

GULF SAHODAYA (SAUDI CHAPTER) EXAMINATION – 2012

GRADE: XI

MAX.MARKS:70

SUBJECT: PHYSICS (Theory)

TIME: 3HOURS

Total pages: 04

Please check that this question paper contains 30 questions.

Please write down the serial number of the questions before attempting it.

(SET 1)

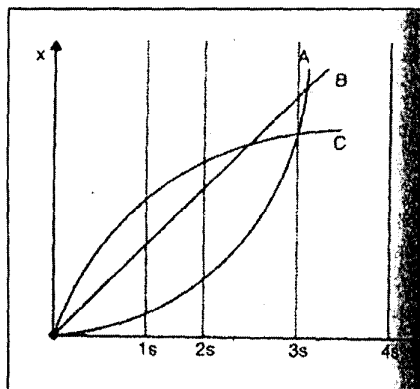
General Instructions:

- (i) All questions are compulsory.
- (ii) 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.
- (iii) Questions numbers 1 to 8 are very short answer type questions, carrying one mark each.
- (iv) Questions numbers 9 to 18 are short answer type questions, carrying two marks each.
- (v) Questions numbers 19 to 27 are also short answer type questions, carrying three marks each.
- (vi) Question numbers 28 to 30 are long answer type questions, carrying five marks each.
- (vii) Use of calculators is not permitted. However, you may use log tables, if necessary.

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1. If  $x = a + bt + ct^2$ , where  $x$  is in meter and  $t$  in seconds. Then what is the unit of  $C$ ?
  2. Two bodies of masses  $m$  and  $4m$  are moving with equal linear momentum, what is the ratio of their kinetic energies?
  3. Find the location of the center of mass of a three particle system. Given that particles have identical mass and are located at  $(0,0,0)$ ,  $(a,0,0)$  and  $(2a,0,0)$ .
  4. What will be the weight of an object at the centre of the earth?
  5. What is the bulk modulus of a perfectly rigid body?
  6. Why spinning cricket ball in air does not follow a parabolic path?
  7. Two, exactly similar simple pendulum are vibrating with amplitude  $1\text{cm}$  and  $3\text{cm}$  respectively. What is the ratio of their total energies of vibration?
  8. Two sound waves produce 20beats in 5 sec. What is the difference in frequencies of two sources?
  9. The force ' $f_c$ ' experienced by a mass moving with a uniform speed ' $v$ ' in a circular path of radius ' $r$ ' depends on its mass, speed and radius. Using dimensional method, prove that the relation is

$$f_c = \frac{mv^2}{r}$$

10. The position- time graph in figure depicts the journey of three bodies A , B, and C,



- At 1s, which has greater velocity?
- At 2 s, which has travelled farthest?
- When A meets C, is 'B' moving faster or slower than A?
- Write approximate time duration in which average velocity of A is equal to B?

OR

Prove that area under velocity – time graph of a uniformly accelerated motion of an object is numerically equal to the distance travelled.

- An air craft executes a horizontal loop at a speed of 720km/h with its wings banked at  $15^\circ$ . What is the radius of the loop? (Acceleration due to gravity is taken as  $10\text{m/s}^2$ ).
- State and prove law of conservation of linear momentum.
- A spring of force constant 1200N/m is mounted, on a horizontal frictionless table. A mass of 3kg is attached to the free end of the spring pulled from its mean position to a distance of 2cm and released. Calculate frequency of oscillation of the mass.
- (a) State parallel axes theorem and perpendicular axes theorem of moment of inertia of an object.  
(b) The moment of inertia of circular disc about an axis passing through its centre and normal the plane of the disc is  $16\text{kgm}^2$ . What will be the moment of inertia of the same disc about an axis passing along its diameter?
- Obtain expression for variation of acceleration due to gravity with respect to altitude.
- Define escape velocity. Find the velocity of escape at the earth. Given that its radius is  $6.4 \times 10^6\text{m}$  and the value of 'g' at the earth surface is  $9.8\text{m/s}^2$ .
- State first law of thermodynamics. Apply it for an isothermal process.
- Calculate r.m.s velocity of one gram mole of hydrogen at S.T.P. Given density of hydrogen at S.T.P is  $0.09\text{Kg/m}^3$

19. (a) State parallelogram law of vector addition.
- (b) Rain is falling vertically down with a speed of 35m/s. A wind starts blowing after some time with a speed of 12m/s in east to west direction. In what direction should a boy waiting at the bus stop to hold his umbrella?
20. Obtain the expression for the maximum velocity with which a vehicle can turn along a curved banked road, of radius 'r', coefficient of friction is ' $\mu$ ', angle of banking ' $\theta$ '.
21. (a) State laws of static friction.
- (b) A motor cycle weighs 1200N. When brakes are applied, the wheels stop rolling and start skidding. Find the force of kinetic friction, if coefficient of kinetic friction is 0.4.
- (c) If the weight of the motor cycle is increased, how does it affect the coefficient of friction?
22. What is meant by an elastic collision? For one dimensional elastic collision between two objects, find the expression for the velocities of the bodies after collision.
23. (a) What is meant by moment of force?
- (b) Find the torque of a force  $(7\hat{i} + 3\hat{j} - 5\hat{k})N$  about the origin. The force acts on a particle whose position vector is  $(\hat{i} - \hat{j} + \hat{k})m$ .
24. Obtain the expression for the excess pressure inside a liquid drop.

OR

- (a) Differentiate between radiation and convection method of heat transfer.
- (b) Calculate the temperature (in Kelvin) at which a perfect black body radiates energy at the rate of  $5.67Wcm^{-2}$ . Given  $\sigma = 5.67 \times 10^{-8} Wm^{-2} K^{-4}$ .
25. Explain the working of heat engine and obtain the expression for its efficiency.
26. State law of equi-partition of energy. Obtain the ratio of molar specific heat capacities for a monatomic gas.
27. Consider a plane progressive wave, expressed as,  $y_{(x,t)} = 2.2 \cos(300t - 0.24x)$ . If the units for y, t and x are in m, s and m respectively, find (a) amplitude (b) frequency (c) wavelength (d) wave velocity.

28. What is meant by a projectile? Obtain the expression for time of flight and maximum height.

OR

(a) Obtain the expression for the horizontal range of projectile, which is projected with an initial velocity 'u' and at angle 'θ' with the horizontal.

(b) The velocity at the maximum height of a projectile is half its initial velocity of projection 'u'.

Prove that its range is  $\frac{\sqrt{3}}{2} \left( \frac{u^2}{g} \right)$

29. (a) What is meant by capillarity? (b) Obtain expression for capillary rise through a capillary tube.  
(c) if surface tension of the liquid is increased, how does it affect capillary rise?

OR

State Stokes law, for a small solid sphere moving through a viscous liquid. Obtain the expression for the terminal velocity of a solid moving through a viscous medium.

30. Prove that motion of a simple pendulum for smaller amplitude is simple harmonic, and also obtain the expression for the period of a simple pendulum executing simple harmonic motion.

OR

(a) What is meant by Doppler Effect? Obtain the expression for the apparent frequency when source is moving towards the listener.

(b) A train is standing at the outer signal of a railway station blows a whistle of frequency 400Hz in still air. (i) What is the frequency of the whistle for a platform observer when the train (a) approaches the platforms with a speed of 10m/s (b) recedes away from the platform with a speed of 10m/s? Given, velocity of sound in still air is 340m/s

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