CBSE POINT, BALASORE

WEEKLY EXAMINATION (2025-26)

SUBJECT-PHYSICS

TIME: 3 HR **CLASS-XI** **FM-60**

General Instructions:

- *There are **30** questions. All questions are compulsory.*
- *This question paper has five sections: Section **A**, Section **B**, Section **C**, Section **D**.*
- ***Section A** consists of **12** multiple-choice questions carrying **1** marks each.*
- ***Section B** consists of **8** very short answer questions carrying **2** marks each.*
- ***Section C** consists of **2** case-based questions carrying **4** marks each.*
- ***Section D** consists of **8** short answer questions carrying **3** marks each.*

Section – A **[1 × 12]**

1. An unmanned space probe is to be thrown with such a velocity that is does not return to earth. It should be thrown with a velocity given by [M = mass of earth, R = radius of earth]

(a) $v = \sqrt{\frac{2GM}{R}}$ (b) $v > \sqrt{\frac{2GM}{R}}$

(c) $v \geq \sqrt{\frac{2GM}{R}}$ (d) a great velocity but nothing can be said about

2. A planet in a distant solar system is 10 times more massive than the earth and its radius is 10 times smaller. Given that the escape velocity from the earth is 11 km s^{-1}, the escape velocity from the surface of the planet would be

(a) 110 km s^{-1} (b) 0.11 km s^{-1} (c) 1.1 km s^{-1} (d) 11 km s^{-1}

3. Different points of earth area are at slightly different distances from the sun and hence experience different forces due to gravitation. For a rigid body, we know that if various forces act at various points on it, the resultant motion is as if a net force acts on the centre of mass (C.M.) causing translation and a net torque at the C.M. causing rotation around an axis through the C.M. For the earth – sun system (assuming the earth to be a uniform sphere)

(a) the torque is zero

(b) the torque causes the earth to spin

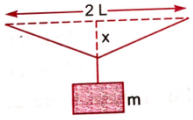
(c)the rigid body result is not applicable since the earth is not even approximately a rigid body

(d) the torque causes the earth to move around the sun

4. A rigid bar mass M is supported symmetrically by three wires each of length l. The two wires at ends are of copper and the third wire in the middle is of iron. The ratio of their diameters $\left(\frac{\mathbf{D_{copper}}}{\mathbf{D_{iron}}}\right)$ if each to have the same tension, is equal to

(a) $\frac{Y_{\text{copper}}}{Y_{\text{iron}}}$ (b) $\sqrt{\frac{Y_{\text{iron}}}{Y_{\text{copper}}}}$ (c) $\frac{Y_{\text{iron}}^2}{Y_{\text{copper}}^2}$ (d) $\frac{Y_{\text{iron}}}{Y_{\text{copper}}}$

5. A mild steel wire of length $2L$ and cross-sectional area A is stretched well within elastic limit, horizontally between two pillars (fig.).



A mass m is suspended from the mid-point of the wire, strain in the wire is

(a) $\frac{x^2}{2L^2}$ (b) $\frac{x}{L}$ (c) $\frac{x^2}{L}$ (d) $\frac{x^2}{2L}$

6. Raindrops fall from a great height under gravity. Choose the correct statement.

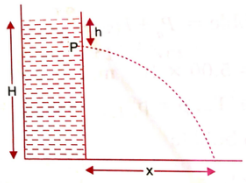
(a) Their velocity continuously increases till they hit the earth with the same final velocity.

(b) They fall with a terminal velocity which is different for drops of different size.

(c) They fall with a terminal velocity which is the same for every drop.

(d) Their velocity goes on increasing continuously till they hit the earth, and the final velocity of each drop is different.

7. A tank is filled with water upto a height H. Water is allowed to come out of a hole P in one of the walls at a depth h below the surface of water (see figure). Express the horizontal distance x in terms of H and h



(a) $x = \sqrt{[h(H-h)]}$ (b) $x = \sqrt{\left[\frac{h}{2}(H-h)\right]}$

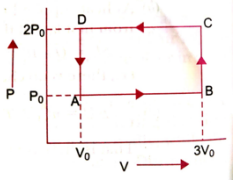
(c) $x = 2\sqrt{\{h(H-h)\}}$ (d) $x = 4\sqrt{\{h(H-h)\}}$

8. If λ_m denotes the wavelength at which the radiactive emission from a black body at a temperature T(K) is maximum when

(a) $\lambda_m \alpha\, T^4$ (b) $\lambda_m \alpha\, T$

(c) $\lambda_m \alpha\, T^{-1}$ (d) λ_m is independent of T

9. An ideal gas undergoes a cyclic process $ABCDA$ as shown in given P-V diagram (fig.). The amount of work done by the gas is



(a) $+2P_0V_0$ (b) $-2P_0V_0$ (c) $+4P_0V_0$ (d) $+6P_0V_0$

10. An ideal gas undergoes isothermal process from some initial state $'i'$ to final state $'f'$. Choose the correct alternatives

(a) $dU = 0$ (b) $dQ = 0$ (c) $dQ = dU$ (d) $dQ = dW$

In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.

(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.

11. Assertion **(A):** The comets do not obey Kepler's law of planetary motion.
Reason **(R):** The comets do not have elliptical orbits.

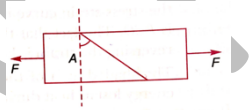
12. Assertion **(A):** The shape of an automobile is so designed that its front resembles streamline pattern of the fluid through which is moves.
Reason **(R):** The resistance offered by the fluid is maximum.

Section – B [2 × 8]

13. Draw graphs showing the variation of acceleration due to gravity with (i) height above earth is surface and (ii) depth below earth's surface.

14. (i) What is the Young's modulus for a perfect rigid body?
(ii) What is the Bulk modulus for a perfect rigid body?

15. A bar of cross-section A is subjected to equal and opposite tensile forces (F, F) at its ends. Consider a plane through the bar making an angle θ with a plane at right angles to the bar (fig.).



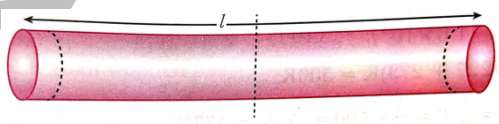
(i) What is the tensile stress in this plane in terms of F, A and θ? For what value of θ is it maximum?
(ii) What is the shearing stress at this plane in terms of F, A and θ? For what value of θ is it maximum?

16. According to Bernoulli's theorem, the pressure of water should remain uniform in a pipe of uniform radius. But actually it goes on decreasing, why?

17. Define terminal velocity, Determine an expression for it, with graph.

18. Plot a graph showing the variation of $\beta = -\frac{dV/dP}{V}$ with P for an ideal gas at constant temperature.

19. Find out the increase in moment of inertia I of a uniform rod coefficient of linear expansion (α) about its perpendicular bisector when its temperature is slightly increased by ΔT.



20. The initial state of a certain gas is $(P_i,\ V_i,\ T_i)$. It undergoes expansion till its volume becomes V_f. Consider the following two cases:
(i) The expansion takes place at constant temperature
(ii) The expansion takes place at constant pressure
Plot the $P - V$ diagram for each case. In which of the two cases, is work done by the gas more?

Section – C [4 × 2]

21. ***Read the given passage and answer the questions that follow:***

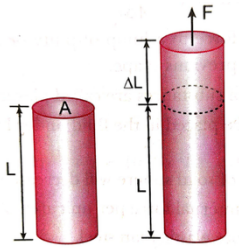
Hooke's Law and Modulus of Elasticity: From the experimental investigations, Robert Hooke, an English physicist (1635-1703 A.D.), formulated in 1679, a law known after him as

Hooke's law which states that the extension produced in a wire is directly proportional to the load applied. In 1807, Thomas Younng pointed out that the strain is proportional to the extension on the wire and the stress is proportional to the load applied. He, therefore, modified Hooke's law and stated that within the elastic limit, the stress is directly proportional to strain. Thus, within the elastic limit,

i. e., stress $\propto$ strain

or $\frac{\text{Stress}}{\text{Strain}} = \text{Constant}$

The constant of proportionally is called modulus of elasticity or coefficient of elasticity of the material. Its value depends on the nature of the material of the body and the manner in which it is deformed.



(i) According to Hooke's law of elasticity, if stress is increased, the ratio of stress to strain

(a) decreases (b) increases

(c) becomes zero (d) remain constant

(ii) Which of the following affects the elasticity of a substance?

(a) Hammering and annealing (b) Change in temperature

(c) Impurity in substance (d) All of these

(iii) A wire whose cross-sectional area is 2 mm^2 is stretched by 0.1 mm by a certain load, and if a similar wire of triple the area of cross-sectional is stretched by the same load, then the elongation of the second wire would be

(a) 3.3 mm (b) 0.033 mm (c) 0.33 mm (d) 0.0033 mm

(iv) Which of the following has no dimensions?

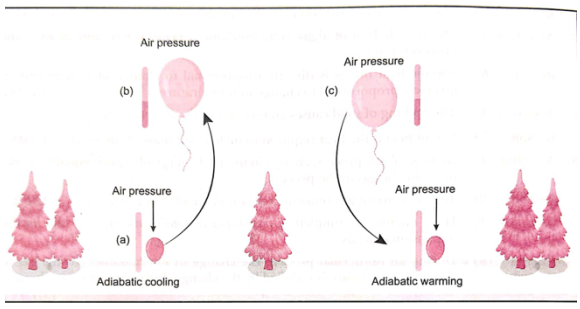
(a) Angular velocity (b) Momentum

(c) Stress (d) Strain

22. *Read the given passage and answer the questions that follow:*

Adiabatic Heating and Cooling:

Whenever air ascends or descends, the temperature changes. As air descends, it worms up because of above pressure compressing down on the molecules *i. e.*, adiabatic heating (with no heat from external sources).



As air rises, the molecule spread over a greater volume and so cool down due to infrequent collisions *i. e.*, adiabatic cooling.

(i) An ideal gas is compressed to half of its initial volume by means of several processes. Which of the processes results in the maximum work done of the gas?

(a) Isothermal (b) Adiabatic (c) Isobaric (d) Isochoric

(ii) In thermodynamics process which of the following statement is not true?

(a) In an isochoric process pressure remains constant

(b) In an isothermal process the temperature remains constant

(c) In an adiabatic process, $PV^{\gamma} = \text{constant}$

(d) In an adiabatic process the system in insulated from the surroundings.

(iii) An ideal gas at 27°C is compressed adiabatically to 8/27 of its initial volume. If $\gamma = 5/3$, the rise in temperature is

(a) 275 K (b) 375 K (c) 475 K (d) 175 K

(iv) A mass of diatomic gas ($\gamma = 1.4$) at a pressure of 2 atm is compressed adiabatically so that its temperature rise from 27°C to 927°C. The pressure of the gas in the final state is

(a) 28 atm (b) 8 atm (c) 256 atm (d) 68.7 atm

Section – D [3 × 8]

23. The gravitational force acting on a rocket at height h from earth's surface is one-third of the force acting on a body at sea level. What is the relation between h and R_e (radius of earth)?

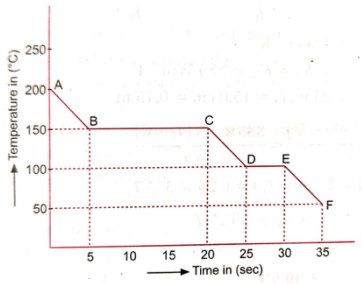
24. Define escape velocity of earth and obtain an expression for escape velocity of a body from the surface of earth. Also derive the relation between escape velocity and orbital velocity of satellite.

25. State Pascal's law. What is hydraulic lift? Explain its working also (with help of a diagram).

26. (i) Define term stress and strain. Also describe the different types of stress and strain.
(ii) Explain an experiment for determination of Young's modulus of the material of a wire.

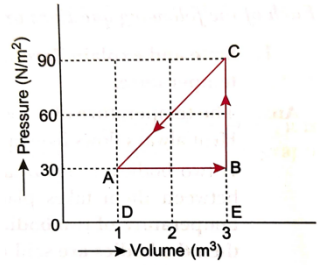
27. State and prove Bernoulli's principle for the flow on non-vision, incompressible liquid in streamlined flow. Give its limitations.

28. The graph below represents a cooling curve for a substance being cooled from a higher temperature to a lower temperature.



(i) What is the boiling point of the substance?
(ii) What happens in the region DE?
(iii) Why is the region DE shorter than the region BC?

29. The adjoining figure represents the changes in a thermodynamic system in going from an initial state A to the state B and C and then returning to the state A. If $U_A = 0, U_B = 30$ joule and the heat given to system in the process $B \rightarrow C$ is 50 joule, then calculate



(i) internal energy of the system in state C

(ii) heat given to system in the process $A \rightarrow B$.

(iii) work done in whole cyclic process.

30. State and explain Zeroth law of thermodynamics. How does Zeroth law lead to the concept of temperature.