

COUNCIL OF CBSE AFFILIATED SCHOOLS IN THE GULF
GULF SAHODAYA EXAMINATION, Grade 11, 2007

Subject: PHYSICS

Max. Marks: 70

Time: 3 Hours

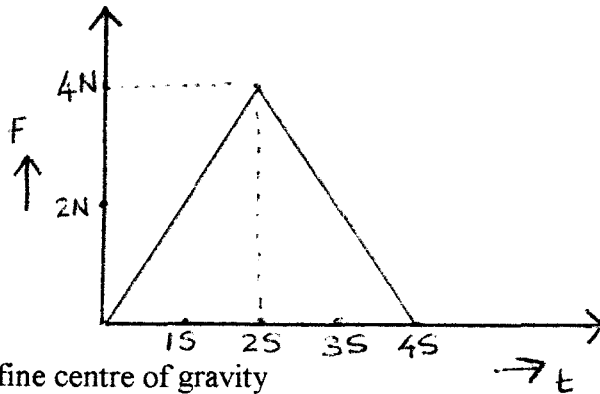
SET - A

General Instructions

- (i) All questions are compulsory.
- (ii) Marks for each question are indicated against it.
- (iii) Questions 1 to 5 are very short answer questions of 1 mark each. These are to be answered in one or two sentences each.
- (iv) Questions 6 to 12 are short answer questions, each carrying two 2 marks. Answer to these questions should be around 30 words.
- (v) Questions 13 to 24 are short answer questions, each carrying 3 marks. Answers to these questions should be around 50 words.
- (vi) Questions 25 to 27 are long answer questions, each carrying 5 marks. Answer to these questions should be around 150 words.
- (vii) Use log tables if necessary

1. Write a vector quantity whose dimensional formula is same as that of work. 1

2. The force – time graph of a body of mass 2 kg is shown in the figure. What is the velocity of the body at the end of 4 seconds (assume that the body is initially at rest)



3. Define centre of gravity 1

4. A mass 'm' attached to the end of a horizontal spring is displaced to a distance 'x' and released. At what position from the mean position the kinetic and potential energy of the mass are same. 1

5. The wavelength of light coming from a distant star is found to be 0.001% more than the light coming from the earth. Calculate the velocity of the star. 1
6. Determine the maximum percentage error in the determination of acceleration due to gravity using the following observations
 Length of the thread = 100.1 cm, Radius of the bob = 2.52 cm, Time period of oscillation = 2.1 s
 The length of the thread is measured with a meter scale of least count 1mm, radius of the bob is measured with vernier callipers of least count 0.01 cm and the time period is measured with a stopwatch of least count 0.1s. 2
7. A body accelerates from rest at a constant rate a_1 for some time and then decelerate at a constant rate a_2 to come to rest. If t is the total time taken by the body, plot the velocity – time graph and find the expression for the maximum velocity attained by the body 2
8. The Moment of Inertia of a ring about an axis perpendicular to its plane and passing through its centre is I . Find the Moment of Inertia of a disc of double the mass and same radius of the ring about an axis perpendicular to its plane and passing through its edge. 2
9. Two uniform solid spheres of equal radii R , but mass M and $4M$ have a centre to centre separation $6R$. The two spheres are held fixed. A projectile of mass m is projected from the surface of the sphere of mass M directly towards the centre of the second sphere. Obtain an expression for the minimum speed v of the projectile so that it reaches the surface of the second sphere. 2
10. Show that speed of efflux from an open tank is given by a formula identical to that of a freely falling body 2
11. Write Kelvin-Planck and Clausius statements of second law of thermodynamics
- OR
- State the first law of thermodynamics. Also write the mathematical expression 2
12. What is Kinetic interpretation of temperature? Derive an expression for the average kinetic energy of a gas molecule at temperature T Kelvin. 2
13. A projectile is fired at an angle θ with the horizontal with an initial velocity u . Show that the trajectory is a parabola and hence derive an expression for the time of flight 3
14. Deduce Newton's III law from Newton's II law of motion 3
15. Derive an expression for the minimum angle of elevation of the inclined plane by which a body just starts sliding. (assume that μ is the coefficient of friction of the plane

- surface) Also find the minimum force required to pull the body upwards along the inclined plane. 3
16. State and prove Work energy theorem for a variable force 3
17. Derive an expression for the maximum velocity with which a body can move along a curved and banked road of coefficient of friction μ 3
18. A sphere of mass m collides elastically with another identical mass suspended by a thread. Calculate the maximum height attained by the suspended mass after the collision. 3
19. Explain the principle and working of Refrigerator. Write the expression for the coefficient of performance. 3
20. What is centre of mass? Derive a relation for the position vector of the centre of mass of a two body system in terms of the position vector of the masses. 3
21. Discuss the variation of acceleration due to gravity with respect to depth from the surface of the earth and hence find the acceleration at a depth half the radius of the earth from the surface.

OR

- Discuss the variation of acceleration due to gravity with respect to height from the surface of the earth and hence find the acceleration at a height half the radius of the earth from the surface. 3
22. Define coefficient of viscosity in terms of shearing stress. Also derive an expression for the terminal velocity of a spherical body falling down through a liquid of coefficient viscosity η 3
23. State the law of equi partition of energy. Hence write expression for the specific heat at constant volume and specific heat at constant pressure of a poly atomic gas. 3
- 24 Show that the motion of a simple pendulum is simple harmonic and hence drive an expression for the time period of oscillation.. 3
25. (a) What is uniform circular motion?
 (b) Derive an expression for the acceleration and show that acceleration of an object in uniform circular motion is directed towards the centre of the circle. 5

OR

- (a) Define relative velocity in two dimensions.
(b) Rain is falling vertically with a speed of 30 m/s. A woman rides a bicycle with a speed of 10 m/s in north to south direction. What is the direction in which she should hold her umbrella?

26. Discuss the formation of standing waves and hence find the expression for the frequency of fundamental and overtones in string attached at its ends

OR

Discuss the formation of standing waves and hence find the expression for the frequency of fundamental and overtones in an organ pipe open at both ends 5

27. (a) What is angle of contact?
(b) Derive an expression for the height of capillary rise

5

OR

- (a) What is Surface energy?
(b) Derive an expression for the excess of pressure inside Liquid drop of radius 'R' and surface tension 'T'.

List of useful constants

$$G = 6.67 \times 10^{-11} \text{ N m}^2\text{kg}^{-2}$$

$$\text{Mass of the earth} = 6 \times 10^{24} \text{ kg}$$

$$\text{Radius of earth} = 6400 \text{ km}$$