Class No. : .....

FY 3024

Name : .....

FIRST YEAR HIGHER SECONDARY SECOND TERMINAL EXAMINATION, DECEMBER 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 മിനിട്ട് '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

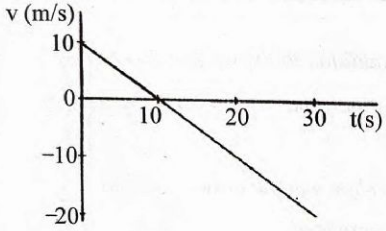
Answer any 5 questions from 1 to 7. Each carries 1 score. **(5×1=5)**

1. Find the number of significant figures in

a) 0.0006032

b) 6.3200. **(½+½)**

2. The velocity time graph for a particle moving on a straight line is shown in figure.



a) The particle has a constant acceleration

b) The particle has never turned around

c) The particle has zero displacement

d) The particle has constant velocity

3. If a particle executes uniform circular motion in the x-y plane in clockwise direction, then the angular velocity is in fig.

a) +y direction

b) +z direction

c) −z direction

d) −x direction

4. Work done by the conservative force for a closed path is

a) Always negative

b) Zero

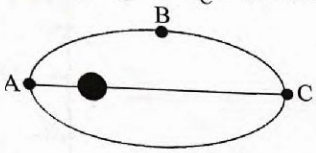
c) Always positive

d) Not defined

Score

5. The centre of mass of a system of particles does not depend upon
   a) Position of particles
   b) Relative distance between particles
   c) Masses of particles
   d) Forces acting on particle

6. The kinetic energies of a planet in an elliptical orbit about the Sun, at positions A, B and C are K_A, K_B and K_C respectively.



   a) $K_A > K_B > K_C$
   b) $K_B < K_A < K_C$
   c) $K_A < K_B < K_C$
   d) $K_B > K_A > K_C$

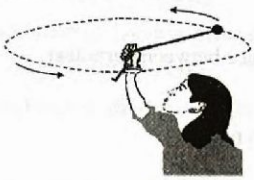
7. The ability of a liquid to wet a surface depend primarily on
   a) Density
   b) Angle of contact between surface and liquid
   c) Viscosity
   d) Surface tension

Answer any 5 questions from 8 to 14. Each carries 2 scores. **(5×2=10)**

8. Define the following :
   a) Average acceleration
   b) Instantaneous acceleration. **(1+1)**

Score

9. If the string shown in the figure is released, the body will fly along the _____ (radius/tangent). Why ?



10. a) What is inelastic collision ?

b) In which way it is different from elastic collision ? (1+1)

11. Derive the relation between torque and angular momentum.

12. a) Write down the expression for acceleration due to gravity of Earth.

b) If both the mass and radius of the Earth are doubled, then the acceleration due to gravity g′

i) Remains same

ii) g/2

iii) 2g

iv) 4g (1+1

13. a) State equation of continuity.

b) Water is flowing through a tube as shown in figure. Which among the following is true ?

i) $V_A = V_B$

ii) $V_A < V_B$

iii) $V_A > V_B$

iv) None of the above (1+

14. a) State Stefan-Boltzmann law.

b) For a perfect radiator, emissivity = _____ (1-

Score

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

15. Assuming that the frequency υ of a vibrating string may depend on

i) Applied force (F)

ii) Length (l)

iii) Mass per unit length (μ).

Prove that $\upsilon \propto \frac{1}{l}\sqrt{\frac{F}{\mu}}$ applying Principle of Homogeneity of dimensions.

16. a) Derive an expression for horizontal range for a particle in projectile motion.

b) Two objects are projected at angles 30° and 60° respectively with respect to the horizontal direction. The range of two objects are denoted as R_{30} and R_{60}, choose the correct relation from the following :

i) $R_{30} = R_{60}$ ii) $R_{30} = 4R_{60}$

iii) $R_{30} = \frac{R_{60}}{2}$ iv) $R_{30} = 2R_{60}$ (2+

17. a) State law of conservation of linear momentum.

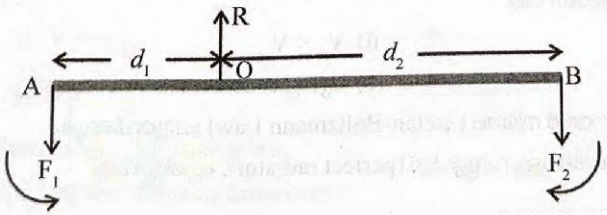
b) A shell of mass 0.020 kg is fired by a gun of mass 100 kg. If the muzzle speed of the shell is 80 m/s. What is the recoil speed of the gun ? (1+

18. a) A couple produces

i) Pure rotation ii) Pure translation

iii) Rotation and translation iv) No motion.

b) Derive principle of moments for the lever shown in figure. (1+



19. a) State Pascal's law.

b) A hydraulic automobile lift is designed to lift cars with a maximum mass of 3000 kg. The area of cross section of the piston carrying the load is 425 cm^2. What maximum pressure does the smaller piston have to bear ? (1+

20. a) Define co-efficient of volume expansion.

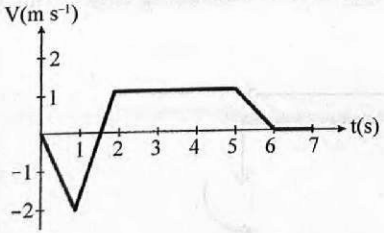
b) Show that the co-efficient of volume expansion α_V is 3 times the coefficient of linear expansion α_l. (1+

21. Derive the relation connecting molar specific heat capacity at constant pressure C_p and molar specific heat capacity at constant volume C_v.

Answer any 3 questions from 22 to 25. Each carries 4 scores. (3×4=1

22. a) Derive the relation $s = ut + \frac{1}{2}at^2$ from velocity-time graph for a uniformly accelerated body.

b) The following velocity time graph represents a particle moving in the positive x direction. Analyse its motion from 0 to 7 s. Calculate the displacement covered and distance travelled by the particle from 0 to 5 s. (2+



Score

23. a) Define work done by a force.

b) Work done by frictional force is negative (True/False).

c) Calculate the work done by a force of 30 N in lifting a load of 2 kg to a height of 10 m. **(1+1+2)**

24. a) Arrive at an expression for Young's modulus of a material.

b) One end of a wire of 2 m long and 0.2 cm^2 in cross section is fixed in a ceiling and a load of 4.8 kg is attached to the free end. Find the extension of the wire. Young's modulus of steel is 2×10^{11} N/m^2. Take $g = 10$ m/s^2. **(2+2)**

25. a) If heat is supplied to an ideal gas in an isothermal process

i) The internal energy of the system will increase

ii) The gas will do positive work

iii) The gas will do negative work

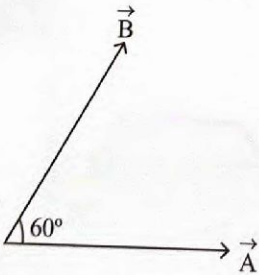
iv) The said process is not possible.

b) Derive at an expression for work done by the gas in an isothermal process. **(1+3)**

Answer any 3 questions from 26 to 29. Each carries 5 scores. **(3×5=15)**

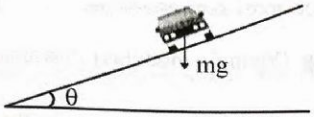
26. a) Arrive at an expression for the resultant of two vectors $\vec{A}$ and $\vec{B}$ making an angle θ with each other.

b) Two vectors $\vec{A}$ and $\vec{B}$ of magnitude 5 units and 7 units respectively make an angle 60° with each other as shown below. Find the magnitude of the resultant vector. **(3+2)**



Score

27. a) Redraw the figure and mark the normal reaction and frictional force acting on the car taking a curve on a banked road as shown in the figure.



b) Arrive at an expression for the maximum safe speed the car can take while executing a curve on a banked road. **(2+3)**

28. a) Define escape velocity.

b) Arrive at an expression for escape velocity of a body of mass m from the surface of earth.

c) Calculate the escape velocity from moon. The mass of the moon = 7.4×10^{22} kg and radius of the moon = 1740 km, G = 6.67×10^{-11} Nm^2/kg^2. **(1+2+2)**

29. a) Arrive at an expression for terminal velocity of a sphere of radius a and density ρ falling through a fluid of density σ.

b) The terminal velocity of copper ball of radius 2 mm falling through a tank of oil at 20°C is 6.5 cm/s. Compute the viscosity of the oil at 20°C. Density of oil is 1.5×10^3 kg/m^3, density of copper is 8.9×10^3 kg/m^3. **(3+2)**
