HIMACHAL PRADESH BOARD OF SCHOOL EDUCATION,
DHARAMSHALA, HP

PHYSICS
SAMPLE QUESTION PAPER
CLASS – XI (2026–27)

Time Allowed: 3 Hours **Maximum Marks: 60**

General instructions

1. There are 27 questions in all distributed in five sections A, B, C, D and E. All the questions are mandatory. Internal choices are given where applicable.
2. Section A contains 12 MCQ, each of 1 mark. Section B contains 4 questions of 2 marks each. Section C contains 7 questions of 3 marks each. Section D contains 1 case study-based question of 4 marks. Section E contains 3 long answer questions of 5 marks each.
3. Use of calculator or any calculation device is not permitted.
4. You may use the following values wherever necessary:

i) $\sin 23.4^0 = 0.397$ ii) $c = 3 \times 10^8$ m s^{-1} iii) $h = 6.63 \times 10^{-34}$ J s
iv) $k_B = 1.38 \times 1023$ JK^{-1} v) $N_A = 6.023 \times 10^{23}$/ mole

Section A

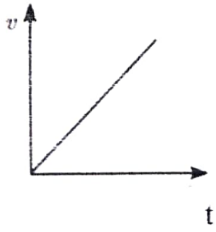
Mark the right option for Q 1 to 12. There is no negative marking.

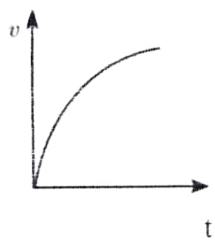
1. Match the given dimensions with the respective physical quantities

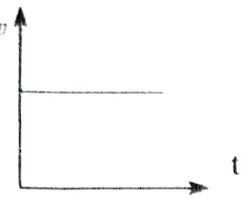
Dimensional formula	Physical quantity
(a) $M L^2 T^{-1}$	(i) Force constant
(b) $M L^2 T^{-2} K^{-1}$	(ii) Planck's constant
(c) $M^{-1} L^3 T^{-2}$	(iii) Gravitational Constant
(d) $M L^0 T^{-2}$	(iv) Boltzmann's constant

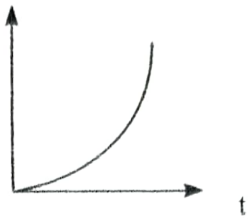
A) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)
B) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
C) (a)-(ii), (b)-(i), (c)-(iii), (d)-(iv)
D) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

2. Acceleration is the rate of change of velocity. A student while being in the playground, drops a stone from a certain height. Which of the following velocity – time graphs, represents the motion of the stone during its free fall?

A) 

B) 

C) 

D) 

3. Two stones are projected with the same speed at 30^0 and 60^0 with the horizontal. Ratio of the maximum heights attained by the two stones will be _____

A) 1: 2 B) 1: 3 C) 1: 1 D) 1: $\sqrt{3}$

4. Match the given column I with the relevant match from column II in reference to simple harmonic motion.

Column I	Column II
(a) Maximum velocity of the particle in SHM	(i) $\frac{2\pi}{\omega}$
(b)Velocity of the particle when it is at extreme position	(ii) ω A
(c) Time period of y = A sin ω t	(iii) $\sqrt{k/m}$
(d) Angular speed of a particle executing SHM	(iv) 0

Which of the following is a correct combination of matches?

A) (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)

B) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)

C) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)

D) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)

5. Moment of inertia of a circular disc of radius R about an axis perpendicular to the plane of the disc and passing through its centre is $1/2MR^2$. If the axis is now taken along its diameter, the new moment of inertia becomes -

A) double B) four times C) half D) one fourth

6. Consider the following statements in the light of work-energy theorem.

I Change in kinetic energy of a body is equal to work done by the net force on the body.

II. Work energy theorem is independent of Newton's law of motion.

III. Work energy theorem is valid only for the conservative forces.

IV. Work energy theorem hold good for conservative as well non-conservative forces.

Which of these statements are correct?

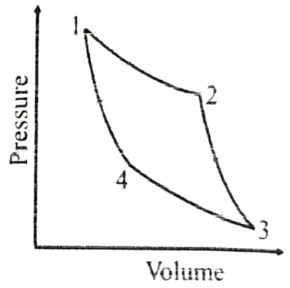
A) I,II, III B) I, II, III, IV C) I, II, IV D) I, III

7. If the gravitational force of attraction between earth and a satellite revolving around it suddenly becomes zero, then the satellite will
   A) move toward earth. B) become stationary in its orbit.
   C) continue the same orbit with same speed.
   D) move tangential to the original orbit with the same speed.

8. Which type of the coefficient of elasticity is involved in compressing a gas?
   A) Young's modulus B) Bulk modulus
   C) Shear modulus D) All the three moduli of elasticity

9. The pressure on a swimmer 10 m below the surface of a lake is
   A) 0.01×10^5 Pa B) 1.01×10^5 Pa
   C) 2.01×10^5 Pa D) 2.01×10^{-5} Pa

10. Analyse the given figure which represents Carnot cycle for a heat engine with an ideal gas as the working substance. Which of the following is a correct statement?
    A) Process between 1 and 2 is adiabatic expansion.
    B) Process between 2 and 3 is adiabatic compression.
    C) Process between 4 and 1 is adiabatic expansion.
    D) Process between 3 and 4 is isothermal compression.



Questions 11 and 12, 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.

11. **Assertion:** Two bodies A and B are in contact. Force on the body A by B is equal and opposite to the force on body B by A.
    Reason: First a force, called action acts on a body thereafter reaction acts on the second body in response to the action force.

12. **Assertion:** When heat is added or removed during a change of state, the temperature remains constant.
    Reason: The amount of heat per unit mass transferred during change of state is called latent heat of the substance.

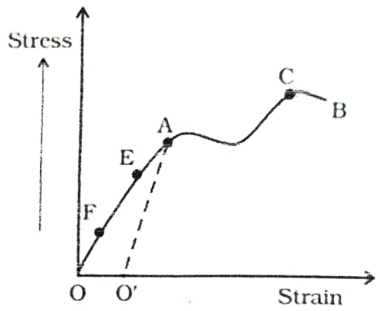
Section B

13. Check the dimensional consistency of the equation $s = ut + 1/2\, at^2$, where the symbols have usual meanings. (2)

14. The distances traversed, during equal intervals of time, by a body falling from rest, stand to one another in the same ratio as the odd numbers beginning with unity i.e. 1: 3: 5: 7..... Prove it. **OR**

    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. Assuming that the car retards uniformly, calculate the retardation of the car. (2)

15. The stress-strain curve for a metal wire is shown in the figure. The wire returns to its original state O along the curve EFO when it is gradually unloaded. Point B corresponds to the fracture of the wire.



    i) Up to what point of the curve is Hooke's law obeyed?

    ii) Which point on the curve corresponds to the elastic limit or yield point of the wire?

    iii) Explain the relevance of dotted curve AO' . (0.5+0.5+1 =2)

16. Describe in brief Kepler's law of areas, with the help of a labelled diagram. (2)

Section C

17. In an elastic one-dimensional collision between two bodies, show that after the collision between two bodies of equal masses, if first body comes to rest , it pushes off the second body with its initial speed. (3)

18. Define centripetal acceleration.

    Show that centripetal acceleration of an object moving with uniform speed v in a circle of radius R is given by $a_c = 4\,\pi^2\, f^2\, R$. Where f is number of revolutions per second.

    OR

    A motorboat is racing towards north at 25 km/h and the water current in that region is 10 km/h in the direction of 60° east of south. Find the resultant velocity of the boat. (3)

19. Value of acceleration due to gravity (g) varies with height above the surface of earth. Discuss the variation in the value of g, when a body of mass m gains small height h above the surface.

    Also plot a graph to show this variation. (2.5 +0.5 =3)

20. Derive expression for kinetic energy of a simple harmonic oscillator.
You are given a task to modify a simple harmonic oscillator. Identify one way, you could decrease the maximum velocity of the system (2 + 1=3)

21. State second law of thermodynamics. Which fundamental limitations are given by the second law? (2+1 = 3)

22. I) State two factors on which the conduction of heat through a substance depends.
ii) Hence write an expression for the rate of flow of heat.
iii) Give the SI units of thermal conductivity. (1+1+1 = 3)

23. What is a rigid body? When a rigid body is said to be in mechanical equilibrium? If the origin with respect to which the torques are taken is shifted, does the rotational equilibrium remain valid? (1+1+1 =3)

Section D

24. Study, analyse the paragraph carefully and answer the given questions based on this paragraph. Each question carries one mark.

Properties of gases are easier to understand than those of solids and liquids. This is mainly because in a gas, molecules are far from each other and their mutual interactions are negligible except when two molecules collide. Gases at low pressures and high temperatures much above that at which they liquefy (or solidify) approximately satisfy a simple relation between their pressure, temperature and volume given by $PV = KT$ for a given sample of the gas. Here T is the temperature in kelvin or (absolute) scale. We can write $K = N k$.

Observation tells us that this k is same for all gases. It is called Boltzmann constant and is denoted by k_B. If P, V and T are same, then N is also same for all gases. This is Avogadro's hypothesis, that the number of molecules per unit volume is the same for all gases at a fixed temperature and pressure. The number in 22.4 litres of any gas is 6.02×10^{23}. This is known as Avogadro number and is denoted by N_A. The mass of 22.4 litres of any gas is equal to its molecular weight in grams at S.T.P (standard temperature 273 K and pressure 1 atm). This amount of substance is called a mole. Perfect gas equation can be written as $PV = n RT$, where n is number of moles and $R = N_A k_B$ is a universal constant and its value is given by $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$

a) The graph of P and 1/V of 1 mole of an ideal gas at constant temperature is a
i) straight line parallel to P axis ii) a parabola
iii) a straight line inclined at 1/V axis. iv) rectangular hyperbola (1)

OR

Under which of the following conditions does a real gas behave most closely as an ideal gas?
(a) Low pressure and low temperature (b) Low pressure and high temperature
(c) High pressure and low temperature (d) High pressure and high temperature

b) The ideal gas equation for 5 g oxygen at a pressure P and temperature T, when occupies volume V is

i) PV = 5 RT ii) PV = 5/32 RT

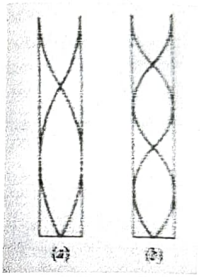
iii) 5/16 RT iv) 5/2 RT (1)

c) How Boltzmann's constant is different from universal gas constant? (2)

Section E

25. A) What is difference between a node and an antinode?

B) If one end of a pipe is closed, then write the expressions for the frequencies corresponding to first harmonic, and the subsequent two harmonics. Also draw the relevant diagram for the first three normal modes of the air column.



C) Two vibrating modes of an air columns are given in the figure. Find the ratio of frequencies of the two modes. (1+3+1)

OR

A) What do you mean by a wave?

B) How the transverse waves are different from longitudinal waves. Give one example of each.

C) Identify the type of wave motion in the following examples. (Transverse/ longitudinal / combination of both.)

i) waves produced by a moto boat sailing in water

ii) Ultrasonic waves in air produced by a vibrating quartz crystal. (1+3+1)

26. A) Define excess pressure inside a liquid drop. Derive an expression for the rise of water in a capillary tube.

B) A student wants to increase the height of water in a capillary tube during an experiment. Suggest one change in the experimental arrangement and justify your answer using the formula for capillary rise.

C) What change do you observe in the above experiment if water is replaced by mercury? (3+1+1 = 5)

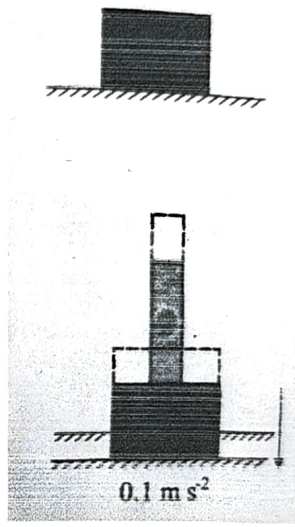
OR

A) What is Torricelli's law?

B) Apply Bernoulli's principle to determine the speed of efflux from the side of a container when i) the top of the container is closed ii) top of the container is open.

C) A cylindrical container with uncovered top and height 20 m is completely filled with water. A hole is drilled on the side wall just above its bottom. Taking value of g as 10 ms^{-2}, the velocity of efflux of water will be _____ ms^{-1}. (1+ 2.5 +1.5 = 5)

27. A) Give two major points which must be kept in mind while drawing a free body diagram in mechanics problem solving. (2)



B) A wooden block of mass 2 kg rests on a smooth horizontal floor. When an iron cylinder of mass 25 kg is placed on top of the block, the floor yields steadily and the block and the cylinder together go down with an acceleration of 0.1 m s $^{-2}$.

i) Draw free body diagrams of the block in both the cases. (1)

ii) What is the action of the block on the floor before and after the floor yields? (0.5 +1.5 =2)

(Take g = 10 m s^{-2}.)

OR

A) What do you mean by a banked road? Describe the motion of a car on a banked road. (0.5 + 2 = 2.5)

B) A circular race track has a radius of 300m and is banked at an angle of 15^0. If the coefficient of friction between the wheels of race car and the road is 0.2, find

i) optimum speed of the race car to avoid wear and tear of its tyres and

ii) maximum permissible speed to avoid slipping. (2.5)

FORMAT OF DESIGN (Subject Other Than Language)

Question Paper / Test Blueprint

Subject: Physics

Paper: Sample Question Paper

Class: 11th

Time: 3 hours

Maximum Marks: 60

1. Weightage to Objectives

Objective	Knowledge	Understanding	Application	Analysis	Evaluation	Creation	Total
Percentage of Marks	18.3	16.7	34.2	22.5	5	3.3	100
Marks Allotted	11	10	20.5	13.5	3	2	60

2. Weightage to Forms of Questions

Forms of Questions	E/LA	Case Study based	SA	VSA	Objective (MCQ)	Total
No. of Questions	3	1	7	4	12	27
Marks Allotted	15	4	21	8	12	60
Estimated Time (Minutes)	54 minutes	19 minutes	52 minutes	20 minutes	25 minutes	170 minutes

3. Weightage to Major Content Areas

S. No.	Unit / Topic / Sub-topic	Marks
1	Units and Measurement	3
2	Motion in a straight line	3

3	Motion in a plane	4
4	Laws of motion	6
5	Work, Energy and Power	4
6	System of particles and rotational motion	4
7	Gravitation	6
8	Mechanical properties of solids	3
9	Mechanical properties of fluids	6
10	Thermal properties of matter	4
11	Thermodynamics	4
12	Kinetic theory	4
13	Oscillations	4
14	Waves	5
Total		60

Schemes of sections	**There are 5 sections in all.** **Section A:** It has 12 MCQs including two match the columns type questions, two assertion reason type questions, two diagram based questions and two competency based questions. **Section B:** It has 4 very short answer type questions. One competency-based question, one diagram based question and one applying type question. **Section C:** It has seven short answer type questions. **Section D:** This section is case study based in which one paragraph has been provided followed by 3 questions to be answered,

	two of MCQ type and one with subjective type. **Section E:** It has three questions. Every question has three parts, in which first part is based on remember/ recall/ state type question. Second part is based on the related theory question and the third part is based on the application/ extra exploration of the same concept covered in first and second part.
Pattern of options	1. No option is given in section A and B 2. In section C, one internal choice has been given in Q 18 from the chapter motion in plane. 3. In section D, a case study based question is given, in which one internal option in an MCQ questions have been provided. 4. In section E, the internal choices have been provided in all the three questions, keeping the general pattern of asking the questions similar.

Estimated difficulty level:	Difficult	20 % marks
	Average (Moderate)	41.7 % marks
	Easy	38.3 % marks

Index of Abbreviations

(E/LA : Essay / Long Answer; SA : Short Answer ; VSA : Very Short Answer, Objective)

PROFORMA FOR ANALYSING QUESTION PAPERS

Part – I : General Information

1. Name of the Board: HPBOSE

2. Name of Examination: Annual examination 2027

3. Year of Examination: 2026-27

4. Class: 11^{th}

5. Subject: Physics

6. Question Paper Number: SQP

7. Maximum Marks: 60

8. Time Allotted: 3 hours

9. Sections, if any: Five sections

Part – II (A): General Item-wise Analysis of Questions

S. No.	Objective	Specification	Content / Topic	Unit / Sub-unit No.	Form of Question	Marks Allotted	Estimated Time (Min.)	Estimated Difficulty Level
1	Understanding	Matching the columns. Diagram based MCQ	Units and Measurement	1	MCQ	1	2.5 minutes	Easy
2	Analysing	Graph based MCQ	Motion in a straight line	2	MCQ	1	1.5 minutes	Moderate
3	Application	Problem solving	Motion in a plane	3	MCQ	1	2.5 minutes	Moderate
4	Analysis	Matching the columns	Oscillations	13	MCQ	1	3.0 minutes	Moderate
5	Application	Comparing two cases followed by problem solving	System of particles and rotational motion	6	MCQ	1	2.5 minutes	Moderate
6	Evaluating	Choose the correct	Work, Energy and Power	5	MCQ	1	2.5 minutes	Easy

		statement MCQ						
7	Analysing	Situation based	Gravitation	7	MCQ	1	1.0 minutes	Easy
8	Understanding	Fact based	Mechanical properties of solids	8	MCQ	1	1.0 minutes	Easy
9	Application	Problem solving	Mechanical properties of fluids	9	MCQ	1	2.5 minutes	Moder ate
10	Understanding	Graphical analysis	Thermodynamics	11	MCQ	1	2.0 minutes	Easy
11	Understanding	Assertion-reasoning type	Laws of motion	4	MCQ	1	2.0 minutes	Easy
12	Analysing	Assertion-reasoning type	Thermal properties of matter	10	MCQ	1	2.0 minutes	Easy
13	Understanding	Apply facts in a problem	Units and Measurement	1	VSA	2	4 minutes	Easy
14	Application	Obtaining an expression	Motion in a straight line	2	VSA	2	5 minutes	Moder ate
15	Knowledge Analysing	Graphical analysis	Mechanical properties of solids	8	VSA	1+1 = 2	6 minutes	Moder ate
16	Understanding	Describe a law and diagram based	Gravitation	7	VSA		5 minutes	Easy
17	Application	Derivation	Work, Energy and Power	5	SA	3	8 minutes	Moder ate
18	Knowledge Application:	Derivation/ Numerical	Motion in a plane	3	SA	1+ 2 = 3	7 minutes	Moder ate
19	Application Analysis	Derivation of expression and draw the graph	Gravitation	7	SA	2.5 +0.5 =3	7 minutes	Easy

20	Application Create	Derivation/ Modify the experiment	Oscillations	13	SA	3	8 minutes	Moder ate
21	Remember Understand	Statement of a law and limitations	Thermodynamics	11	SA	3	7 minutes	Easy
22	Remember	Writing an expressions, SI unit and affecting factors	Thermal properties of matter	10	SA	3	7 minutes	Easy
23	Remembering Understanding Analysing	Definition, Description and situation	System of particles and rotational motion	6	SA	3	8 minutes	Easy
24	Analysing	Case study based on scientific interpretation	Kinetic theory	12	Case study based	4	15 minutes	Moder ate :2 Difficu lt:2
25	Remembering Applying	Definition/ state Derivation Application	Waves	14	LA	5	18 minutes	Moder ate
26	Remembering Applying Analysing Creating	Definition/ state Derivation/ construction Application	Mechanical properties of fluids	9	LA	5	18 minutes	Difficu lt
27	Remembering Analysing Evaluating	Definition/ state. Derivation/ construction Application	Laws of motion	4	LA	5	18 minutes	Difficu lt

20	Application Create	Derivation/ Modify the experiment	Oscillations	13	SA	3	8 minutes	Moder ate
21	Remember Understand	Statement of a law and limitations	Thermodynamics	11	SA	3	7 minutes	Easy
22	Remember	Writing an expressions, SI unit and affecting factors	Thermal properties of matter	10	SA	3	7 minutes	Easy
23	Remembering Understanding Analysing	Definition, Description and situation	System of particles and rotational motion	6	SA	3	8 minutes	Easy
24	Analysing	Case study based on scientific interpretation	Kinetic theory	12	Case study based	4	15 minutes	Moder ate :2 Difficu lt:2
25	Remembering Applying	Definition/ state Derivation Application	Waves	14	LA	5	18 minutes	Moder ate
26	Remembering Applying Analysing Creating	Definition/ state Derivation/ construction Application	Mechanical properties of fluids	9	LA	5	18 minutes	Difficu lt
27	Remembering Analysing Evaluating	Definition/ state. Derivation/ construction Application	Laws of motion	4	LA	5	18 minutes	Difficu lt

FORMAT OF BLUEPRINT (Subject other than language)

Subject :Physics	Class : 11th	
Unit/Paper : Sample Question Paper 2026-27	Maximum marks : 3 hours	Time: 3 hours

S. No.	Objective	Knowledge				Understanding				Application				Analysis				Evaluation				Creation				Total Row Wise
	Form of Questions Content Unit Sub Unit	E/LA	SA	VSA	O	E/LA	SA	VSA	O	E/LA	SA	VSA	O	E/LA	SA	VSA	O	E/LA	SA	VSA	O	E/LA	SA	VSA	O	
1	Units and Measurement							2	1																	3
2	Motion in a straight line											2					1									3
3	Motion in a plane		1*								2*		1													4
4	Laws of motion	2*							1					1*				2*								6
5	Work, Energy and Power										3										1					4
6	System of particles and rotational motion		1*				1*						1		1*											4
7	Gravitation							2			2.5				0.5		1									6
8	Mechanical properties of solids			1*					1							1*										3

FORMAT OF BLUEPRINT (Subject other than language)

S. No.	Objective	Knowledge				Understanding				Application				Analysis				Evaluation				Creation				Total Row Wise
	Form of Questions Content Unit Sub Unit	E/LA	SA	VSA	O	E/LA	SA	VSA	O	E/LA	SA	VSA	O	E/LA	SA	VSA	O	E/LA	SA	VSA	O	E/LA	SA	VSA	O	
9	Mechanical properties of fluids	1*								2*			1	1*								1*				6
10	Thermal properties of matter		3														1									4
11	Thermodynamics		2*				1*		1																	4
12	Kinetic theory															2*	2*									4
13	Oscillations										2*						1									4
14	Waves									4*				1*									1*			5
	Sub Total	B				B				B				B				b				b				
	Total	**11 (Marks Total)**				**10 (Marks Total)**				**20.5 (Marks Total)**				**13.5 (Marks Total)**				**3 (Marks Total)**				**2 (Marks Total)**				

Note: Figures within brackets to indicate the number of questions and figures outside the brackets to indicate marks. * Denotes that marks have been combined to form one question. The box has been shaded where internal choice is given.

Summary:

Essay (E)	No.	3 Marks	15
Short Answer (SA)	No.	7 Marks	21
Very Short Answer (VSA)	No.	4 Marks	8
Objective (O)	No.	12 Marks	12
Case study based:	No	1 Marks :	4

Pattern of options: In Q 18, Q 24 and all the 5 marks questions

Schemes of section: Five sections. Section A: MCQ, Section B -VSA Section C – SA, Section D- Case study based and Section E- LA