



Reg. No. :

ME 624

Name :

**FIRST YEAR HIGHER SECONDARY MODEL
EXAMINATION, JUNE 2022**

**Part – III
PHYSICS**

Maximum : 60 Scores

Time : 2 Hours

Cool-off Time : 15 Minutes

General Instructions to Candidates :

- There is a 'Cool off time' of 15 minutes in addition to the writing time.
- Read questions carefully before answering.
- Calculations, figures and graphs should be shown in the answer sheet itself.
- Malayalam version of the questions is also provided.
- Give equations wherever necessary.
- Electronic devices except non programmable calculators are not allowed in the Examination Hall.

വിദ്യാർത്ഥികൾക്കുള്ള പൊതുനിർദ്ദേശങ്ങൾ :

- നിർദ്ദിഷ്ട സമയത്തിന് പുറമെ 15 മിനിട്ട് 'കൂൾ ഓഫ് ടൈം' ഉണ്ടായിരിക്കും.
- ഉത്തരങ്ങൾ എഴുതുന്നതിന് മുമ്പ് ചോദ്യങ്ങൾ ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- കണക്ക് കൂട്ടലുകൾ, ചിത്രങ്ങൾ, ഗ്രാഫുകൾ, എന്നിവ ഉത്തരപേപ്പറിൽ തന്നെ ഉണ്ടായിരിക്കണം.
- ചോദ്യങ്ങൾ മലയാളത്തിലും നൽകിയിട്ടുണ്ട്.
- ആവശ്യമുള്ള സ്ഥലത്ത് സമവാക്യങ്ങൾ കൊടുക്കണം.
- പ്രോഗ്രാമുകൾ ചെയ്യാനാകാത്ത കാൽക്കുലേറ്ററുകൾ ഒഴികെയുള്ള ഒരു ഇലക്ട്രോണിക് ഉപകരണവും പരീക്ഷാഹാളിൽ ഉപയോഗിക്കുവാൻ പാടില്ല.



Score

(5×1=5)

Answer any five questions from 1 to 7. Each carries 1 score.

1. Which one of the following fundamental forces in nature binds protons and neutrons ?
 - a) Gravitational force
 - b) Electromagnetic force
 - c) Strong nuclear force

2. 1 Angstrom [1\AA] = _____
 - a) 10^{-15} m
 - b) 10^{-10} m
 - c) 10^{-12} m

3. Magnitude of a null vector is
 - a) 1
 - b) Zero
 - c) Unpredictable



Score

4. When a bus suddenly moves forward, a passenger gets thrown backward with a jerk.
Name the law used to explain the above situation.
- a) Law of area
 - b) Second law of motion
 - c) Law of inertia
5. The ratio of tensile stress to the longitudinal strain is
- a) Young's modulus
 - b) Elasticity
 - c) Elastomer
6. Working of a hydraulic lift is based on _____ law.
- a) Pascal's law
 - b) Newton's law
 - c) Kepler's law
7. The change of solid state to vapour state without passing through the liquid state is called
- a) Melting
 - b) Sublimation
 - c) Regelation



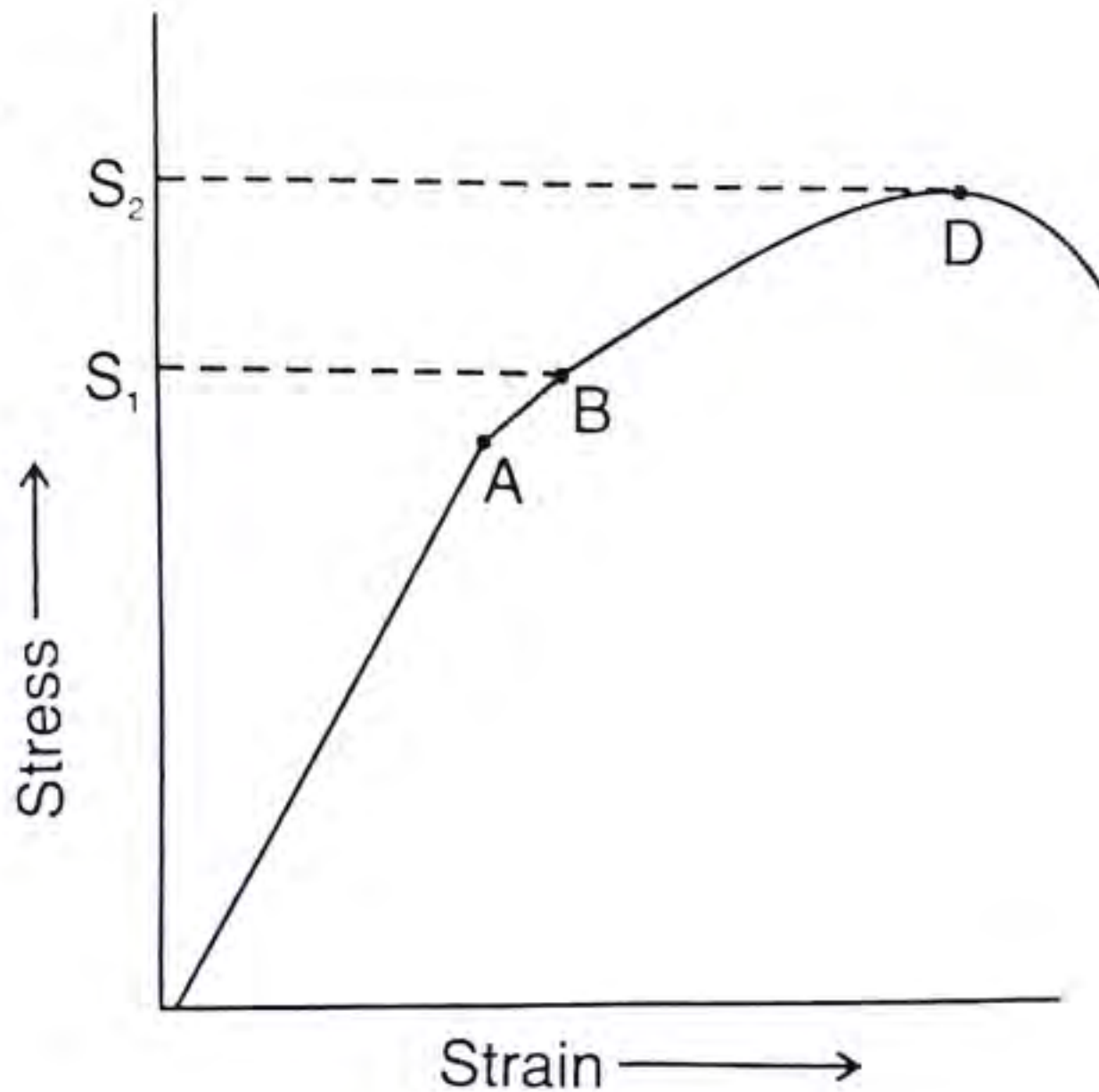
Score

(5×2=10)

Answer any 5 questions from 8 to 14. Each carries 2 scores.

8. Show that impulse is equal to change in momentum.

9.



In the given stress-strain graph identify the stresses S_1 and S_2 corresponding to points B and D respectively.

10. A body falls through a fluid

i) Name the forces acting on the falling body.

ii) Name the velocity of the body when the net force acting on it is zero.

(1+1)

11. The triple point of carbon dioxide is -56.6°C . Express this temperature on Fahrenheit scale.



12. State the law of equipartition of energy.
13. Equation for velocity of simple harmonic motion is $V_{(t)} = -\omega A \sin(\omega t + \phi)$.
Find the expression for acceleration of simple harmonic motion.

14. What is meant by standing waves ?

Answer any 6 questions from 15 to 22. Each carries 3 scores.

(6×3=18)

15. The correctness of equations can be checked by the principle of homogeneity of dimensions.

- State the principle of homogeneity of dimensions.
- Using this principle, check whether the following equation is dimensionally correct.

$$\frac{1}{2}mv^2 = mgh \quad (1+2)$$

16. i) Draw the velocity time graph of a uniformly accelerated object.

- Using the graph derive an equation for displacement in terms of initial velocity $V_{(0)}$ and acceleration (a). (1+2)

17. Find the magnitude of the resultant of two vectors \vec{A} and \vec{B} in terms of their magnitudes and angle θ between them.

18. A mass rests on a horizontal plane. The plane is gradually inclined with the horizontal until the mass just begins to slide. Find an equation for the coefficient of static friction (μ_s) between the block and the surface.



19. Find the angle between force $\vec{F} = (3\hat{i} + 4\hat{j} - 5\hat{k})$ unit and displacement $\vec{d} = (5\hat{i} + 4\hat{j} + 3\hat{k})$ unit.

20. Angular momentum of a rotating body is $\vec{l} = \vec{r} \times \vec{p}$. Using this relation arrive at the equation, $\frac{d\vec{l}}{dt} = \vec{\tau}$.

21. i) The value of acceleration due to gravity is maximum at the _____.

- a) Poles
- b) Centre of the earth
- c) Equator

ii) Find the height at which g is reduced to $\frac{g}{2}$.

(Radius of earth – R_E)

(1+2)

22. i) Differentiate streamline flow and turbulent flow.

ii) What is meant by critical speed in fluid dynamics ?

(2+1)

Answer any 3 questions from 23 to 27. Each carries 4 scores.

(3×4=12)

23. An object released near the surface of earth is accelerated downward under the influence of gravity

i) Write down the equations of motion in this case.

ii) Also plot a graph connecting acceleration and time in this case.

(3+1)



Score

24. i) What is meant by work done by a force ?
ii) Write down any two conditions in which work done is zero.
iii) Write any one example for negative work. (1+2+1)

25. Heat engine is a device by which a system is made to undergo a cyclic process that results in conversion of heat to work. Explain briefly the operations of a Carnot's heat engine and draw the Carnot's cycle. (4)

26. i) What do you mean by simple harmonic motion ?
ii) Prove that the projection of uniform circular motion on any diameter of the circle is simple harmonic motion. (1+3)

27. A resonance column is an example for a closed pipe.

- i) Sketch the pattern of wave forms of the first two harmonics formed in a closed pipe.
ii) Show that in a closed pipe the frequencies of the first two harmonics are in the ratio 1 : 3. (2+2)

Answer any 3 questions from 28 to 32. Each carries 5 scores. (3×5=15)

28. A ball is projected at an angle θ with the horizontal

- i) What is the path followed by this ball ?
a) Circle
b) Ellipse
c) Parabola



Score

ii) Derive an equation for the path followed by the ball.

iii) A cricket ball is thrown at a speed of 28 ms^{-1} at an angle $\theta = 30^\circ$ with the horizontal. Calculate the maximum height. ($\sin 30 = 0.5$)

(1+2+2)

29. A car is moving on a circular level road.

i) What are the three forces acting on the car ?

ii) Derive an expression for maximum safe speed of the car.

(1+4)

30. State and prove Bernoulli's principle.

31. i) Define orbital velocity of a satellite.

ii) Obtain an equation for orbital velocity.

iii) Write the relationship connecting orbital velocity and escape speed.

(1+3+1)

32. i) What are the analogues of mass and force in rotational motion ?

ii) Derive an expression for kinetic energy of a rotating body.

(2+3)
