



Reg. No. :

FY 524

Name :

**FIRST YEAR HIGHER SECONDARY MODEL
EXAMINATION, FEBRUARY 2025**

**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.
- Use 'cool off time' to get familiar with questions and to plan your answers.
- 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 മിനിറ്റ് 'കൂൾ ഓഫ് ടൈം' ഉണ്ടായിരിക്കും.
- 'കൂൾ ഓഫ് ടൈം' ചോദ്യങ്ങൾ പരിചയപ്പെടാനും ഉത്തരങ്ങൾ ആസൂത്രണം ചെയ്യാനും ഉപയോഗിക്കുക.
- 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 5 questions from 1 to 7. Each carries 1 score.

1. Number of significant figures in 0.0024500 is _____
a) 3 b) 5 c) 8 d) 7
2. What is the relationship between the stopping distance and the initial velocity of a vehicle ?
3. Orbital velocity of a satellite of mass m is V_0 . What will be the orbital velocity of another satellite of mass $2m$ in the same orbit ?
4. Substance which can be stretched to cause large strains are called _____
5. Equation of continuity deals with the law of conservation of _____
6. In which mode of heat transfer no medium is required ?
a) Conduction
b) Radiation
c) Convection
7. The average kinetic energy of a molecule of a gas is directly proportional to _____

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

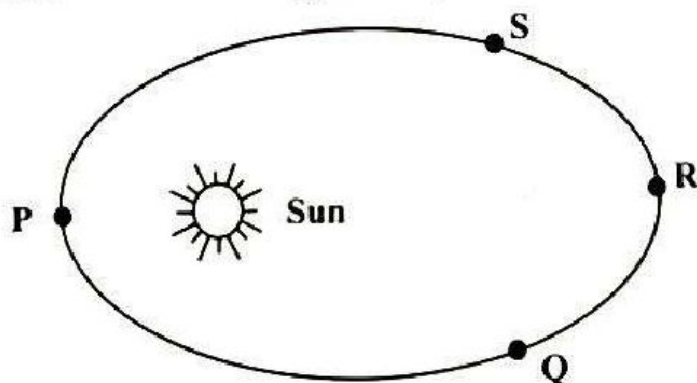
(5×2=10)

8. A player throws a ball upward with an initial speed of 29.4 m/s.
a) What is the direction of acceleration during the upward motion of the ball ? (1)
b) What are the velocity and acceleration of the ball at the highest point of its motion ? (1)



Score

9. a) If \vec{A} and \vec{B} are two vectors of different magnitude, can $\vec{A} + \vec{B} = \vec{A} - \vec{B}$? (1)
- b) Write two properties of null vector. (1)
10. a) Work done in the motion of a body over a closed loop is zero for conservative forces in nature. Say true or false. Give reason for your answer. (1)
- b) Classify the following into conservative and non-conservative forces. (1)
Electrostatic force, frictional force, viscous force, magnetic force.
11. a) Define moment of inertia. (1)
- b) What are the factors on which moment of inertia of a body depends ? (1)
12. a) State Kepler's second law (law of area) of planetary motion. (1)
- b) The figure shows different positions P, Q, R and S of a planet around the sun. The planet has different velocities at these positions. Identify the position at which the kinetic energy of the planet is maximum. (1)



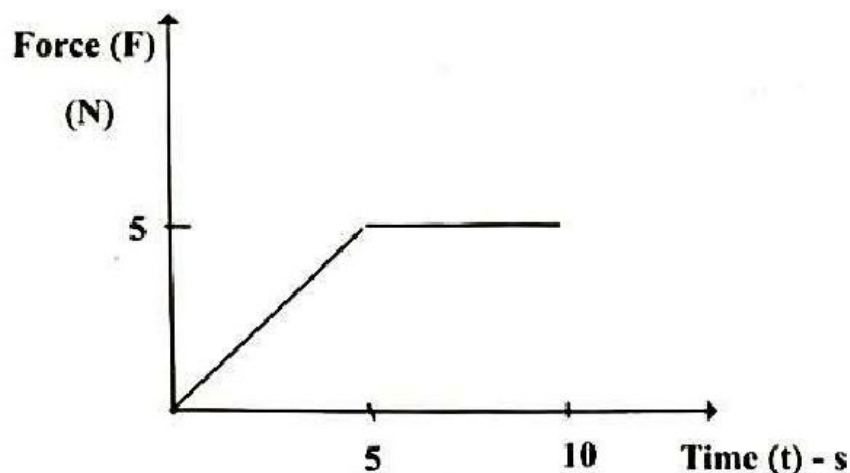
- | | |
|--------|-------|
| i) P | ii) Q |
| iii) R | iv) S |

(1)

- 13. a) State first law of thermodynamics.** (1)
- b) The increase in internal energy of a system is equal to the work done on the system.
Which process does the system undergo ?
- i) Isothermal ii) Isobaric
iii) Adiabatic iv) Isochoric (1)
- 14. a) What would be the effect on r.m.s. velocity of a gas molecule, if the temperature of a gas is increased ?** (1)
- b) Calculate the root mean square velocity of oxygen molecule at 100K.
(Given $R = 8.31 \text{ J mol}^{-1} \text{ K}^{-1}$, molecular mass = 32g) (1)

Answer any 6 questions from 15 to 21. Each carries 3 scores. (6×3=18)

15. a) Draw the velocity – time graph of a body in uniform accelerated motion. (1)
- b) From graph, derive the relation $x = v_0 t + \frac{1}{2} at^2$. (2)
16. a) State Newton's second law of motion. (1)
- b) The force F acting on a particle of mass m is indicated by force – time graph shown below. Find the change in momentum of the particle over the time interval from zero to 10 s. (2)





Score

17. a) State the law of conservation of angular momentum. (1)

b) Angular momentum of a rotating body is $\vec{L} = \vec{r} \times \vec{p}$. Using this relation arrive at the equation $\frac{d\vec{L}}{dt} = \vec{\tau}$ (τ = Torque). (2)

18. a) State Hooke's law in elasticity. (1)

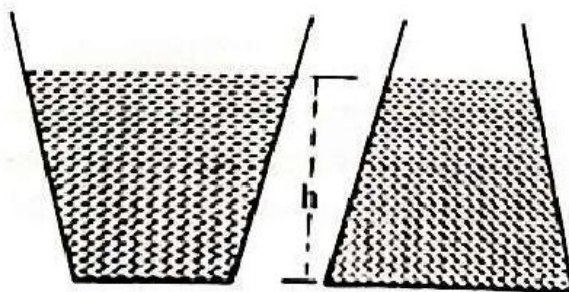
b) Say true or false

i) The Young's modulus of rubber is greater than that of steel.

ii) The stretching of a coil is determined by its shear modulus. (2)

19. a) It is easy and less painful to use thin needle than a thick needle for taking an injection. For the same applied force, which needle exerts more pressure ? Why ? (1)

b) Two vessels of different shape are filled with water to the same height 'h' as shown in figure, is the pressure on the base of each vessel the same ? Explain.



(2)

20. a) Explain anomalous expansion of water. (2)

b) Latent heat of vaporization of water is 22.6×10^5 J/kg. Calculate the energy needed to change 0.5g of water into steam at 100°C . (1)

21. Obtain an expression for work done in an isothermal process.



Score

Answer any 3 questions from 22 to 25. Each carries 4 scores.

(3×4=12)

- 22. a) State the principle of homogeneity of dimension. (1)**
- b) Which of the following has unit but no dimension ?**
- | | | |
|------------|-----------------------|------------|
| i) Strain | ii) Relative velocity | |
| iii) Angle | iv) Relative density | (1) |
- c) Kinetic energy of a body depends on its mass 'M' and velocity 'v'. Using principle of dimension derive an expression for kinetic energy. (2)**
- 23. a) State and prove work energy theorem. (3)**
- b) State whether the potential energy in the following cases increases or decreases.**
- | | |
|----------------------------|------------|
| i) A spring is stretched | |
| ii) A spring is compressed | (1) |
- 24. a) Give one example of S. H. M. oscillation. (1)**
- b) Derive equations for the kinetic energy and potential energy of a body executing simple harmonic motion. (3)**
- 25. a) On what factor does the speed of sound in a medium depend ? (1)**
- b) Show that in a closed pipe, the frequencies of first three harmonics are in the ratio 1 : 3 : 5. (3)**



Score

Answer any 3 questions from 26 to 29. Each carries 5 scores.

(3×5=15)

26. A boy throws a cricket ball with velocity u at an angle θ with the horizontal.

- a) Draw the velocity time graph for the horizontal and vertical components of velocity. (2)
- b) Taking the vertical component of velocity, arrive at an equation to find the time of flight of the ball. (2)
- c) What is the kinetic energy of the ball at the highest point of projection ? (1)

27. Vehicle of mass m is moving with a velocity v along a banked road with radius R .

- a) Draw vector diagram showing the various forces acting on the vehicle. (2)
- b) Derive an expression for the maximum permissible speed at the banked road with friction. (2)
- c) A car speeding at 80 km/h on a level road takes a sharp turn without reducing the speed. If the coefficient of static friction between the tyre and road is 0.20. Will the car skid while taking the turn ? (Radius of the circular path = 4m) (1)

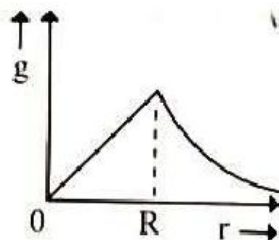
28. The value of g is same for all objects at a given place.

- a) The acceleration due to gravity is maximum at _____ (poles, equator) (1)
- b) Derive an expression for the variation of ' g ' with height ' h ' above the surface of the earth, where $h \ll R$. (3)

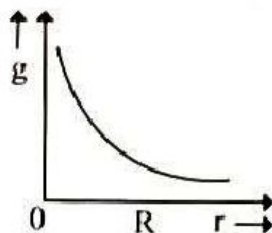


Score

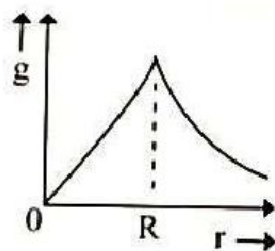
- c) The variation of acceleration due to gravity (g) with distance (r) from the centre of the earth is correctly represented by (Given R = radius of earth) (1)



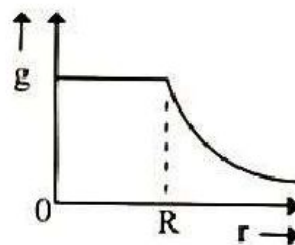
(a)



(b)



(c)



(d)

29. a) Define angle of contact. (1)

- b) Due to capillary action, a liquid will rise in a tube.

The angle of contact in this case is

- | | |
|---------------|-----------|
| a) Acute | b) Obtuse |
| c) 90° | d) Zero |

(1)

- c) Obtain an expression for rise of liquid in the tube. (3)
