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INDIAN SCHOOL SALALAH
FIRST TERM EXAMINATION - SEPTEMBER 2026
PHYSICS (042)

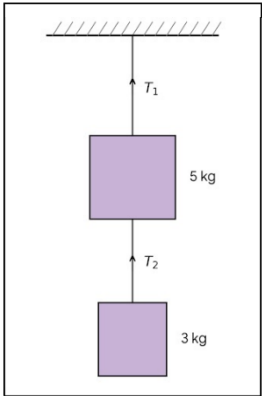
**Class: XI****Date: 20/09/2026****Time: 3 hours****Maximum Marks: 70****General Instructions:**

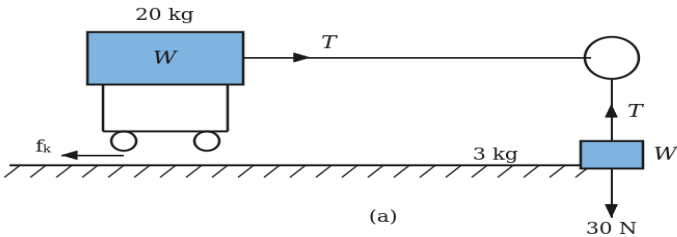
- a. There are 33 questions in all. All questions are compulsory.
- b. This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
- c. All the sections are compulsory.
- d. Section A contains sixteen questions, twelve MCQ and four assertion reasoning based of 1 mark each, Section B contains five questions of two marks each, Section C contains seven questions of three marks each, Section D contains two case study-based questions of four marks each and Section E contains three long answer questions of five marks each.
- e. There is no overall choice. However, an internal choice has been provided in two questions in Section B, one question in Section C and all three questions in Section E. You must attempt only one of the choices in such questions.
- f. Use of calculators is not allowed.
- g. You may use the following values of physical constants wherever necessary
 - (i) $c = 3 \times 10^8 \text{ m/s}$
 - (ii) $m_e = 9.1 \times 10^{-31} \text{ kg}$
 - (iii) $m_p = 1.7 \times 10^{-27} \text{ kg}$
 - (iv) $e = 1.6 \times 10^{-19} \text{ C}$
 - (v) $\mu_0 = 4\pi \times 10^{-7} \text{ T m A}^{-1}$
 - (vi) $h = 6.63 \times 10^{-34} \text{ J s}$
 - (vii) $\epsilon_0 = 8.854 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$
 - (viii) Avogadro's number = 6.023×10^{23} per gram mole.

SECTION A		
1	Which of the following is a derived unit? (a) metre (b) kilogram (c) newton (d) second	1
2	The density of a cube is measured by measuring its mass and length of its side. If the maximum errors in the measurement of mass and length are 3% and 2% respectively then the maximum error in the measurement of density is: a) 7% b) 5% c) 9% d) 3%	1
3	The area under a velocity-time graph of a moving object gives its:	1

	(a) acceleration (b) displacement (c) speed (d) force	
4	Direction of velocity in circular motion is: a) Radial b) Tangential c) Vertical d) Random	1
5	A projectile is fired with speed u at an angle of 45° with the horizontal. The ratio of its maximum height to its horizontal range is: (a) 1 : 1 (b) 1 : 2 (c) 1 : 4 (d) 1 : 8	1
6	If the magnitude of the sum of two vectors A and B equals the magnitude of their difference, the angle between A and B is: (a) 0° (b) 45° (c) 90° (d) 180°	1
7	A cyclist completes one round of a circular track of radius 105 m in 2 minutes. The average speed of the cyclist is nearly: (a) 5.5 m/s (b) 8.8 m/s (c) 11 m/s (d) 17.5 m/s	1
8	A passenger standing in a moving bus falls forward when the bus suddenly stops. This happens due to: (a) Newton's first law of motion (b) Newton's second law of motion (c) Newton's third law of motion (d) law of conservation of momentum	1
9	A marble block of mass 2kg lying on ice when given a velocity 6m/s is stopped by a friction in 10s. Then, the coefficient of friction is (a) 0.02 (b) 0.03 (c) 0.06 (d) 0.01	1
10	If the radii of circular paths of two particles of same masses are in the ratio of 1:2 then to have a constant centripetal force, their velocities should be in the ratio of (a) $1:\sqrt{2}$ (b) $\sqrt{2}:1$ (c) 4:1 (d) 1:4	1
11	A particle of mass 2kg is displaced from position $\vec{r}_1 = (2\hat{i} + \hat{j})$ m to $\vec{r}_2 = (5\hat{i} + 5\hat{j})$ m under the action of constant force $\vec{F} = (3\hat{i} + 4\hat{j})$ N. What is the work done by the force? (a) 25J (b) 18J (c) 21J (d) 24J	1
12	A machine delivers a power of 100 W while lifting a mass of 5 kg vertically. The speed with which the mass is being lifted is: ($g = 10 \text{ m/s}^2$) (a) 1 m/s (b) 2 m/s (c) 5 m/s (d) 10 m/s	1
	For Questions 13 to 16 , two statements are given, one labelled Assertion (A) and other labelled Reason (R) . Select the correct answer to these questions from the options given below. (A) Both Assertion and Reason are true, and Reason is the correct explanation of Assertion.	

	(B) Both Assertion and Reason are true, but Reason is not the correct explanation of Assertion. (C) Assertion is true, but Reason is false. (D) Both Assertion and Reason are false.	
13	Assertion (A): The speedometer of an automobile measures the average velocity of the automobile. Reason (R): Average velocity is equal to the total displacement divided by the total time taken.	1
14	Assertion (A): A body can have zero velocity and still be accelerating. Reason (R): Velocity is a vector quantity, and acceleration is defined as the rate of change of velocity.	1
15	Assertion (A): A quick collision between two bodies is more violent than a slow collision, even when the initial and final velocities of both bodies are identical in the two cases. Reason (R): The force experienced during a collision depends on the rate of change of momentum, and a quick collision means a greater rate of change of momentum.	1
16	Assertion (A): A body cannot have momentum without possessing kinetic energy. Reason (R): Momentum is given by $p = mv$ and kinetic energy by $KE = \frac{1}{2}mv^2$, both of which depend on the velocity v of the body.	1
	SECTION B	
17	Check the correctness of the given relation: Relation: $S_{nth} = u + (a/2)(2n - 1)$ where u is initial velocity, a is acceleration, and S_{nth} is the distance travelled by the body in the nth second.	2
18	A block initially at rest breaks into two parts of masses in the ratio 2: 3. The velocity of smaller part is $(8\hat{i} + 6\hat{j})$ m/s. Find the velocity of bigger part.	2
19	A vector $\mathbf{A} = 3\hat{i} + 4\hat{j}$. Find the unit vector in the direction of $\mathbf{A}$.	2
20(I)	Two masses of 5kg and 3 kg are suspended with help of massless inextensible strings as shown in Fig. Calculate T_1 , and T_2 when whole system is going upwards with acceleration 2m/s^2 ($g = 9.8 \text{ m/s}^2$)	2

		
	OR	
20(II)	Define impulse of a force. State the impulse-momentum theorem and write its mathematical expression.	2
21(I)	A body of mass 2 kg moving with a velocity of 4 m/s is acted upon by a constant force that does 16 J of work on it. Using the work-energy theorem, calculate the final velocity of the body.	2
	OR	
21(II)	Distinguish between conservative and non-conservative forces, giving one example of each.	2
	SECTION C	
22	Find the value of 100J of energy on a system whose fundamental units are 100gram;10cm and half a minute	3
23	By the method of dimensions, obtain an expression for the surface tension S of a liquid rising in a capillary tube. Assume that S depends upon mass m of the liquid, pressure p of the liquid, and radius r of the capillary tube Given: $[S] = MT^{-2}$ and $K = \frac{1}{2}$	3
24(I)	A ball is thrown vertically upward with a velocity of 20 m/s from the top of a tower 25 m high. Find (i) the time taken by the ball to reach the ground, and (ii) the velocity with which it strikes the ground. ($g = 10 \text{ m/s}^2$)	3
	OR	
24(II)	Using a velocity-time graph, derive the equation of motion $x = ut + \frac{1}{2}at^2$ for a body moving with uniform acceleration a, where the symbols have their usual meanings.	3
25	The position vector of the particle is given by $\vec{r}(t) = 3.0t\hat{i} + 2.0t^2\hat{j} + 5.0t\hat{k}$ where t is in seconds and the coefficients have the proper units for $\vec{r}$ to be in meters. Find the velocity and acceleration of the particle in magnitude and direction at time $t = 3.0\text{s}$	3
26	What is the acceleration of the block and trolley system shown in Fig., if the coefficient of kinetic friction between the trolley and the surface is 0.04? What is the tension in the string? (Take $g = 10 \text{ m s}^{-2}$.) Neglect the mass of the string.	3

	 (a)		
27	A particle of mass m is attached to a light, inextensible string of length r and is made to move in a vertical circle. (a) Using Newton's second law, derive an expression for the tension (T-Max) in the string at the lowest point of the vertical circle. (b) Derive an expression for the tension (T-Min) at the highest point of the circle. (c) State the condition for the string to remain just taut at the highest point.		3
28	A pump on the ground floor of a building can pump up water to fill a tank of volume 30 m^3 in 15 minutes. If the tank is 40 m above the ground and the efficiency of the pump is 30%, calculate the electric power consumed by the pump. ($g = 10 \text{ m/s}^2$, density of water = 1000 kg/m^3)		3
	SECTION D		
29	Every measured physical quantity carries some uncertainty, called an error, which may be a systematic error or a random error. The number of significant figures in a measured value indicates the precision of the measurement, and specific rules are followed to determine the number of significant figures or decimal places when quantities are added, subtracted, multiplied or divided. Dimensional analysis, based on the principle of homogeneity of dimensions, is used to check the correctness of physical equations and to derive relations between physical quantities.		
	I	What is meant by 'significant figures' in a measurement? a) The total number of digits in a measurement b) The digits in a measurement that convey its precision c) Only the digits after the decimal point d) Only the non-zero digits in a measurement	1
	II	Name the two broad types of errors that occur in a measurement. a) Absolute error and relative error c) percentage error and fractional error b) Systematic error and random error d) instrumental error and personal error	1
	III	State the number of significant figures in the measurement 0.02030 kg. a) 2 b) 3 c) 4 d) 5	1
	IV	Using dimensional analysis, verify whether the equation $h = p/\lambda$ is dimensionally correct.	1

		a) A. The equation is dimensionally correct because both sides have the dimensions of $M L T^{-1}$ b) The equation is dimensionally correct because both sides have the dimensions of $M L^{-2} T^{-2}$ c) The equation is dimensionally incorrect because the dimensions of h and p/λ are different. d) The equation cannot be checked using dimensional analysis.	
30	A car starts from rest and accelerates uniformly at 2 m/s^2 for the first 10 s. It then moves with the uniform velocity so attained for the next 20 s, and finally decelerates uniformly, coming to rest in the next 5 s.		
	i)	Calculate the velocity attained by the car at the end of the first 10 s a)10m/s b)15m/s c)20m/s d)25m/s	1
	ii)	the distance covered by it during this phase. a)100m b)150m c)200m d)250m	1
	iii)	Calculate the distance covered by the car while it moves with uniform velocity. a)100m b)150m c)200m d)400m	1
	iv)	Calculate the deceleration of the car during the last phase of its motion. a) -4 m/s^2 b) -8 m/s^2 c) -12 m/s^2 d) -16 m/s^2	1
	SECTION E		
31(I)	Derive expressions for the maximum height, time of flight and horizontal range of a projectile launched with an initial velocity u at an angle θ above the horizontal. Hence show that the range is maximum when $\theta = 45^\circ$.		5
	OR		
31(II)	A river flows due east with a speed of 3 km/h. A boatman, who can row a boat at 5 km/h in still water, wishes to cross the river along the shortest possible path (i.e. straight to the north bank). (i) In which direction should he row the boat? (ii) Find the resultant speed of the boat. (iii) If the width of the river is 2 km, find the time taken to cross it.		5
32(I)	Refer to the graph to answer the questions below: a) Calculate the acceleration of the particle during the first 2 seconds. b) Calculate the distance traveled by the particle in the first 4 seconds. c) Compare the displacement in region AB with the displacement in region CD.		5

	OR	
32(II)	(a) Derive an expression for the maximum speed with which a vehicle can safely negotiate a curved road of radius r, banked at an angle θ, given that the coefficient of friction between the tyres and the road is μ. (b) A circular racetrack of radius 300 m is banked at an angle of 15°. If the coefficient of friction between the wheels and the road is 0.2, find the optimum speed of the car to avoid wear and tear of its tyres.	5
33(I)	a) State the law of conservation of mechanical energy. Prove this law for a body of mass m falling freely under gravity from a height h, showing that the total mechanical energy remains constant at every point during the fall. b) The momentum of a body is doubled. By what factor does its kinetic energy change? What is the percentage change in its kinetic energy?	5
	OR	
33(II)	(a) What is an elastic collision? What will happen, when (b) a heavy body collides with a lighter one at rest? (c) A lighter body collides with a heavy mass at rest? (d) Show that two bodies of equal masses undergoing an oblique collision move at right angles to each other after the collision.	5