Suguna International School
Gandhipuram
Pre-Annual Examination (December 2025)

Name: _____ **Subject: Physics**

Class & Sec: XI A&B **Marks: 70**

Date: 23.12.2025 **Time: 3 Hours**

General Instructions:

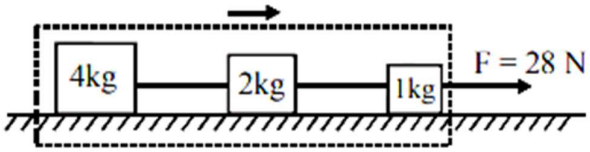
(i) *All questions are compulsory.*

(ii) The question paper has five sections and 33 questions.

(iii) Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each with two questions have internal choices; Section– C has 7 questions of 3 marks each with one question has internal choice; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each with all the questions have internal choices.

(iv) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

(v) Wherever necessary, neat and properly labeled diagrams should be drawn.

	SECTION – A	
1.	hρg in the relation P = Pa + hρg is called A. Absolute pressure B. Atmospheric pressure C. Gauge pressure D. Surface pressure	**1**
2.	Which of the following is true for the relation: Torque (τ) $\propto$ $[M^a L^b T^c]$? A. (a = 2; b = -1; c = 1) B. (a = - 2; b = 0; c = 1/2) C. (a = 0; b = -1/2; c = -2) D. (a = 1; b = 2; c = - 2)	**1**
3.	A bomb is fired from a canon with a velocity of 1000 m/s making an angle of 30° with the horizontal (g = 9.8 m/s^2). Time taken by bomb to reach the highest point is A. 40 s B. 30 s C. 51 s D. 18 s	**1**
4.	In the arrangement shown in the figure, the connected strings are light and inextensible. The surface over which blocks are placed is smooth. What is the acceleration of each block?  A. 8 m/s^2 B. 4 m/s^2 C. 2 m/s^2 D. 14 m/s^2	**1**
5.	Relationship between moment of inertia and rotational kinetic energy is A. I^2 = ½ (Rotational kinetic energy) B. Rotational kinetic energy = 2 (Iω^2) C. Rotational kinetic energy = Iω^2 D. Rotational kinetic energy = ½ Iω^2	**1**
6.	Which of the following quantities are expressed by the rate of change of angular momentum? A. Moment of Inertia B. Power C. Angular displacement D. Torque	**1**
7.	Orbital velocity (Vo) of a satellite near Earth's surface is approximately A. 7.9 km/s B. 11.2 km/s C.5.0 km/s D. 9.8 km/s	**1**
8.	The maximum stress up to which a material can be stretched without permanent deformation is A. Yield point B. Breaking point C. Elastic limit D. Permanent set	**1**

9.	If the diameter of a wire is doubled, keeping other factors same, its elongation under a give load is becomes A. 4 times B. ½ times C. ¼ times D. 2 times	1
10.	Which of the following equations are dimensionally not correct? A. $h = u^2/g$ B. $L = I\omega$ C. $t = u \sin\theta/g$ D. $v = rg \tan\theta$	1
11.	The pressure at a point in a moving liquid decreases as the speed of the liquid increases. This statement is A. Newton's law B. Pascal's lw C. Bernoulli's principle D. Archimedes principle	1
12.	The terminal velocity of a sphere in a viscous fluid is directly proportional to A. radius B. $(radius)^2$ C. $1/(radius)^2$ D. (radius) / 2	1
Questions from 13 to 16: Assertion And Reason Type **A.** Both A and R are true, and R is the correct explanation of A. **B.** Both A and R are true, but R is not the correct explanation of A. **C.** A is true, but R is false. **D.** A is false, but R is true.		
13.	**Assertion (A):** The speedometer of an automobile measures the average speed of the automobile. **Reason (R):** Average velocity is equal to total displacement divided by total time taken. **D**	1
14.	**Assertion (A):** During turning, a cyclist leans towards the centre of the curve; while a man sitting in the car leans outwards of the curve. **Reason (R):** An acceleration always acting towards the centre of the curve. C	1
15.	**Assertion (A):** A planet moves faster, when it is closer to the sun in its orbit and vice-versa **Reason (R):** Orbital velocity in orbit of a planet is constant. **C**	1
16.	**Assertion (A):** The pressure just below a falling raindrop is less than the pressure above it **Reason (R):** The velocity of air just below the raindrop is higher than that above it. **A**	1
	SECTION – B	
17.	Differentiate between speed and velocity.	2
18.	Check whether the following relations are dimensionally correct? i) $v = \sqrt{(P/\rho)}$ where v = velocity, P = pressure and ρ = density **Correct** ii) $T = 2\pi \sqrt{(g/l)}$ **Not correct**	2
19.	A bullet of mass 150 g is travelling with velocity 18 m/s stops in 3 second after hitting a wooden block. Calculate the (i) impulse of the applied force and (ii) change in kinetic energy. **- 2.7 kg m/s, - 24.3 J**	2
20.A	Differentiate between elastic collision and inelastic collision. Elastic: If there is no loss of kinetic energy during a collision, it is called elastic collision. Inelastic collision: If there is a loss of kinetic energy during collision, it is called inelastic collision.	2
	(OR)	
20. B	Two masses 8 kg and 12 kg are connected at the two ends of a string that goes over a frictionless pulley. Calculate the acceleration of the masses. 2 m/s^2	
21. A	Define Reynolds Number. What is its dimensional formula. Reynolds number (Re) is a dimensionless quantity used in fluid mechanics to determine the type of flow of a fluid — whether it is laminar or turbulent.	2
	(OR)	
21. B	Specify any four applications of Bernoulli's theorem. 1) Lift of an aeroplane wing 2) Venturimeter 3) Atomizer (Spray gun) 4) Flow of blood in arteries	
	SECTION – C	

22	i) Find the number of significant figures in 0.050 cm Two ii) Round off 248337 upto three significant figures. 248000 iii) Subtract 63.54 kg from 187.2 kg in appropriate number of significant figures. 123.7 kg	**3**
23	An electron travelling with a speed of 5 x 10^3 m/s passes through an electric field with an acceleration of 10^{12} m/s^2. i) How long will it take for the electron to 'double' its speed? t = v-u/a = 5x10^{-9} s ii) What will be the distance covered by the electron in this time? S = ut + ½ at^2 = 3.75 x 10^{-5} m	**3**
24	A bullet fired at an angle of 60° with the vertical hits the ground at a distance of 2 km. Calculate the distance at which the bullet will hit the ground when fired at an angle of 45°, assuming the speed to be the same. (p 4.53, 2.31 km or 4 root 3/3 m)	**3**
25	i) Write the formula and dimension for co-efficient of static friction. μs = f/N (dimensionless) ii) The mass of a bicycle rider along with the bicycle is 100 kg. He wants to cross over a circular turn of radius 100 m with a speed of 10 ms^{-1}. By calculation, find if the co-efficient of friction between the tyres and the road is 0.6, will the rider be able to cross the turn without falling? (g = 10 ms^{-2}; friction provides necessary centripetal force) (p-5.57 (3), Yes, f is more than centripetal force)	**3**
26	State parallelogram law of vectors and derive the expression for magnitude and direction of the resultant vector. (statement: 1, magnitude: 1, direction: 1)	**3**
27. A	i) A steel wire of length 2.00 m and cross-sectional area 1 x 10^{-6} m^2 is stretched by a force of 500 N. Find the extension in the wire if Young's modulus of steel is 2.00 x 10^{11} Pa. (dL = FL/AY = 5.00 mm) ii) Define poisson's ratio and write its dimensional formula.	**3**
	(OR)	
27. B	**State Hooke's law.** (Statement 1) A metal sample with an initial volume of 0.5 m^3 experiences a pressure increase of 10^7 Pa. The corresponding change in volume of the sample is 2 x 10^{-5} m^3. Calculate the bulk modulus of the material. 2.5 x 10^{11} Pa	
28	A ball is kicked at an angle of 30° with the vertical. If the horizontal component of its velocity is 19.6 m/s, find the height and horizontal range. (h = 58.8 m and R = 135.8 m)	**3**
	SECTION – D (CASE BASED QUESTIONS)	
29.	At different points on Earth's surface, the free fall acceleration ranges from 9.764 to 9.834 m/s^2 depending on altitude, latitude, and longitude. A conventional standard value is defined exactly as 9.80665 m/s^2. Locations of significant variation from this value are known as gravity anomalies. This does not take into account other effects, such as buoyancy or drag. Escape velocity is a crucial concept in astrophysics and aerospace engineering. It represents the speed required for an object to escape the gravitational influence of a planet, moon, or other celestial body. This speed is independent of the direction of travel, making it a scalar quantity rather than a vector. Understanding escape velocity is essential for space travel, as it determines the initial speed needed for spacecraft to leave a planet's gravitational field without additional energy input. However, it must not accelerate further. It is the minimum speed with which an object must be launched so that it is able to overpower the gravitational pull of the Earth and hence is able to escape to space. a. The acceleration due to gravity A. less in mines than that on the earth's surface (A) B. more in mines than that on the earth's surface	**4**

C. remains same in mines and on the earth's surface

D. Can't be determined

b. The acceleration due to gravity at a depth d is gd and at height h above the surface of the earth is gh. If d = 2h, then the ratio gd/gh is equal to (p 8.63 – C)

A. 2/1 B. 1/2 C. 1 D. 1/4

c. At what altitude (h) above the earth's surface wouldthe acceleration due to gravity be one-fourth its value at the earth's surface? (A)

A. h = R B. h = 4R C. h = 2R D. h = 16R

d. An elephant and an ant are to be projected out of earth into space. Select the correct statement from the following

A. An elephant needs to be projected with greater speed than an ant

B. Both need to be projected with the same speed (B)

C. An ant needs to be projected with greater speed than an elephant

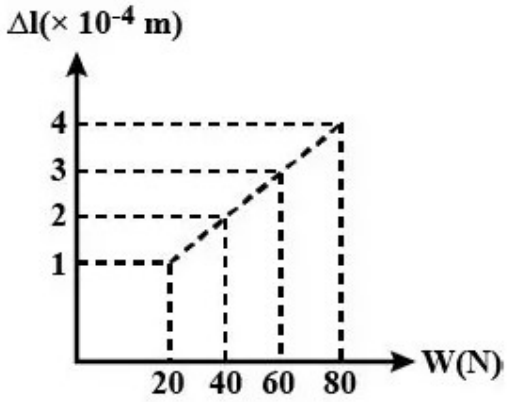
D. Ant needs to be projected first followed by the elephant after sometime

30. Young's modulus, or the modulus of elasticity, gauges how stiff a material is by comparing stress (force per unit area) to strain (deformation) within the material's elastic range. A higher modulus means the material is stiffer, while a lower value indicates greater flexibility. This property is crucial in engineering and materials science as it helps predict how materials will behave when subjected to stress. **4**

a. Among solids, liquids and gases, which can have all the three moduli of elasticity? Solids

b. What does the slope of stress versus strain graph represent? Modulus of elasticity

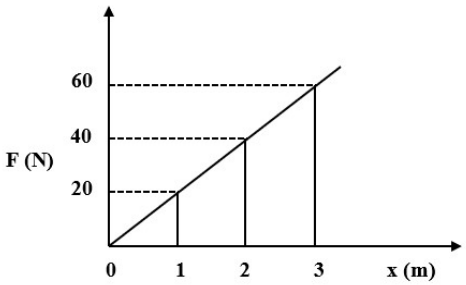
c. The graph shows the extension of a wire of length 1 m suspended from the top of a roof at one end with a load W connected to the other end. If the cross-sectional area of the wire is 10^{-6} m^2, calculate the Young's modulus of the material of the wire. $Y = W/A\ (l/dl) = 2x10^{11}$ Nm^{-2}



d. Which is more elastic - a rubber chord or a steel wire? Give reason. (Steel. Its YM is larger than that of rubber)

SECTION – E

31.A i) Calculate the work done in moving the object from x = 2m to x = 3m from the following graph 50 J **5**



ii) A railway carriage of mass 9000 kg moving with a speed of 36 km h^{-1} collides with a stationary carriage of the same mass. After collision, the carriages get coupled and move together. Calculate their common speed after collision. 5 m/s Using total momentum and kinetic

	energy, prove that this is collision is 'inelastic'. (KE before collision = 450000 J, after collision = 225000 J so loss of kinetic energy after collision)	
	(OR)	
31. B	i) With neat labelled diagrams, derive the expression of potential energy stored in a spring. ($U = \frac{1}{2} kx^2$) ii) Define power. (Definition) Write its SI unit and dimensional formula. (watt, $[ML^{-2}T^{-3}]$ Derive the expression that gives the relationship between power and velocity. ($P = Fv$)	
32. A	i) State Pascal's law. (Statment) ii) Prove it using neat diagram, by considering a right angled prism in the interior of a fluid at rest. ($Pa = Pb = Pc$) iii) Mention any two important applications of Pascals's law. (Hydraulic lift and hydraulic brakes)	**5**
	(OR)	
32. B)	i) State Stokes' Law with equation. (Statment, $F = 6\pi \eta av$) ii) Derive an expression for the terminal velocity of a small spherical body falling through a viscous medium and discussion the results as how does terminal velocity get affected by various factors. ($v = 2/9\ r^2\ (\rho - \sigma)g / \eta$ iii) Write the dimensional formula for co-efficient of viscosity (η). $[M^1L^{-1}T^{-1}]$	
33. A	State Bernoulli's theorem (Statment). Using a neat labelled diagram, prove Bernoulli's principle for the flow of non-viscous, incompressible fluid flowing steadily through a pipe of variying cross-sections. (Proof: $P + \frac{1}{2} \rho v^2 + \rho gh = \text{constant}$ or $P/\rho g + \frac{1}{2} v^2/g + h = \text{constant}$)	**5**
	(OR)	
33. B	i) Distinguish between streamlined flow and turbulent flow with one example for each. ii) Define critical velocity (Vc) of a fluid. (limiting value of its velocity of flow up to which the flow is streamlined and above which the flow becomes turbulent) iii) Critical velocity of a fluid is related to coefficient of viscosity (η), density of the fluid (ρ) and diameter of the pipe (D) through which it is flowing. Derive the expression for critical velocity of a liquid using dimensional analysis. 'k' is a dimensionless constant. ($Vc = k\eta\ \rho D$)	