

Class: XI SESSION:2023-2024  
HBSE MODEL PAPER THEORY  
SUBJECT: PHYSICS

Maximum Marks:70 Marks

Time Allowed:3hours.

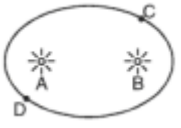
General Instructions:

- (1) There are 35 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. All these 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 4 marks each.
- (4) There is no overall choice. However, an internal choice has been provided in section B, C, D and E. You have to attempt only one of the choices in such questions.
5. Use of calculator is not allowed.

SECTION A

| Que. NO. |  | Marks |
|----------|--|-------|
| 1.       | A ball is released from the top of a tower of height $h$ metres. It takes $T$ seconds to reach the ground. What is the position of the ball in $T/3$ seconds?<br>(i) $h/9$ metres from the ground<br>(ii) $7h/9$ metres from the ground<br>(iii) $8h/9$ metres from the ground<br>(iv) $17h/18$ metres from the ground | 1     |
| 2.       | A body is moving in a circular path and completes one revolution in $4s$ . What is the displacement of the body?<br>(i) Non-Zero<br>(ii) Zero<br>(iii) Incomplete Statement<br>(iv) None of these  | 1     |

|    |   | Marks |
|----|---|-------|
| 3. | Horizontal range is maximum when angle of projection with horizontal is<br><br>(i) 0 Degree<br>(ii) 45 Degree<br>(iii) 60 Degree<br>(iv) 90 Degree  | 1     |
| 4. | Calculate the net force required to give an automobile of mass 1600 kg an acceleration of $4.5 \text{ m/s}^2$ .<br>(i) 720 Newton<br>(ii) 3600 Newton<br>(iii) 7200 Newton<br>(iv) 360 Newton | 1     |
| 5. | Friction is an<br>(i) opposing force<br>(ii) Conservative force<br>(iii) Centripetal force<br>(iv) Push and pull force  | 1     |
| 6. | Which is not the unit of work<br>(i) joule<br>(ii) electron volt<br>(iii) erg<br>(iv) pascal  | 1     |
| 7. | Value of coefficient of restitution for perfectly inelastic body is<br>(i) 0<br>(ii) 1<br>(iii) $>1$<br>(iv) $<1$   | 1     |

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| 8.  | <p>F is The Gravitational Force Between Two Blocks. What is the new force If the Mass of Both the Blocks as Well as Distance Between Them Is Doubled?</p> <p>(i) F<br/>(ii) 2F<br/>(iii) 3F<br/>(iv) 4F</p>  | 1 |
| 9.  | <p>Identify the position of sun in the following diagram if the linear speed of the planet is greater at C than at D.</p>  <p>(i) A<br/>(ii) B<br/>(iii) C<br/>(iv) D</p>   | 1 |
| 10. | <p>Value of acceleration due to gravity at centre of earth is</p> <p>(i) <math>9.8 \text{ m/s}^2</math><br/>(ii) <math>-9.8 \text{ m/s}^2</math><br/>(iii) zero<br/>(iv) greater than <math>9.8 \text{ m/s}^2</math></p>   | 1 |
| 11. | <p>spherical ball contracts in volume by 0.1% when subjected to a uniform normal pressure of 100 atmosphere. the bulk modulus of material of the ball is</p> <p>(i) <math>10^{10} \text{ N/m}^2</math><br/>(ii) <math>10^9 \text{ N/m}^2</math><br/>(iii) <math>10^8 \text{ N/m}^2</math><br/>(iv) <math>10^7 \text{ N/m}^2</math></p> | 1 |
| 12. | <p>Stress is directly proportional to strain. This is</p> <p>(i) Newton law<br/>(ii) Pascal law<br/>(iii) hooke law<br/>(iv) joules law</p>  | 1 |

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| 13. | <p>If the rate of flow of liquid through a horizontal pipe of length <math>l</math> and radius <math>R</math> is <math>Q</math>. What is the rate of flow of liquid if length and radius of tube is doubled?</p> <p>(i) <math>Q</math><br/> (ii) <math>2Q</math><br/> (iii) <math>4Q</math><br/> (iv) <math>8Q</math></p>   | 1 |
| 14. | <p>What is the S.I. unit of latent heat of vaporisation ?</p> <p>(i) <math>J\ kg^{-1}</math><br/> (ii) <math>cal\ Kg^{-1}</math><br/> (iii) <math>kJ\ Kg^{-1}</math><br/> (iv) <math>J\ g^{-1}</math></p>   | 1 |
| 15  | <p>Two statements are given-<br/> One labelled Assertion(A) and the other labelled Reason(R).<br/> Select the correct answer to these questions from the codes (a) , (b) , (c) and (d) as given below.</p> <p>a) Both A and R are true and R is the correct explanation of A<br/> b) Both A and R are true and R is NOT the correct explanation of A<br/> c) A is true but R is false<br/> d) A is false and R is also false</p> <p>Assertion (A) : According to Joule, heat and work are related<br/> Reason (R) : For every 1 cal. of heat we can get 4.186 J of mechanical work.</p>   | 1 |
| 16. | <p>Two statements are given-<br/> One labelled Assertion(A) and the other labelled Reason(R).<br/> Select the correct answer to these questions from the codes (a) , (b) , (c) and (d) as given below.</p> <p>a) Both A and R are true and R is the correct explanation of A<br/> b) Both A and R are true and R is NOT the correct explanation of A<br/> c) A is true but R is false<br/> d) A is false and R is also false</p> <p>Assertion (A): Zeroth law of thermodynamics gives us the concept of energy.<br/> Reason (R): Internal energy is dependent on temperature.</p>   | 1 |
| 17. | <p>Two statements are given-<br/> 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.</p> <p>(a) Both A and R are true and R is the correct explanation of A<br/> (b) Both A and R are true and R is NOT the correct explanation of A<br/> (c) A is true but R is false<br/> (d) A is false and R is also false</p> <p>Assertion (A) : All small oscillation are simple harmonic in nature.<br/> Reason (R) : Oscillation of spring block system are always simple harmonic whether amplitude is small or large.</p> | 1 |

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| 18. | Two statements are given-<br>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.<br>a) Both A and R are true and R is the correct explanation of A<br>b) Both A and R are true and R is NOT the correct explanation of A<br>c) A is true but R is false<br>d) A is false and R is also false<br>Assertion (A) : An oscillatory motion is necessarily periodic<br>Reason (R) : A simple harmonic motion is necessarily oscillatory | 1 |
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### SECTION B

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| 19.              | physical quantity P is related to four observables a, b, c and d as follows:<br>$p = a^3 b^2 / \sqrt{cd}$<br>The percentage errors of measurement in a,b,c and d are 1%, 3%, 4% and 2% respectively. What is the percentage error in the quantity P?   | 2 |
| 20.              | A calorie is a unit of heat (energy in transit) and it equals about 4.2 J, where $1J = 1kg \ m^2 s^{-2}$ . Suppose we employ a system of units in which the unit of mass equals $\alpha$ kg, the unit of length equals $\beta$ m and unit of time is $\gamma$ s. Show that a calorie has a magnitude of $4.2 \alpha^{-1} \beta^{-2} \gamma^2$ in terms of the new units. | 2 |
| 21.              | What is conservative force. Give its example<br>OR<br>What is Elastic Potential Energy.<br>Write it's Mathematical formula for spring having spring constant k.  | 2 |
| 22.              | What is elastic collision. Write Its Characteristics ?<br>OR<br>What Is Coefficient Of Restitution   | 2 |
| 23.              | State pascal law. Write its one application  | 2 |
| 24.              | Air pressure in a car tyre increases during driving.<br>Explain why.   | 2 |
| 25.              | A steel wire has a length of 12.0 m and a mass of 2.10 kg. What should be the tension in the wire so that speed of a transverse wave on the wire equals the speed of sound in dry air at $20^\circ C = 343 \text{ ms}^{-1}$ ?  | 2 |
| <u>SECTION C</u> |  |   |
| 26.              | A man goes 50km at a speed of 40km/hr and return back to same place at as speed of 30km/hr .find average speed and average velocity for whole journey  | 3 |
| 27.              | Derive expression for centre of mass of two particle system  | 3 |
| 28.              | What is moment of inertia<br>Derive relation between kinetic energy and moment of inertia  | 3 |
| 29.              | What is orbital velocity. Derive expression for it<br>OR<br>What is escape velocity. Derive expression for it.   | 3 |

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| 30. | What is isothermal process. Derive expression for work done in isothermal process. | 3 |
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SECTION E

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|------------------|---|----------|
| <u>SECTION D</u> |   |          |
| 31.              | Derive expression for Maximum height, Horizontal range, time of flight. When object is projected making angle $\theta$ with horizontal.<br>OR<br>State law of parallelogram Vector addition and prove expression of resultant.  | 5        |
| 32.              | State Newton second law of motion<br>The driver of a three wheeler moving with a speed of 36 km h <sup>-1</sup> sees a child standing in the middle of the road and brings his vehicle to rest 4.0 s just in time to save the child. What is the average retarding force on the vehicle? The mass of the three wheeler is 400 kg and the mass of the driver is 65 kg<br>OR<br>A man of mass 70 kg stands on a weighing scale in a lift which is moving:<br>(a) upwards with a uniform speed of 10 ms <sup>-1</sup> .<br>(b) downwards with uniform acceleration of 5 ms <sup>-2</sup> .<br>(c) upwards with a uniform acceleration of 5 ms <sup>-2</sup> .<br>What would be readings on the scale in each case? | 5        |
| 33               | State and prove Bernoulli s theorem? Write its two limitation also<br>OR<br>What is terminal velocity? Dervive expression for it?   | 5        |
|                  |   | <u>4</u> |

34.

CASE STUDY

Pressure of an Ideal Gas: according to kinetic theory of gases pressure is given by

$$P = \frac{1}{3} nmv^2$$

Where, n is number of molecules per unit volume, m is mass and  $v^2$  is mean squared speed. Though we choose the container to be a cube, the shape of the vessel really is immaterial.

The average kinetic energy of a molecule is proportional to the absolute temperature of the gas; it is independent of pressure, volume or the nature of the ideal gas. This is a fundamental result relating temperature, a macroscopic measurable parameter of a gas (a thermodynamic variable as it is called) to a molecular quantity, namely the average kinetic energy of a molecule. The two domains are connected by the Boltzmann constant and given by  $E = kbT$ .

Where kb is Boltzmann constant having value of  $1.38 \times 10^{-23}$  joule per Kelvin

1) Boltzmann constant has value of

a)  $1.38 \times 10^{-23}$  joule per Kelvin.

b)  $1.38 \times 10^{-28}$  joule per Kelvin.

c)  $1.38 \times 10^{-30}$  joule per Kelvin.

d) None of these

2) According to kinetic theory give formula for pressure of idea gas.

3) state law of equipartition of energy

OR

State Degree of Freedom.







35

CASE STUDY

4

When we speak, the sound moves outward from us, without any flow of air from one part of the medium to another. The disturbances produced in air are much less obvious and only our ears or a microphone can detect them. These patterns, which move without the actual physical transfer or flow of matter as a whole, are called waves. The most familiar type of waves such as waves on a string, water waves, sound waves, seismic waves, etc. is the so-called mechanical waves. These waves require a medium for propagation, they cannot propagate through vacuum. They involve oscillations of constituent particles and depend on the elastic properties of the medium. The electromagnetic waves that you will learn in Class XII are a different type of wave. Electromagnetic waves do not necessarily require a medium – they can travel through vacuum. Light, radio waves, X-rays, are all electromagnetic waves. We have seen that motion of mechanical waves involves oscillations of constituents of the medium. If the constituents of the medium oscillate perpendicular to the direction of wave propagation, we call the wave a transverse wave. If they oscillate along the direction of wave propagation, we call the wave a longitudinal wave. In transverse waves, the particle motion is normal to the direction of propagation of the wave

- 1) Air can sustain
  - a) Transverse waves
  - b) longitudinal waves
  - c) both a and b
  - d) none of these
- 2) The electromagnetic waves can pass through
  - a) Solids only
  - b) Fluids only
  - c) Any medium even through vacuum
  - d) None of these
- 3) Write difference between transverse and longitudinal waves

OR

Derive relation between wavelength, Frequency and speed.

