GULF SAHODAYA (SAUDI CHAPTER) EXAMINIATION-2015

CLASS-XI **Maximum Marks : 70**
PHYSICS **Time : 3 Hrs**

General Instructions: **SET-A**

(i) All questions are compulsory.
(ii) There is no overall choice. However an internal choice has been provided in one question of 2marks, one question of 3 marks and all the three questions of 5 marks.
(iii) Question numbers 1 to 5 are very short answer type questions carrying 1 mark each.
(iv) Question numbers 6 to 10 are short answer type questions carrying 2 marks each.
(v) Question numbers 11 to 22 are short answer type questions carrying 3 marks each.
(vi) Question number 23 is a value based question carrying 4 marks.
(vii) Question numbers 24 to 26 are long answer type questions carrying 5 marks each.
(viii) Use of calculator is not permitted. However you may use log table, if necessary.

1. A girl sitting on a swing stands up. What is the effect on the time period of the swing?
2. State Wien's displacement law.
3. A bucket containing water is tied to one end of a rope 1m long and rotated about the other end in a vertical circle. What is the minimum velocity at the lowest point so that the water may not spill?
4. Oxygen and hydrogen gas are at the same temperature T. What is the ratio of kinetic energies of oxygen molecule and hydrogen molecule if oxygen is 16 times heavier than hydrogen?
5. A railway carriage of mass 10000kg moving with a speed $15ms^{-1}$ hits a stationary carriage of same mass. After the collision the carriages get coupled and move together. What is their common velocity after collision?
6. Explain how will you determine the size of an astronomical object?
7. Draw the velocity- time graph for :
   (a) uniform motion. (b) uniform acceleration.

   OR

   A car travelling at 20m/s takes a U turn in 10s. What is the acceleration of the car?
8. State Newton's second law of motion and hence deduce the relation F=ma.
9. A piece of copper having rectangular cross section 15mm x 19mm is pulled by a force of 44500N, producing elastic deformation. Calculate the resulting strain. Shear modulus of copper is $42 \times 10^9 Nm^{-2}$.
10. Define gravitational potential energy. Find the gravitational potential energy of a system of four particles each of mass m placed at the vertices of a square of side a.
11. The velocity v of transverse waves in a string may depend upon length l of the string, tension T in the string and mass per unit length m of the string. Derive the formula dimensionally.

12. Define escape velocity. Obtain an expression for escape velocity.

13. Explain why:
    (a) It is easier to pull a lawn mower than to push it.
    (b) A cricketer moves his hands backward while holding a catch

14. Define relative velocity. Rain is falling vertically with a speed of $30ms^{-1}$. A woman rides a bicycle with a speed of $10ms^{-1}$ in west to east direction. What is the direction in which she should hold her umbrella?

15. State and prove Bernoulli's principle.

OR

State Pascal's law. Explain the working of hydraulic lift.

16. Draw the figure showing all the forces and obtain an expression for maximum velocity of vehicle on a circular banked road.

17. Define centre of mass. Two balls of masses *3m* and *m* are separated by a distance L. Find the position of the centre of mass.

18. State the theorem of parallel axes of moment of inertia. Using the theorem find the moment of inertia of a uniform circular disc of mass M and radius R about an axis through a point on its edge and normal to its plane.

19. State the law of equipartition of energy. Obtain the molar specific heats at constant volume and constant pressure of a monoatomic gas.

20. Show that the motion of simple pendulum is simple harmonic. Obtain an expression for its time period.

21. Explain Doppler effect in sound. Obtain an expression for apparent frequency of sound when the source and listener are approaching each other.

22. The equation for a travelling wave in x- direction is $y = 0.03 \sin(36t + 1.8x)$ where x, y and t are in SI units. Calculate the frequency, velocity and wavelength of the wave.

23. Suraj went to a shopping mall to purchase certain goods. There he noticed an old lady struggling to carry her goods to the ground floor. Immediately he showed her the lift and explained to her how it carries the load from one floor to the next. Then he took her to the lift and showed her how to operate it. The old lady was very happy.
(a) What values does Suraj possess?
(b) An elevator can carry a maximum load of 1800kg, is moving up with a constant speed $2ms^{-1}$. The frictional force opposing motion is 4000N. Determine the minimum power delivered by the motor to the elevator.

24. State Clausius statement of second law of thermodynamics.
    Draw the block diagram and explain the working of a refrigerator. Obtain an expression for its co-efficient of performance in terms of temperatures of source (T_1) and sink (T_2).

OR

24. State Kelvin –Planck statement of second law of thermodynamics.
    Draw the block diagram and explain the working of a heat engine. Obtain an expression for its efficiency in terms of heat absorbed from source Q_1 and heat rejected to the sink Q_2.

25. Define capillarity. Obtain an expression for the height of a liquid rising in a capillary tube. What happens to the surface tension of a liquid when temperature is increased?

OR

25. What do you mean by terminal velocity? Obtain the terminal velocity of a sphere of radius r and density ρ falling through a liquid of density ρ' and co efficient of viscosity η.
What is the acceleration of a body falling through a viscous medium after terminal velocity is attained?

26. A projectile is thrown from ground with a velocity u at an angle Θ with the horizontal. Obtain the expression for maximum height and horizontal range of the projectile.
Find the angle of projection at which the horizontal range and maximum height of the projectile are equal.

OR

26. What do you mean by uniform circular motion? Derive an expression for acceleration of an object in uniform circular motion.
A stone tied to the end of a string 0.8m long is whirled in a horizontal circle with a constant speed. If the stone makes 14 revolutions in 25 seconds, what is the acceleration of the stone?