modulus of wire is 90 *10^9 Pascal	3
30	10. A 5 kg object is attached to a spring of spring constant 500 N/M. It slides without friction over a horizontal surface Object is displaced 10cm from its equilibrium position and released. Calculate the (i) Time period (II) Maximum. Speed (III) Maximum Acceleration of the object. OR A spring of spring constant 1200 N/M is placed on horizontal table. An object mass of 3 kg isattached to the free end of a spring, pulled sideways to a distance	3

	of 2 cm and released. Determine, The frequency of oscillation of the object (b)The maximum acceleration of the object (c)The maximum speed of the object	
	SECTION D	
31	Explain and obtain the expression for time period of oscillation of a simple pendulum executing SHO. (a) What are the factors depending on the period of a Simple Pendulum. (b) Calculate the length of a second's pendulum	5
32	What do you understand by streamline flow and turbulent flow? State Bernoulli's theorem and briefly explain the working of Venturi meter, how to measure the rate of flow of a liquid through a pipe using Bernoulli's theorem. OR [a]What is a projectile? Show that the path traced by a projectile is a parabola. [b] A projectile is thrown upwards with an initial horizontal component of velocity 4m/s. What is its final horizontal component of velocity, when it reaches the maximum height?	5
33	Liquid drops are spherical in shape why? Obtain the mathematical expression for excess pressure inside liquid drop and bubble. OR Derive the Expression for Kinetic Energy, Potential Energy of an object executing SHM and show that total energy in SHO is conserved	5
	SECTION E-**Case Study Questions**	
34	Simple harmonic motion is the simplest form of oscillation. A particular type of periodic motion in which a particle moves to and fro repeatedly about a mean position under the influence of a restoring force is termed as simple harmonic motion (S.H.M).A body is undergoing simple harmonic motion if it has an acceleration which is directed towards a fixed point, and proportional to the displacement of the body from that point.	4

Acceleration $a \propto -x \Rightarrow a = -kx$ or $\frac{d^2x}{dt^2} = -kx$,

1. Which of the following is not a characteristic of simple harmonic motion?

(a) The motion is periodic.

(b) The motion is along a straight line about the mean position.

(c) The oscillations are responsible for the energy conversion.

(d) The acceleration of the particle is directed towards the extreme position.

2. The equation of motion of a simple harmonic motion is

(a) $\frac{d^2x}{dt^2} = -\omega^2 x$ (b) $\frac{d^2x}{dt^2} = -\omega^2 t$

(c) $\frac{d^2x}{dt^2} = -\omega x$ (d) $\frac{d^2x}{dt^2} = -\omega t$

3. The time period of simple harmonic motion depends upon

(a) amplitude

(b) energy

(c) phase constant

(d) mass

4. Which of the following motions is not simple harmonic?

(a) Vertical oscillations of a spring

	(b) Motion of a simple pendulum (c) Motion of planet around the Sun (d) Oscillation of liquid in a U-tube	
35	The property due to which the free surface of liquid tends to have minimum surface area and behaves like a stretched membrane is called surface tension. It is a force per unit length acting in the plane of interface between the liquid and the bounding surface *i.e.*, S = F/L, where F = force acting on either side of imaginary line on surface and L = length of imaginary line. Surface tension decreases with rise in temperature. Highly soluble impurities increase surface tension and sparingly soluble impurities decreases surface tension. **1.** The excess pressure inside a soap bubble is three times than excess pressure inside a second soap bubble, then the ratio of their surface area is (a) 9 : 1 (b) 1 : 3 (c) 1 : 9 (d) 3 : 1 **2.** Which of the following statements is not true about surface tension? (a) A small liquid drop takes spherical shape due to surface tension. (b) Surface tension is a vector quantity. (c) Surface tension of liquid is a molecular phenomenon. (d) Surface tension of liquid depends on length but not on the area.	4

	3. Which of the following statement is not true about angle of contact? (a) The value of angle of contact for pure water and glass is zero. (b) Angle of contact increases with increase in temperature of liquid. (c) If the angle of contact of a liquid and a solid surface is less than 90°, then the liquid spreads on the surface of solid. (d) Angle of contact depend upon the inclination of the solid surface to the liquid surface. **4.** Which of the following statements is correct? (a) Viscosity is a vector quantity. (b) Surface tension is a vector quantity. (c) Reynolds number is a dimensionless quantity. (d) Angle of contact is a vector quantity. OR **4.** A liquid does not wet the solid surface if the angle of contact is (a) 0° (b) equal to 45° (c) equal to 90° (d) greater than 90°	