Reg. No. : .....

Name : .....

FY-424

FIRST YEAR HIGHER SECONDARY EXAMINATION, MARCH 2023

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 the 'Cool-off time' to get familiar with questions and to plan your answers.
- Read questions carefully before answering.
- Read the instructions carefully.
- 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.
- നിർദ്ദേശങ്ങൾ മുഴുവനും ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- കണക്ക് കൂട്ടലുകൾ, ചിത്രങ്ങൾ, ഗ്രാഫുകൾ, എന്നിവ ഉത്തരപേപ്പറിൽ തന്നെ ഉണ്ടായിരിക്കണം.
- ചോദ്യങ്ങൾ മലയാളത്തിലും നല്കിയിട്ടുണ്ട്.
- ആവശ്യമുള്ള സ്ഥലത്ത് സമവാക്യങ്ങൾ കൊടുക്കണം.
- പ്രോഗ്രാമുകൾ ചെയ്യാനാകാത്ത കാൽക്കുലേറ്ററുകൾ ഒഴികെയുള്ള ഒരു ഇലക്ട്രോണിക് ഉപകരണവും പരീക്ഷാഹാളിൽ ഉപയോഗിക്കുവാൻ പാടില്ല.

Answer any 5 questions from 1 to 7. Each carries 1 score. $(5 \times 1 = 5)$

1. 1 Å (angstrom) = _____.

   (i) 10^{10} m

   (ii) 10^{-15} m

   (iii) 10^{15} m

   (iv) 10^{-10} m

2. _____ is the measure of inertia.

3. True or False :

   Elastomers do not obey Hooke's law.

4. The point at which the whole mass of the body is supposed to be concentrated is called _____.

5. The change of state from liquid to solid is called _____.

6. Kinetic energy of a gas molecule is directly proportional to the _____ of the gas.

7. Most fundamental property of wave is

   (a) Temperature

   (b) Pressure

   (c) Frequency

   (d) Wavelength

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

8. A ball is thrown vertically upwards with an initial velocity u. Calculate the time taken to reach maximum height.

9. What is a null (zero) vector ? Give any two properties.

10. (a) Choose the correct option :

The spring force is a **conservative/non conservative** force. (1)

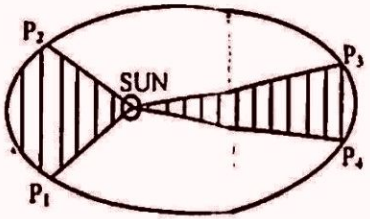
(b) Draw the variation of potential and kinetic energies of a spring with its displacement from the equilibrium position. (1)

11. What are the factors affecting moment of inertia of an object ?

12. (a) Consider a planet moving in an elliptical orbit around the sun as shown in fig. If t_1 and t_2 be the time taken by the planet to go from P_1 to P_2 and from P_3 to P_4 respectively. The two shaded parts have equal area, then

(i) $t_1 < t_2$ (ii) $t_1 = t_2$.

(iii) $t_1 > t_2$ (iv) $t_2 = -t_1$ (1)

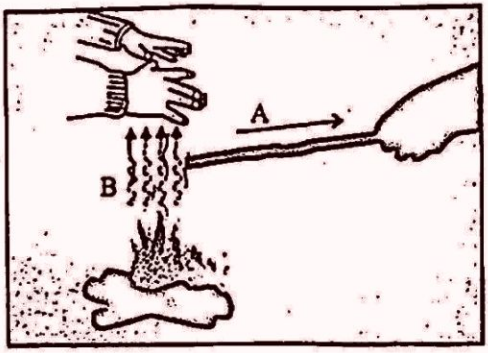


(b) State the law which explains the above case. (1)

13. (a) A drop of liquid under no external force is always spherical in shape. Why ? (1)

(b) When a painting brush dipped in water, its hairs cling together. Why ? (1)

14. The modes of heat transfer is shown below. Identify A and B.



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

15. (a) Give an example for a body possessing zero velocity which is accelerating. (1)

(b) Show that area under velocity-time graph gives displacement. (2)

16. While firing a bullet the gun recoils.

(a) Which conservation law helps you to explain this phenomenon ? (1)

(b) "In the firing process, the speed of the gun is very low compared to the speed of bullet". Substantiate the above statement mathematically. (2)

17. (a) Which type of elasticity is involved in stretching a wire ? (1)

(b) Steel is more elastic than rubber. Why ? (1)

(c) If the bulk modulus of water is 2×10^9 N m^{-2}, find its compressibility. (1)

18. (a) 'When water flowing in a broader pipe enters into a narrow pipe, its pressure decreases." Do you agree with this statement ? Explain. (2)

(b) Define coefficient of viscosity. (1)

19. (a) State First law of thermodynamics. (1)

(b) One mole of an ideal gas expands from volume V_1 to volume V_2 at a constant temperature T. Derive an expression for the work done. (2)

20. (a) State the law of equipartition of energy. (1)

(b) A box contains an equal number of molecules of hydrogen and oxygen. If there is a fine hole on top of the box, which gas will leak rapidly ? Why ? (1)

(c) When gas is heated, its temperature increases. Explain it on the basis of kinetic theory of gases. (1)

21. (a) Derive an expression for time period of oscillation of a Simple Pendulum. (2)

(b) Can a pendulum clock show correct time inside a spaceship ? Why ? (1)

Answer any 3 questions from 22 to 25. Each carries 4 scores. $(3 \times 4 = 12)$

22. (a) What do you mean by principle of homogeneity of dimensions ? (1)

(b) Using this principle, check whether the following equation is dimensionally correct :

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

(c) State the number of significant figures in the following :

(i) $0.060607\ m^2$

(ii) $6.0320\ N\ m^{-2}$ (1)

23. (a) Sketch the schematic diagram of a vehicle on a banked road and mark various forces acting on it. (2)

(b) Obtain an expression for maximum safe speed for a vehicle in the banked road. (Without considering friction) (2)

24. (a) A car and a lorry have equal kinetic energy, which one will have greater momentum ? Explain. (1)

(b) State and prove work-energy theorem. (3)

25. (a) A string is stretched between two fixed supports and a note of sound is heard when it is plucked at its middle point.

(i) How standing waves are produced ? (1)

(ii) Derive an expression for the frequency of sound produced by the first two modes of vibration. (2)

(b) Where will a man hear a louder sound in the case of stationary wave (node or anti node) ? (1)

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) What is the trajectory of the ball ? (1)

(b) Deduce an expression for maximum height reached by the ball. (2)

(c) If the boy can throw the ball to a maximum height 'h', what is the maximum horizontal distance to which he can throw ? (2)

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

(b) Based on law of conservation of angular momentum, how does the speed of a ballet dancer vary when

(i) outstretching her arms and legs

(ii) folding her arms and legs (2)

(c) Derive the relation connecting torque and angular momentum. (2)

28. Escape velocity from the earth for a body of mass m is 11 km/s.

(a) If the body is projected at an angle of 45° with the vertical, the escape velocity will be

(i) $11/\sqrt{2}$ km/s (ii) $22\sqrt{2}$ km/s

(iii) 22 km/s (iv) 11 km/s (1)

(b) Derive an expression for the escape velocity of an object from the surface of the earth. (3)

(c) The moon has no atmosphere. Why ? (1)

29. Due to capillary action, water will rise inside a glass tube.

(a) The angle of contact in this case is

(i) Acute (ii) Obtuse

(iii) 90° (iv) Zero (1)

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

(c) Water rises to different heights in glass tubes of different radii. Give reason. (1)