No. of printed pages: 06

INDIAN SCHOOL SOHAR

TERM - I EXAMINATION (2022-23)

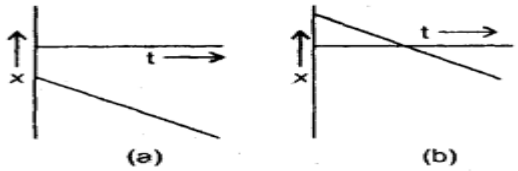
PHYSICS THEORY

CLASS: XI **Maximum Marks: 70**

DATE: 19/09/2022 **Time Allowed: 3 hours**

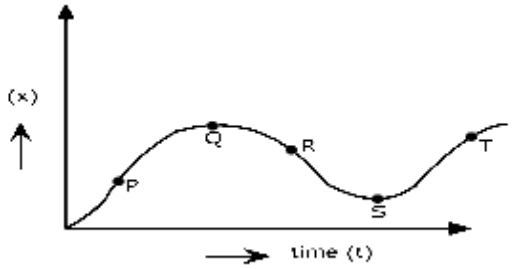
GENERAL INSTRUSTIONS:

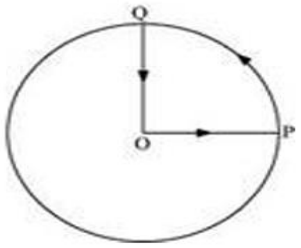
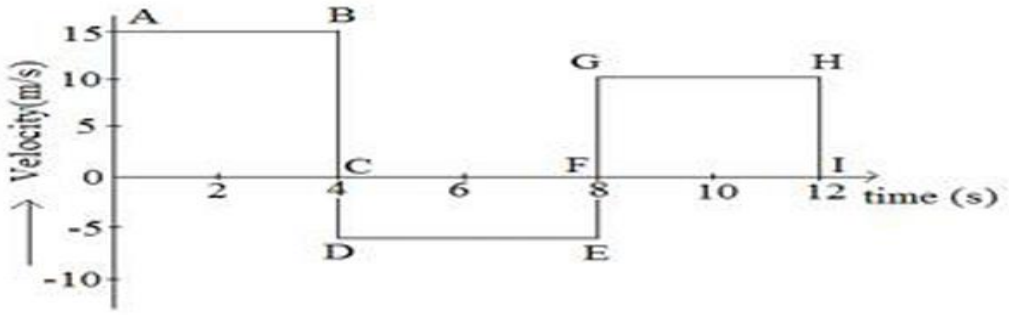
1. There are 33 questions in all. All questions are compulsory.
2. This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
3. **Section A** contains ten very short answer questions and four assertion reasoning MCQs of **1** mark each, **Section B** has two case based questions of **4** marks each, **Section C** contains nine short answer questions of **2** marks each, **Section D** contains five short answer questions of **3** marks each and **Section E** contains three long answer questions of **5** marks each.
4. There is no overall choice. However internal choice is provided. You have to attempt only one of the choices in such questions.
5. You may use log tables if necessary but use of calculator is not allowed.

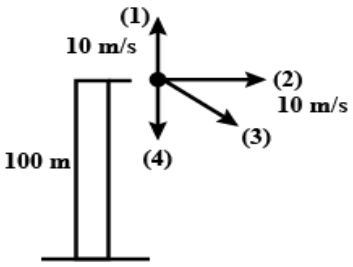
Sr. No		Marks
	Section - A **All questions are compulsory. In case of internal choices, attempt any one of them.**	**10**
1	Name at least two physical quantities each having dimensions: [M L^{-1} T^{-2}]	1
2	Do significant figures change if the physical quantity is measured in different systems of units? **OR** What are the significant figures in the following measurement: i) 353.72 cm ii) 0.00928 N?	1
3	What is common between the two graphs shown in figs, (a) and (b)? 	1
4	Is it possible to have the rate of change of velocity constant while the velocity itself changes both in magnitude and direction? Give an example. **OR** Can there be motion in two dimensions with acceleration in only one dimension?	1
5	What is the dot product of $2\hat{i} + 4\hat{j} + 5\hat{k}$ and $3\hat{i} + 2\hat{j} + \hat{k}$?	1
6	A quantity has both magnitude and direction. Is it necessarily a vector? Why? Give an example.	1
7	What will be the effect on horizontal range of a projectile when its initial velocity is doubled, keeping the angle of projection same? **OR** A stone is thrown vertically upwards and then it returns to the thrower. Is it a projectile? Explain?	1
8	A soda water bottle is falling freely. Will the bubbles of the gas rise in the water of the bottle? **OR**	1

	Why does a heavy gun not kick so strongly as a light gun using the same bullet?	
9	Several forces act simultaneously on a body. In which direction will it move?	1
10	A thief jumps from the roof of a house with a box of weight 3 kg on his head. What will be the weight of the box as experienced by the thief during jump?	1
	For question numbers 11, 12, 13 and 14, 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 but 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**	**4**
11	**Assertion:** The position-time graph of a uniform motion in one dimension of a body can have negative slope. **Reason:** When the speed of body decreases with time, the position-time graph of the moving body has negative slope.	1
12	**Assertion**: A positive acceleration of a body can be associated with a slowing down of the body. **Reason**: Acceleration is a vector quantity.	1
13	**Assertion:** Rocket in flight is not an illustration of projectile. **Reason**: Rocket takes flight due to combustion of fuel and does not move under the gravity effect alone.	1
14	**Assertion:** The average speed of a body over a given interval of time is equal to the average velocity of the body in the same interval of time if a body moves in a straight line in one direction. **Reason:** Because in this case distance travelled by a body is equal to the displacement of the body.	1
	Section - B **Questions 15 and 16 are Case Study based questions and are compulsory. Attempt any 4 sub parts from each question. Each question carries 1 mark.**	**8**
15	Isaac Newton's First Law of Motion describes the behavior of a massive body at rest or in uniform linear motion, i.e., not accelerating or rotating. The First Law states, "A body at rest will remain at rest, and a body in motion will remain in motion unless it is acted upon by an external force. "This simply means that things cannot start, stop or change direction all by themselves. It requires some force acting on them from the outside to cause such a change. While this concept seems simple and obvious to us today, in Newton's time it was truly revolutionary. There are many excellent examples of Newton's first law involving aerodynamics. The motion of an airplane when the pilot changes the throttle setting of the engine is described by the first law. The motion of a ball falling down through the atmosphere, or a model rocket being launched up into the atmosphere are both examples of Newton's first law. 1. A rider on horse falls back when horse starts running, all of a sudden because a) Rider is taken back b) Rider is suddenly afraid of falling c) Inertia of rest keeps the upper part of body at rest whereas lower part of the body moves forward with the horse d) None of the above.	

	2. When a train stops suddenly, passengers in the running train feel an instant jerk in the forward direction because a) The back of seat suddenly pushes the passengers forward b) Inertia of rest stops the train and takes the body forward c) Upper part of the body continues to be in the state of motion whereas the lower part of the body in contact with seat remains at rest d) Nothing can be said due to insufficient data. 3. Inertia is that property of a body by virtue of which the body is a) Unable to change by itself the state of rest b) Unable to change by itself the state of uniform motion c) Unable to change by itself the direction of motion d) Unable to change by itself the state of rest and of uniform linear motion. 4. A man getting down a running bus falls forward because a) Due to inertia of rest, road is left behind and man reaches forward b) Due to inertia of motion upper part of body continues to be in motion in forward direction while feet come to rest as soon as they touch the road c) He leans forward as a matter of habit d) Of the combined effect of all the three factors stated in (a), (b) and (c). 5. A boy sitting on the topmost berth in the compartment of a train which is just going to stop on a railway station, drops an apple aiming at the open hand of his brother sitting vertically below his hands at a distance of about 2 meter. The apple will fall a) Precisely on the hand of his brother b) Slightly away from the hand of his brother in the direction of motion of the train c) Slightly away from the hand of his brother in the direction opposite to the direction of motion of the train d) None of the above.	4
16	The terms 'work', 'energy' and 'power' are frequently used in everyday language. A farmer clearing weeds in his field is said to be working hard. A woman carrying water from a well to her house is said to be working. In a drought affected region she may be required to carry it over large distances. If she can do so, she is said to have a large stamina or energy. Energy is thus the capacity to do work. The term power is usually associated with speed. In karate, a powerful punch is one delivered at great speed. Work is said to be done when a force applied on the body displaces the body through a certain distance in the direction of force. The work done by a constant force can be defined as the product of the displacement of the object (to which the force is applied) and the component of the constant force which is parallel to the direction of displacement. It is important to note that the work done by a constant force is always directly proportional to the product of the magnitude of the applied force and the displacement of the object to which the force was applied. 1. A body of mass m is moving in a circle of radius r with a constant speed v. The force on the body is mv^2/r and is directed towards the center. What is the work done by this force in moving the body over half the circumference of the circle? a) $mv^2/\pi r^2$ b) zero c) mv^2/r d) $\pi r^2/mv^2$	

	2. If the unit of force and length each be increased by four times, then the unit of energy is increased by a) 16 times b) 8 times c) 2 times d) 4 times 3. A body moves a distance of 10 m along a straight line under the action of a force of 5 N. If the work done is 25 joules, the angle which the force makes with the direction of motion of the body is a) 0^0 b) 30^0 c) 60^0 d) 90^0 4. You lift a heavy book from the floor of the room and keep it in the book-shelf having a height 2 m. In this process you take 5 seconds. The work done by you will depend upon a) Mass of the book and time taken b) Weight of the book and height of the book-shelf c) Height of the book-shelf and time taken d) Mass of the book, height of the book-shelf and time taken. 5. A force F = (5i + 3J) N is applied over a particle which displaces it from its origin to the point r = (2i -1j) m. The work done on the particle is a) -7 J b) -13 J c) +7 J d) +11 J	4
	Section - C **All questions are compulsory. In case of internal choices, attempt anyone.**	**18**
17	Figure shows a displacements time graph. Comment on the sign of velocities at point P, Q, R, S and T. 	2
18	Displacement of a particle is given by the expression $x = 3t^2 + 7t - 9$, where x is in meter and t is in seconds. What is acceleration? **OR** A car moving on a straight highway with speed of 126 km/hrs., is brought to stop within a distance of 200 m. What is the retardation of the car (assumed uniform) and how long does it take for the car to stop?	2
19	At what range will a radar set show a fighter plane flying at 3 km above its centre and at distance of 4 km from it? **OR** a) Define time of flight and horizontal range? b) From a certain height above the ground a stone A is dropped gently. Simultaneously another stone B is fired horizontally. Which of the two stones will arrive on the ground earlier?	2
20	What is the angle between two forces of 2N and 3N having resultant as 4N?	2
21	A cyclist starts from the center O of a circular park of radius 1 km, reaches the edge P of the park, then cycles along the circumference, and returns to the center along QO as	

	shown in Fig. 4.21. If the round trip takes 10 min, what is the (a) net displacement, (b) average velocity, and (c) average speed of the cyclist?  	2
22	What is the angle between the following pair of vectors? $A = \hat{i} + \hat{j} + \hat{k}$, $B = -2\hat{i} - 2\hat{j} - 2\hat{k}$.	2
23	A shell of mass 0.020 kg is fired by a gun of mass 100 kg. If the muzzle speed of the shell is 80 m/s, what is the recoil speed of the gun?	2
24	What are concurrent forces? State the condition for their equilibrium. **OR** Explain how does Newton's first law derived from Newton's second law.	2
25	A body constrained to move along the z-axis of a coordinate system is subject to a constant force F given by F = (i + 2j + 3k) N Where i, j, k are unit vectors along the x, y, z axis of the system respectively. What is the work done by this force in moving the body a distance of 4 m along the z axis?	2
	Section - D **All questions are compulsory. In case of internal choices, attempt any one.**	**15**
26	Velocity time graph of a moving particle is shown. Find the displacement 1) 0–4s, 2) 0–8s and 3) 0 - 12s from the graph. Also write the differences between distance and displacement.  	3
27	**i)** Initial speed of a shell is 392 m/s. At what angle must the gun be fired, if the projectile is to strike the target at same level as the ground at a distance of 7840 m from it? ($g = 9.8$ m/s^2) **OR** Explain triangle's law of vector addition and obtain an expression for the resultant of two vectors acting simultaneously, at a point.	3
28	A railway car of mass 20 tones moves with an initial speed of 54 km/hr. On applying brakes, a constant negative acceleration of 0.3 m/s^2 is produced. (i) What is the breaking force acting on the car? (ii) In what time it will stop? (iii) What distance will be covered by the car before if finally stops? **OR** Prove that law of conservation of mechanical energy in a free fall object with a help of neat and labelled diagram.	3

29	State Newton's second, law of motion. Express it mathematically and hence obtains a relation between force and acceleration.	3
30	The mass of the particle is 2 kg. It is projected as shown in four different ways with same speed of 10 m/s. Find out the work done by gravity by the time the stone fails on ground.  	3
	Section - E **All questions are compulsory. In case of internal choices, attempt any one.**	**15**
31	State principle of homogeneity and apply it to convert a work of 1 joule into erg. **OR** Write the dimensional formula for following quantities i) Pressure ii) power iii) density iv) angle v) frequency	5
32	The position of a particle is given by $r = 3.0t\ \hat{i} - 2.0t^2\ \hat{j} + 4.0\ \hat{k}\ m$ Where t is in seconds and the coeffients have the proper units for r to be in meters. a) Find the v and a of the particle. b) what is the magnitude and direction of velocity of the particle at t = 2.0 s? **OR** On an open ground, a motorist follows a track that turns to his left by an angle of 60° after every 500 m. Starting from a given turn, specify the displacement of the motorist at the third, sixth and eighth turn. Compare the magnitude of the displacement with the total path length covered by the motorist in each case.	5
33	i) A constant force acting on a body of mass 3.0 kg changes its speed from 2.0 ms^{-1} to 3.5 ms^{-1} in 25 s. The direction of the motion of the body remains unchanged. What is the magnitude and direction of the force? ii)) Give two examples which illustrate the concept of impulse of a force. **OR** A body of mass 5 kg is acted upon by two perpendicular forces 8 N and 6 N. Calculate the magnitude and direction of the acceleration of the body.	5