St Margaret Sr Sec School

Practice Paper (Session: 2023-24)

Class: XI **Subject: Physics**

Duration:3 h **Maximum Marks:70**

General Instructions:

(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) All the sections are compulsory.
(4) Section A contains sixteen questions, twelve MCQ and four Assertion Reasoning based of 1 mark each, Section B contains five questions of two marks each, Section C contains seven questions of three marks each, Section D contains two case study based questions of four marks each and Section E contains three long answer questions of five marks each.
(5) There is no overall choice. However, an internal choice has been provided in one question in Section B, one question in Section C, one question in each Case study based questions in Section D and all three questions in Section E. You have to attempt only one of the choices in such questions.
(6) Use of calculators is not allowed.

	Section – A सभी प्रश्न अनिवार्य हैं। **All questions are compulsory.**
1	**What is the unit of solid angle?** **a. second** **b. Steradian** **c. kilogram** **d. candela**
2	**If the displacement-time graph of an object is parallel to the time-axis, then it represents that the object is :** **a. at rest** **b. in uniform motion** **c. in accelerated motion** **d. Object will first move with uniform motion and finally will come to rest.**

3	**A body of moment of inertia 3 kg m² rotating with an angular velocity 2 rad/s has the same K.E. as a mass of 12 kg moving linearly with a velocity of……** **a. 21 m/s** **b. 2 m/s** **c. 4 m/s** **d. 1 m/s**
4	**What is the minimum number of unequal forces whose resultant will be zero?** **a. 1** **b. 2** **c. 3** **d. 4**
5	**The value of absolute zero is** **a. 273.15^0C** **b. -273.15^0C** **c. 100^0C** **d. 180.15^0C**
6	**A body starts from rest and travels for t second with uniform acceleration of 2 m/s². If the displacement made by it is 16 m, the time of travel t is** **a. 5 s** **b. 2 s** **c. 3 s** **d.4 s**
7	**In an elastic collision, what is conserved ?** **a. Kinetic energy** **b. Momentum** **c. Kinetic energy and momentum** **d. Neither kinetic energy nor momentum**
8	**A man in a train in motion is facing the engine. He tosses a coin up, the coin falls behind him. The train is** **(a) moving forward with uniform speed.** **(b) moving forward with acceleration.** **(c) moving backward with uniform speed.** **(d) moving forward with retardation.**

9	**In equilibrium, the total energy is equally distributed in all possible energy modes having an energy equal to 1/2K_BT, this is called as-** **a. Boyle's law** **b. Charle's law** **c. Law of equipartition of energy** **d. None**
10	**The first law of thermodynamics is represented as** **a. dQ = dU + dW** **b. dQ = 2dU + dW** **c. dQ = dU – dW** **d. dQ = dU + 2dW**
11	**[ML^2T^-2] is the dimension of** **a. Force** **b. Kinetic energy** **c. Pressure** **d. Power**
12	**When steam is converted into water, internal energy of the system** **(a) increases** **(b) decreases** **(e) remains constant** **(d) becomes zero**
	Directions: These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses. **(a) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.** **(b) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.** **(c) If the Assertion is correct but Reason is incorrect.** **(d) If both the Assertion and Reason are incorrect.**

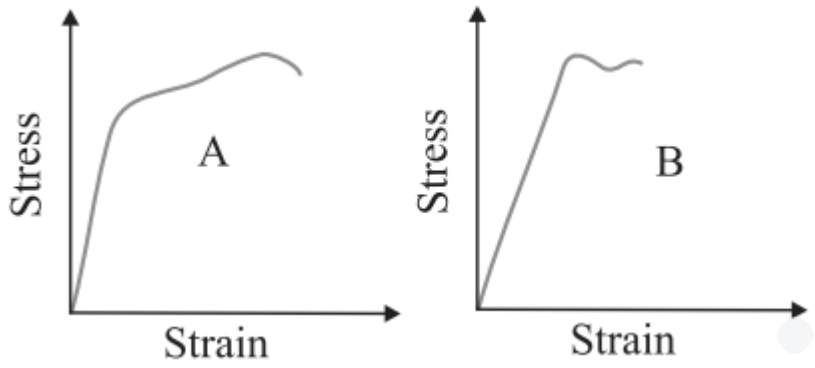
13	**Assertion : Two particles of different mass, projected with same velocity at same angles. The maximum height attained by both the particles will be the same.** **Reason : The maximum height of the projectile is independent of particle mass.**
14	**Assertion: The direction of velocity at any point on the path of an object is tangential to the path at that point and is in the direction of motion.** **Reason: The average acceleration of an object for a time interval Δt moving in x-y plane is the change in velocity divided by the time interval.**
15	**Assertion : Strain is a unitless quantity.** **Reason : Strain is equivalent to force.**
16	**Assertion : Two identical solid balls, one of ivory and the other of wet-clay are dropped from the same height on the floor. Both the balls will rise to the same height after bouncing.** **Reason : Ivory and wet-clay have the same elasticity.**
	Section – B **All questions are compulsory.In case of internal choice,attempt any one.**
17	**Linear momentum is a scalar or a vector? Write its unit and dimensional formula.** **OR** **State Newton's second law of motion.Give an example.**
18	**A thread,pencil and a metre scale are handed over to you. How will you determine the thread's diameter approximately?**
19	**(a) Atmospheric pressure at a height of about 6 km decreases to nearly half of its value at the sea level, though the height of the atmosphere is more than 100 km** **(b) Hydrostatic pressure is a scalar quantity even though pressure is force divided by area.**
20	**A 50 kg girl wearing high heel shoes balances on a single heel. The heel is circular with a diameter 1.0 cm. What is the pressure exerted by the heel on the horizontal floor?**
21	**Molar volume is the volume occupied by 1 mol of any (ideal) gas at standard temperature and pressure (STP : 1 atmospheric pressure, 0 °C). Show that it is 22.4 litres.**
	Section – C

	All questions are compulsory.In case of internal choice,attempt any one.
22	**A bat emits ultrasonic sound of frequency 1000 kHz in air. If this sound meets a water surface, what is the wavelength of** **(a) the reflected sound,** **(b) the transmitted sound?** **Speed of sound in air = 340 ms^-1 and in water = 1486 ms^-1**
23	**Find the torque of a force 7iˆ+ 3jˆ – 5kˆ about the origin.The force acts on a particle whose position vector is iˆ– jˆ+ kˆ.**
24	**The cylindrical tube of a spray pump has a cross-section of 8.0 cm^2 on one end of which has 40 fine holes each of 1.0 mm diameter. If the liquid flow inside the tube is 1.5 m min^-1, what is the speed of ejection of the liquid through the holes?**
25	**A stone tied to the end of a string 80 cm long is whirled in a horizontal circle with a constant speed. If the stone makes 14 revolutions in 25 s, what is the magnitude and direction of acceleration of the stone ?**
26	**Give the magnitude and direction of the net force acting on a stone of mass 0.1 kg** **a) just after it is dropped from the window of a stationary train,** **b) just after it is dropped from the window of a train running at a constant velocity of 36 km/h**
27	**Define Inelastic collision.Throwing mud on a wall is an example of inelastic collision.Explain.** **OR** **The velocity of an aeroplane is doubled.What happens to its momentum and kinetic energy?Will the momentum remain conserved?explain.**
28	**A car moving along a straight highway with speed of 126 km h^–1 is brought to a 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?**
	Section – D **Case Study**

	All questions are compulsory.In case of internal choice,attempt any one.
29	**Simple harmonic motion (SHM) is not any periodic motion but one in which displacement is a sinusoidal function of time.** **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). Oscillatory motion is said to be simple harmonic if the displacement x of the particle from the origin varies with time as-** $$x(t) = A\cos(\omega t + \phi)$$ **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.** $$\text{Acceleration } a \propto -x \Rightarrow a = -kx \text{ or } \frac{d^2x}{dt^2} = -kx,$$ **(i) A particle of mass m oscillating under the influence of Hooke's law restoring force given by F = – k x exhibits simple harmonic motion.The time period of simple harmonic motion depends upon** **(a) amplitude** **(b) energy** **(c) phase constant** **(d) mass** **(ii) Which of the following motions is not simple harmonic?** **(a) Oscillations of a vertical spring-mass system** **(b) Motion of a simple pendulum** **(c) Motion of planet around the Sun** **(d) Oscillation of liquid in a U-tube** **(iii)Which of the following expressions does not represent simple harmonic motion?** **(a) x = Acoswt + Bsinwt** **(b) x = Acos(wt + a)** **(c) x = Bsin(wt + b)** **(d) x = Asinwt cos^2wt**

	(iv)The particle acceleration during SHM is given by- (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) $\frac{d^2x}{dt^2} = -\omega t$ **Or** **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 always directed towards the extreme position.**
30	**It is clear that unless a force is applied the door does not rotate. But any force does not do the job. A force applied to the hinge line cannot produce any rotation at all, whereas a force of given magnitude applied at right angles to the door at its outer edge is most effective in producing rotation.** **It is not the force alone, but how and where the force is applied is important in rotational motion.** **(i)The rotational analogue of 'force in linear motion' is** **a. Moment of force** **b. Mass** **c. Gravitational force** **d. Moment of inertia** **(ii)Torque is -** **a. 2(rxF)** **b. r.F** **c. rxF** **d. 2(r.F)** **(iii)120 N of force is required to open a nut using a spanner of length 10 cm. If another spanner of length 6 cm is used to open the same nut, amount of force to be applied is-** **a. 100N** **b. 200N** **c. 300N** **d. 60N**

	(iv) If applied torque on a system is zero,then for that system **a. Moment of inertia is zero** **b. Angular velocity is zero** **c. angular acceleration is zero** **d. Both (a) and (b)** **OR** **If a body is rotating about an axis passing through its centre of mass, the angular momentum of the body is directed along its –-** **a. Circumference** **b. Radius** **c. Axis of rotation** **d. None**
31	**Define the principle of conservation of linear momentum. Deduce the law of conservation of linear momentum from Newton's third law of motion** **OR** **With the help of suitable example, explain the terms static friction, limiting friction and kinetic friction. Show that static friction is a self adjusting force.** **Also plot the graph showing the variation between applied force F and force of friction f.**
32	**a)State and prove Pascal's Law.** **b)Draw a diagram showing construction of a hydraulic brake .How does it work?** **OR** **a) Derive an expression for the excess pressure inside a soap bubble.** **b) State and Prove Bernoulli's theorem.**
33	**a)A steel wire of length 4.7 m and cross-sectional area 3.0 x 10^{-5} m^2 stretches by the same amount as a copper wire of length 3.5 m and cross-sectional area of 4.0 x 10^{-5} m^2 under a given load. What is the ratio of the Young's modulus of steel to that of copper?** **b)The stress-strain graphs for materials A and B are shown in figure.**



The graphs are drawn to the same scale.
(i) Which of the materials has the greater Young's modulus?
(ii) Which of the two is the stronger material?

OR

a) **A steel cable with a radius of 1.5 cm supports a chairlift at a ski area. If the maximum stress is not to exceed 10^8 Nm^{-2} what is the maximum load the cable can support ?**
b) **A rigid bar of mass 15 kg is supported symmetrically by three wires each 2.0 m long. Those at each end are of copper and the middle one is of iron. Determine the ratios of their diameters if each is to have the same tension. Take Y(iron)=19x10^10Pa ;Y(copper)=11x10^10Pa**