

GOVIND VIDYALAY TAMULIA
SAMPLE PAPER (2014-2015)
STD- XI
PHYSICS
SET-A

Time : 3 hours

Maximum Marks : 70

General Instruction :

- (i) All questions are compulsory.
- (ii) There are **30** questions in total. Questions **1** to **8** are very short answer type questions and carry **one** mark each.
- (iii) Questions **9** to **18** carry **two** marks each, questions **19** to **27** carry **three** marks each and questions **28** to **30** carry **five** marks each.
- (iv) One of the questions carrying three marks weightage is value based question
- (v) There is not overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three question of five marks each weightage. You have to attempt only one of the choices in such questions.
- (vi) Use of calculators is **not** permitted. However, you may use log tables if necessary.
- (v) Please write down the serial number of question before attempting it.
- (vi) You may use the following values of physical constant wherever necessary.

Boltzmann's constant $K = 1.38 \times 10^{-23} \text{ JK}^{-1}$

Avogadro's number $N_A = 6.022 \times 10^{23}/\text{mol}$

Radius of Earth $R = 6400 \text{ km}$.

- 1. Give examples of dimensional constants and dimensionless constants. 1

- 2. If the instantaneous velocity of a particle is zero, will its instantaneous acceleration be necessarily zero. ? 1
- 3. Wheels are made circular. Why? 1
- 4. A body of mass 5 kg is taken to the centre of the earth. What will be its (i) mass (ii) weight there.
- 5. Why a gas is cooled when expanded? 1

- 6. How is the frequency of oscillation related with the frequency of change in the of K.E and P.E of the body in S.H.M.?

- 7. How does rise in temperature effect (i) viscosity of gases (ii) viscosity of liquids.

- 8. . A simple harmonic motion of acceleration 'a' and displacement 'x' is represented by $a + 4\pi^2x = 0$. What is the time period of S.H.M? 1

9. In Van der Waals equation $(P + \frac{a}{V^2})(V - b) = RT$, Determine the dimensions of a and b . 2

OR

The length and breadth of a rectangle are measured as $(a \pm \Delta a)$ and $(b \pm \Delta b)$ respectively. Find (i) relative error. (ii) absolute error in the measurement of area.

10. An object is in uniform motion along a straight line, what will be position time graph for the motion of the object if (i) $X_0 =$ positive, $v =$ negative, (v is constant) (ii) both X_0 and v are negative (v is constant), where X_0 is position at $t = 0.2$ s. 2

11. A particle of mass 0.3 kg is subjected to a force of $F = -kx$, with $k = 15 \text{ N km}^{-1}$. What will be its initial acceleration if it is released from a point 20 cm away from the origin? ($a = -10 \text{ ms}^{-2}$). 2

12. If the radius of the earth were to decrease by 1% , keeping its mass same, how will the acceleration due to gravity change. If the radius of the earth were to decrease by 1% , keeping its mass same, how will the acceleration due to gravity change? 2

13. Draw graphs showing the variation of acceleration due to gravity with (i) height above earth's surface (ii) depth below the earth's surface. 2

14. The root mean square (rms) speed of oxygen molecule at certain temperature ' T ' is ' V '. If temperature is doubled and oxygen gas dissociates into atomic oxygen what is the speed of atomic oxygen? 2

15. Prove that the elastic potential energy per unit volume is equal to $\frac{1}{2}$ stress \times strain 2

16. Calculate the work done in blowing a soap bubble from a radius of 2 cm to 3 cm. The surface tension of the soap solution is 30 dynes cm^{-1} . 2

17. A person sitting in a train moving at constant velocity throws a ball vertically upwards. How will the ball appear to move to an observer (i) Sitting inside the train (ii) Standing outside the train 2

18. When the angle between two vectors of equal magnitudes is $2\pi/3$, prove that the magnitude of the resultant is equal to either. 2

19. State and prove Work Energy Theorem. 3

20. Define the principle of conservation of linear momentum. Deduce the law of conservation of linear momentum from Newton's third law of motion. 3

21. A liquid is in streamlined flow through a tube of non-uniform cross-section. Prove that sum of its kinetic energy, pressure energy and potential energy per unit volume remains constant. 3

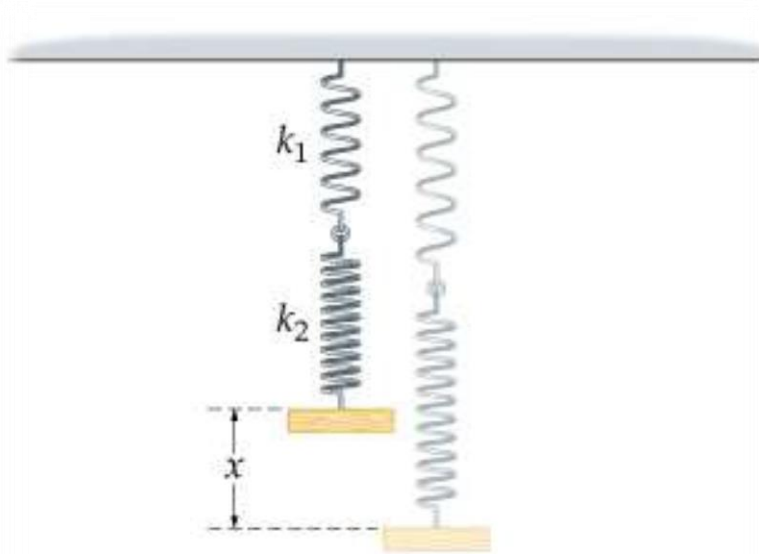
22. What is a cyclic process? Show that the net work done during a cyclic process is numerically equal to the area of the loop representing the cycle. 3

23. State Kepler's law of planetary motion. Name the physical quantities which remain constant during the planetary motion. 3

24. **The Physics Teacher of class XI has assigned the work of finding the resultant spring constant when two springs of spring constant s k_1 , k_2 are joined in series. Two students Sabita and Shirin. Sabita made a theoretical study as well as verified experimentally. Whereas Shirin could not complete the work. When the teacher enquired the next day Sabita could give the answer. Whereas Shirin could not.**

(a) Comment upon the qualities of Sabita.

(b) Two springs are joined in series and connected to a mass m as shown in fig. If spring constants are k_1 and k_2 , calculate the period of oscillation of mass m . 3



25. Deduce an expression for the velocity of a particle executing S.H.M when is the particle velocity (i) Maximum (ii) minimum? 3

OR

A wire stretched between two rigid supports vibrates in its fundamental mode with a frequency 45 Hz. The mass of the wire is 3.5×10^{-2} kg and its linear density is $4.0 \times 10^{-2} \text{ kg m}^{-1}$. What is (a) the speed of transverse wave on the string and (b) the tension in the string?

26. In a two stage launch of a satellite, the first stage brings the satellite to a height of 150 km and the 2nd stage gives it the necessary critical speed to put it in a circular orbit. Which stage requires more expenditure of fuel? Given mass of earth = 6.0×10^{24} kg, radius of earth = 6400 km? 3

27. Three mass points each of mass m are placed at the vertices of an equilateral triangle of side l . What is the gravitational field and potential at the centroid of the triangle due to the three masses? 3

28. A body is projected with velocity u at angle θ_0 upward from horizontal. Prove that the trajectory is parabolic. Deduce expression for (i) horizontal range, (ii) maximum height attained. 5

OR

Define terminal velocity. Obtain an expression for terminal velocity of a sphere falling through a viscous liquid. Use the formula to explain the observed rise of air bubbles in a liquid.

29. Prove that the pressure exerted by a gas is given by $p = \frac{1}{3}\rho c^2$, where ρ is density and c is root mean square velocity. 5

OR

Describe briefly Carnot engine and obtain an expression for its efficiency.

30. State Doppler's effect in sound obtain an expression for apparent frequency when source and listener move away from each other. 5

OR

Discuss the Newton's formula for velocity of sound in air. What correction was applied to it by Laplace and why?

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