

**GULF SAHODAYA (SAUDI CHAPTER) EXAMINATION -2014.**

**GRADE: XI**

**SUB: PHYSICS.**

**MAX.MARKS:70.**

**Total No. of pages.....6**

**SET C**

**TIME:3HOURS.**

**INSTRUCTIONS:**

**Question Numbers 1-5 , each question carries 1M**

**Question Numbers 6-10, each question carries 2M**

**Question Numbers 11-22 each question carries 3M**

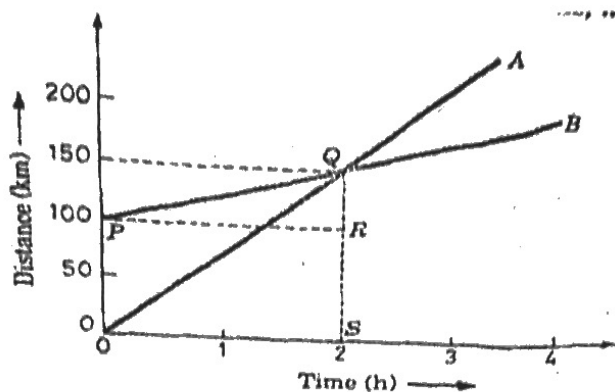
**Question number 23 carries 4M**

**Question numbers 24 -26, each question carries 5M.**

**There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks, and all the three questions of five marks. You have to attempt only one of the choices in such questions.**

**Use of calculators is not permitted. However, you may use log tables, if necessary.**

- The following figure shows the distance time graph of two trains, which start moving simultaneously in the same direction. From the graph, calculate speed of the train A.?



- What is the maximum value of gravitational potential energy? At which position with respect to the surface of earth, the value of gravitational potential energy becomes maximum?
- How escape velocity is related to the orbital velocity for the orbits closer to the earth?
- The maximum acceleration of a particle executing simple harmonic motion is 'A' and its maximum velocity is 'v'. What is amplitude 'a' of the oscillation?
- The fundamental frequency of oscillations of a one end closed pipe is 600Hz. What will be the fundamental frequency of oscillation of a two end open pipe of same length?
- Derive the expression for the excess pressure inside a liquid drop.
- A driver of a three wheeler moving with a speed of 10m/s sees a child standing in the middle of the road and brings his vehicle to rest in 4s just in time to save the child. What is the average retarding force on the vehicle? The mass of the three- wheeler is 400kg and the mass of the driver is 80kg.
- A body of mass 2kg initially at rest moves under the action of an applied horizontal force of 10N on a table with coefficient of kinetic friction = 0.1. Compute the work done by the applied force in 10s. (Take  $g = 10\text{m/s}^2$ )
- State the law of equipartition of energy. What is the internal energy associated with one mole of monatomic and diatomic gases.?

10. Calculate (i) r.m.s velocity of one gram mole of hydrogen at STP.

Given density of hydrogen at S.T.P, is  $0.09\text{kg/m}^3$ .

( $1\text{atm}=1.013\times 10^5\text{N/m}^2$ ).

OR

The r.m.s. speed of oxygen molecules at a certain temperature  $T$  is  $C$ . If the temperature is doubled and oxygen gas dissociates into atomic oxygen, what is the changed r.m.s. speed?

11. Derive the expression for time period of a simple pendulum, assuming that it may depend upon (i) mass ' $m$ ' of the bob.

(ii) Effective length ' $l$ ' of the pendulum and (iii) acceleration due to gravity ( $g$ ) at the place.

12. Rain is falling vertically with a speed of  $30\text{m/s}$ . A woman rides a bicycle with a speed of  $10\text{m/s}$  in the north to south direction. Calculate the relative velocity of rain with respect to woman. Also calculate the direction in which she has to hold her umbrella in order to prevent from the rain?

13. An object is projected with an initial velocity ' $u$ ' from the ground at an angle ' $\theta$ ' with the horizontal. Obtain the expression for the time of flight and hence horizontal range. What is the condition for obtaining maximum value of horizontal range?

14. A food packet is released from a helicopter which is rising steadily at  $2\text{m/s}$ . After two seconds, what is the velocity of the packet and how far is it below the helicopter? Take  $g=10\text{m/s}^2$ .

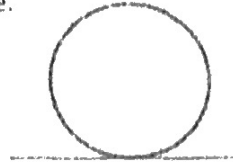
15. State law of conservation of linear momentum. A  $40\text{kg}$  shell is flying at  $48\text{m/s}$ . When it explodes, its one part of  $18\text{kg}$  stops, while the remaining part flies on. Find the velocity of the part which is flying.

OR

An object of mass ' $m$ ' is moving in a circular path of radius ' $r$ ' at a constant speed  $V$ . Obtain an expression for the centripetal acceleration of the body and hence prove that centripetal force is  $F_c = mr\omega^2$ , where ' $\omega$ ', is angular speed.

16. State Parallel axes and perpendicular axes theorem.

Moment of inertia of a ring of radius  $R$  about an axis passing along the diameter  $I_D = MR^2/2$ , Obtain the expression for the moment of inertia of the same ring about an axis passing along the tangent to the ring as shown in the figure.



17.(a) Obtain the expression which shows the variation of acceleration due to gravity of earth with respect to altitude.

(b) Depict a graph which shows this variation. (c) At what point of the earth acceleration due to gravity becomes zero.

18. Define center of mass. Is center of mass of an object necessarily inside the body? Support your answer with one example.

In HCl molecule, the separation between the nuclei of the two atoms is about  $1.27 \text{ \AA}$ . Find the approximate location of the center of mass of the molecule. Given that the chlorine atom is about 35.5 times as massive as a hydrogen atom and nearly all the mass of an atom is concentrated in its nucleus.

19. A thermocole cubical ice box of the side 30cm has a thickness of 5cm. If 4kg of ice is put in the box, estimate the amount of ice remaining after 6hours. The Outside temperature is  $45^\circ$ .

Coefficient of thermal conductivity of thermocole is  $0.01 \text{ Js}^{-1} \text{ m}^{-1} \text{ K}^{-1}$ .

Latent heat of fusion of water =  $335 \times 10^3 \text{ J/Kg}$ .

20. State first law of thermo dynamics.

Explain the working principle of refrigerator and obtain the expression for its coefficient of performance.

21. (a) Write down the expression for the pressure due to a gas in a container. Explain the symbols involved in it.

(b) Prove that average kinetic energy of a molecule of an ideal gas is directly proportional to the absolute temperature of the gas.

22.(a) What is meant by Doppler effect in sound?

(b) A train standing at the outer signal of a railway station blows a whistle of frequency 400Hz in still air

What is the frequency of the whistle for a platform observer when the train (i) approaches the platform with a speed of 10m/s. (ii) the train recedes from the platform with a speed of 10m/s?

23. Rohan and his friends went for an educational trip to visit a dam and a related hydroelectric power project. Their physics teacher explained the techniques involved in the project. Teacher also reminded them the need of saving energy by reducing wastage of energy by luxurious illumination in houses and in the occasions of celebrations.

(i) Mention the values the teacher shown while reminding them about the energy saving.

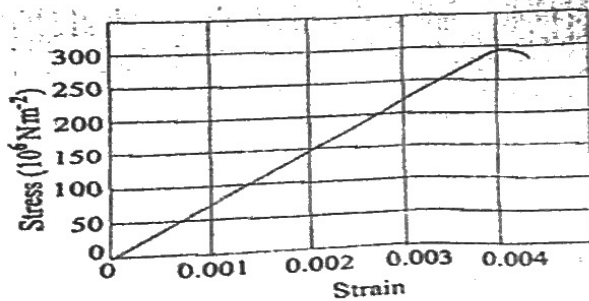
(ii) What kind of mechanical energy stored in the dam while storing water in it.

(iii) What are the energy changes taking place from the storing of energy in a dam until a filament bulb is illuminated in your house?

24. (a) State Hooke's law for elasticity.

(b) The figure shows the stress-strain curve for a given material.

What are (i) Young's modulus of the material and (ii) approximate yield strength for this material?



(c) The breaking stress of a material is  $10^8 \text{ N/m}^2$ . Find the greatest length of a wire that could hang vertically without breaking. Density of the material is  $3000 \text{ kg/m}^3$ .

OR

(a) State and prove Bernoulli's theorem. Mention one of its applications.

26. (a) Obtain the expression for the potential energy, kinetic energy and total energy of a particle executing S.H.M. Depict the graph which shows variation of energy with respect to the displacement of the particle from mean position.

OR

- (a) Define a wave.  
(b) Obtain expression for a plane progressive simple harmonic wave.

- (c) The equation of a plane progressive wave is,  
 $y = 10 \sin 2\pi(t - 0.005x)$ , where  $y$  and  $x$  are in cm and  $t$  is in seconds.

Calculate amplitude, frequency, wavelength and velocity of the wave?

27. a) What is meant by banking of roads?

- (b) Derive an expression for the velocity with which a vehicle can have a safe turn along a curved banked road of coefficient of limiting friction is ' $\mu$ '.

OR

- (a) State Newton's second law of motion. Obtain the expression,  $F=ma$ , where ' $m$ ' is mass and ' $a$ ' is acceleration.  
(b) A cricket ball is moving with a linear momentum of  $5\text{kgm/s}$ , strikes against a smooth wall at an angle of  $45^\circ$  with respect to the normal to the wall and is reflected at the same angle. Calculate the change in linear momentum of the ball.
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