SAMPLE QUESTION PAPER

Reg No : .....
Name : .....

SECOND YEAR HIGHER SECONDARY EXAMINATION, MARCH 2023

Part – III Time : 2 Hrs
PHYSICS Cool-off time : 15 Minutes
Maximum : 60 Scores

General Instructions to Students

- There is a 'cool-off time' of 15 minutes in addition to maximum writing time.
- Use cool-off time to get familiar with questions and to plan your answers.
- Read the instructions carefully.
- Read questions carefully before answering.
- Calculations, figures, graphs should be shown in the answer sheet itself.
- 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.
- നിർദ്ദേശങ്ങൾ മുഴുവനും ശ്രദ്ധാപൂർവം വായിക്കണം
- ഉത്തരങ്ങൾ എഴുതുന്നതിന് മുമ്പ് ചോദ്യങ്ങൾ ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- കണക്ക് കൂട്ടലുകൾ, ചിത്രങ്ങൾ, ഗ്രാഫുകൾ, എന്നിവ ഉത്തരപേപ്പറിൽ തന്നെ ഉണ്ടായിരിക്കണം
- ആവശ്യമുള്ള സ്ഥലത്ത് സമവാക്യങ്ങൾ കൊടുക്കണം
- പ്രോഗ്രാമുകൾ ചെയ്യാനാകാത്ത കാൽക്കുലേറ്ററുകൾ ഒഴികെയുള്ള ഒരു ഇലക്ട്രോണിക് ഉപകരണവും പരീക്ഷാ ഹാളിൽ ഉപയോഗിക്കുവാൻ പാടില്ല.

PART I

Answer any 5 questions from 1 to 7. Each carries 1 score.

1. State the number of significant figures in 2.64×10^{24} kg

2. Newton's first law of motion describes .....

(a) Energy (b) Momentum
(c) Inertia (d) Work

3. Value of g is maximum at

(a) Poles (b) Equator
(c) Centre (d) None of these

4. During sublimation process .....and .....states of substance coexist in thermal equilibrium

5. State true or false. A body can have acceleration without velocity

6. What will be the displacement of a body when it completes one revolution

7. Expression for the time period of oscillation of spring is .....

(a) $T = 2\pi\sqrt{\frac{L}{g}}$ (b) $T = 2\pi\sqrt{\frac{m}{k}}$
(c) $T = 2\pi\sqrt{\frac{g}{L}}$ (d) $T = 2\pi\sqrt{\frac{m}{2k}}$

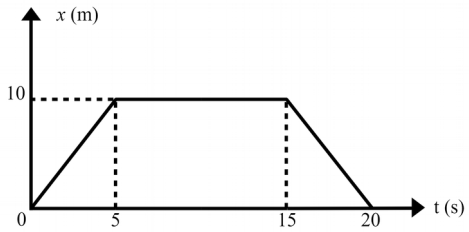
PART II

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

8. Using Newton's second law of motion derive the equation F= ma

9. A lighter and heavier body have same linear momentum. Which one has greater kinetic energy

10. The figure shown the position – time graph of a body moving along a straight line. Draw the corresponding velocity-time graph



11. A wheel starting from rest acquires angular velocity of 10 rad/s in 2 s , the moment of inertia of the wheel is 0.4 kg m^2. Calculate the torque acting on it

12. Derive the expression for the escape velocity

13. A Carnot engine is working between the melting point and the boiling of water. What is the efficiency of the engine.

14. Write any 4 postulates of kinetic theory

PART III

Answer any 6 questions from 15 to 21. Each carries 3 scores.

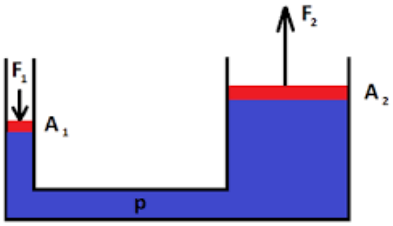
15. Derive the relation between torque and angular momentum

16. Draw the stress-strain graph for steel and mark the ultimate stress and fracture point

17. Derive the expression for the work done in isothermal process

18. (a) Define uniform circular motion
    (b) Obtain the expression for centripetal acceleration

19. (a) Write the name of the device shown below



(b) What is the force exerted on smaller piston of cross-sectional area 25 cm^2 if a mass of 3000 kg is placed on the larger piston of cross-sectional area 425 cm^2

20. A body oscillates with SHM according to the equation (in SI units), $x = 5\cos[2\pi t + \pi/4]$.
At t = 1.5 s, calculate the
    (a) Displacement
    (b) Speed
    (c) Acceleration of the body.

21. Bodies of water such as lakes and ponds freeze at top. Name the phenomenon and explain.

PART IV

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

22. (a) In standing wave pattern, point of maximum displacement are called..... (1)
    (b) Prove that in a closed pipe, only odd harmonics are present (3)

23. (a) State the law of conservation of mechanical energy (1)
    (b) Prove that for a freely falling body the total mechanical energy is conserved (3)

24. (a) State principle of homogeneity (1)
    (b) Consider a simple pendulum, having a bob attached to a string, that oscillates under the action of the force of gravity. Suppose that the period of oscillation of the simple pendulum depends on its length (l), mass of the bob (m) and acceleration due to gravity (g). Derive the expression for its time period using method of dimensions. (3)

25. Obtain the equation
    (a) $v = u + at$
    (b) $s = ut + \frac{1}{2}at^2$

PART V

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

26. (a) Draw the path of a projectile (1)
(b) Derive an expression for time of flight (2)
(c) Derive an expression for horizontal range of a projectile (2)

27. A vehicle of mass ‘m’ moving on a banked road of radius ‘r’
(a) What are the various forces acting on the vehicles and draw the diagram (2)
(b) Obtain an for maximum safe speed of the vehicle on a banked road. (2)
(c) A circular racetrack of radius 300 m is banked at an angle of 15 0 . The coefficient of friction between the wheels of a race car and the road is 0.2. Find the optimum speed of the race car to avoid wear and tear on its tyres. (1)

28. (a) State Bernoulli principle (1)
(b) Derive Bernoulli's equation with a neat diagram (3)
(c) Write any one application of Bernoulli's principle (1)

29. (a) Derive the expression for the variation of acceleration due to gravity with depth ‘d’ below the surface of the earth (3)
(b) At what height the value of ‘g’ will be the half of that on the surface of the earth (2)

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Members
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