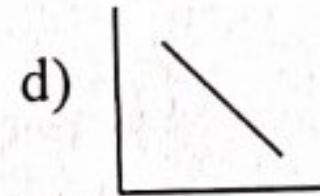
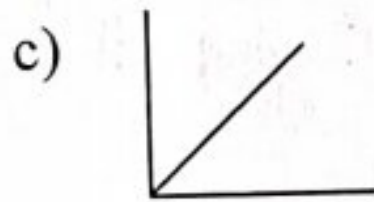
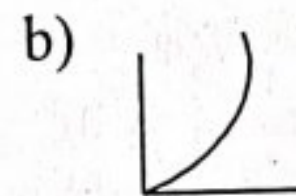
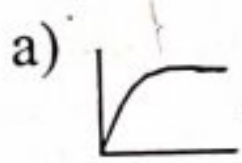


S. No	General Instructions	Marks
1.	There are total of four sections in the question paper. All questions are compulsory.	
	Section – A contains 10 Objective Type Question/ Multiple choice Question of 1 Mark each	1×10=10 marks
	Section – B contains 9 Very Short Answer Type Question of 2 Marks each to be answered in 20 to 30 words	2×9=18 marks
	Section – C contains 9 Short Answer Type Questions of 3 Marks each to be answered in 100 to 150 words.	3×9= 27 marks
	Section – D contains 3 long Answer Type Questions of 5 Marks each to be answered in 150 to 200 words.	5×3= 15 marks
2.	Use log tables, if necessary. Use of scientific calculators is not allowed	

**SECTION A**

**1. Do as directed:**

a) The position time graph for a body in uniform motion is



b) The dimensional formula for Gravitational constant is

a)  $ML^3T^2$

b)  $M^{-1}L^2T^2$

c)  $M^2L^2T^{-1}$

d)  $M^{-1}L^3T^{-2}$

c) If  $\vec{A} = 3\hat{i} + 2\hat{j}$  and  $\vec{B} = 2\hat{i} + m\hat{j} + 2\hat{k}$  are perpendicular to each other. Find the value of 'm'.

a) 2

b) -4

c) 5

d) -3

d) When a body is in free fall its

a) potential energy is conserved

b) kinetic energy is conserved

c) total energy is conserved

d) None of these

e) The centre of mass of Earth – moon system lies

a) close to earth

b) close to moon

c) exactly at the centre of line joining earth & moon

d) on the moon

f) Value of g is maximum at

a) equator

b) poles

c) centre of earth

d) All of above

*[Handwritten signature]*



- g) For an ideal gas, the total energy is equal to its
- Potential energy
  - Kinetic energy
  - Sum of Potential & Kinetic energy
  - None of these
- h) For a heat engine to have 100% efficiency the temperature of
- Sink should be 0 K
  - Sink should be  $0^{\circ}\text{C}$
  - Source should be  $100^{\circ}\text{C}$
  - Source should be  $0^{\circ}\text{C}$
- i) The potential energy of simple pendulum is
- maximum at mean position
  - maximum at extreme position
  - maximum at all the points
  - is always zero
- j) The specific heat of a gas in isothermal process is
- |             |                     |
|-------------|---------------------|
| a) zero     | b) large but finite |
| c) infinite | d) none of these    |

## SECTION B

- Which of the following reading is the most accurate?  
(a) 7000 m      (b)  $70 \times 10^2 \text{m}$       (c)  $7 \times 10^3 \text{ m}$
- Two particles A and B start moving towards each other with a velocity 10 m/s and 15 m/s respectively from the separation of 500m. What is the displacement of A w.r.t. B after 4 seconds.
- Why sand is sometimes thrown on the railway tracks in rainy days?
- A force of 3000 dyne acts on a mass 300 g for 10 seconds. Calculate the kinetic energy of the body after 10 seconds.
- Angular momentum is conserved in the rotation of electron around the nucleus and the rotation of planets around the Sun. Why?
- An artificial satellite moving in a circular orbit around the Earth has total energy  $E_0$ . What is its potential energy?
- When a wire is bent back and forth, it becomes hot. Why?
- State the second law of thermodynamics.

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10. For what frequency in the audio range (20 Hz to 20 kHz) does the listener hear minimum signal? Given the speed of sound in air is 330 m/s

### SECTION C

11. If the density of mercury is  $13.6 \text{ g cm}^{-3}$ , convert its value into  $\text{Kg m}^{-3}$ , using dimensional equation.
12. Calculate the angle of banking of a smooth curved road of radius 100 m if vehicles can safely travel along it with a speed of 108 km/hr.
13. State Newton's three laws of motion.
14. What is law of conservation of angular momentum?
15. State and explain Kepler's three laws of planetary motion.
16. Discuss three limitations of Bernoulli's Theorem.
17. What is the importance of second law of thermodynamics?
18. Write the postulates of kinetic theory of gases.
19. What are the characteristics of simple harmonic motion?

### SECTION D

20. What is Projectile motion? Derive the expression for maximum height, time of flight and horizontal range of a projectile fired at an angle with horizontal.
- Or
- State and explain Newton's second law of motion. Why this law is said to be real Law of motion?
21. Define centre of mass of a system of particles. Calculate the centre of mass of a system of two particles.
- Or
- Derive an expression for the gravitation potential energy of a mass  $m$  placed in the gravitational field of another mass  $M$ , separated by the distance  $r$ .
22. Define Young's modulus of elasticity? What are its units? How it is experimentally