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Class: XI SESSION - 2022-2023

SAMPLE QUESTION PAPER (THEORY) FOR PRACTICE

SUBJECT: PHYSICS HALF YEARLY EXAM

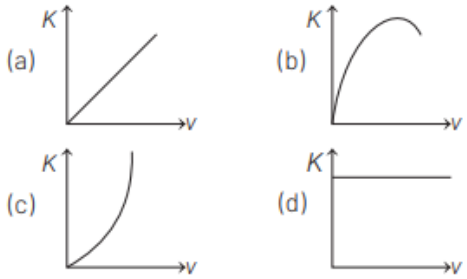
Maximum Marks: 70 Marks **Time Allowed: 3 hours.**

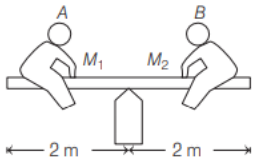
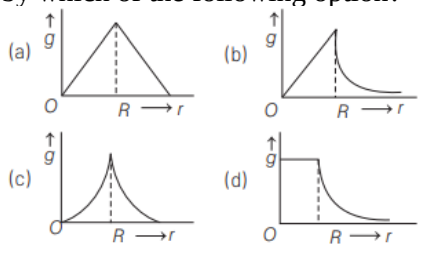
General Instructions:

(1) There are **35 questions** in all. All questions are compulsory
(2) This question paper has five sections: **Section A, Section B, Section C, Section D and Section E**. All the sections are compulsory.
(3) **Section A** contains **eighteen MCQ of 1 mark** each, **Section B** contains **seven questions of two marks** each, **Section C** contains **five questions of three marks** each, **section D** contains **three long questions of five marks** each and **Section E** contains **two case study-based** questions of **4 marks** each.
(4) There is **no overall choice**. However, **an internal choice** has been provided in section B, C, D and E. You have to attempt only one of the choices in such questions.
(5) Use of calculators is not allowed.

SECTION A

Q. No.		MARKS
1	Which of the following pairs has same dimensions? (a) Angular momentum and Plank's constant (b) Dipole moment and electric field (c) Both (a) and (b) (d) None of these.	1
2	If force (F), length (L) and time (T) are assumed to be fundamental units, then the dimensional formula of the mass will be (a) $[FL^{-1}T^{2}]$ (b) $[FL^{-1}T^{-2}]$ (c) $[FL^{-1}T^{-1}]$ (d) $[FL^{2}T^{2}]$	1
3	Error in the measurement of radius of a sphere is 1%. Then error in the measurement of volume is (a) 1% (b) 5% (c) 3% (d) 8%	1
4	A car travels 300 m in 10s. It covers 48 m in the 10^{th} second. The acceleration of the car is ___ (a) 2 ms^{-2} (b) 4 ms^{-2} (c) 5 ms^{-2} (d) 3 ms^{-2}	1

5	A particle A is dropped from a height and another particle B is thrown in a horizontal direction with the speed of 5m/sec from the same height. The correct statement is (a) Particle B will reach the ground first (b) Both particles will reach the ground with the same speed (c) Particle A will reach the ground first (d) Both particles will reach the ground simultaneously	1
6	Three blocks A, B, C and of masses 4 kg, 2 kg and 1 kg respectively, are in contact on a frictionless surface, as shown in the figure. If a force of 14 N is applied on the 4 kg block, then the contact force between A and B is  (a) 2 N (b) 6 N (c) 8 N (d) 18 N	1
7	Which one of the following statements is incorrect? (a) Frictional force opposes the relative motion. (b) Limiting value of static friction is directly proportional to normal reaction. (c) Rolling friction is smaller than sliding friction. (d) Coefficient of sliding friction has dimensions of length.	1
8	Amongst the given graphs which one correctly represents the variation of the kinetic energy (K) of a body with velocity (v) ? 	1
9	Match the Column I (angle) with Column II (work done) and select the correct option from the codes given below. **Column I** / **Column II** A. $\theta < 90°$ — p. Friction B. $\theta = 90°$ — q. Satellite rotating around the earth C. $\theta > 90°$ — r. Coolie is lifting a luggage Codes A B C (a) p q r (b) r q p (c) p r q (d) r p q	1
10	A ball kept in a closed box moves in the box making collisions with the walls. The box is kept on a smooth surface. The velocity of the centre of mass (a) of the box remains constant (b) of the box and the ball system remains constant (c) of the ball remains constant (d) of the ball relative to the box remains constant	1

11	In the game of see-saw, what should be the displacement of boy B from right edge to keep the see-saw in equilibrium? (Given, M_1 = 40 kg and M_2 = 60 kg)  (a) 4/3 m (b) 1m (c) 2/3 m (d) Zero	1
12	If radius of earth is reduced to half without changing its mass, then match the following columns and choose the correct option from the codes given below. **Column I** / **Column II** A. Angular momentum of earth — p. Will become one fourth B. Time period of rotation of earth — q. Will become four times C. Rotational kinetic energy of earth — r. No change Codes A B C (a) p q r (b) p q p (c) r p q (d) p r p	1
13	Starting from the centre of the earth having radius R, the variation of g (acceleration due to gravity) is shown by which of the following option?  	1
14	Which of the following statement is incorrect? (a) Acceleration due to gravity decreases with increasing altitude. (b) Acceleration due to gravity increases with increasing depth (assume the earth to be a sphere of uniform density). (c) Acceleration due to gravity increases with increasing altitude. (d) None of the above	1
15	Match the Column I (quantities) with Column II (approximate values) and select the correct answer from the codes given below. **Column I** / **Column II** A. Escape velocity of earth — p. 1.6 m/s^2 B. Gravitational acceleration at moon's surface — q. 6400 km C. Radius of earth — r. 11.2 km/s Codes A B C (a) p q r (b) r q p (c) q r p (d) r p q	1

16	Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (1), (2), (3) and (4) as given below. (1) Both A and R are true and R is the correct explanation of A (2) Both A and R are true and R is NOT the correct explanation of A (3) A is true but R is false (4) A is false and R is also false **Assertion**: A seasoned cricketer allows a longer time for his hands to stop the ball, while catching the ball. His hand is not hurt. **Reason** The novice (new player) keeps his hand fixed and tries to catch the ball almost instantly. He needs to provide a much greater force to stop the ball instantly and these hurts.	1
17	Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (1), (2), (3) and (4) as given below. (1) Both A and R are true and R is the correct explanation of A (2) Both A and R are true and R is NOT the correct explanation of A (3) A is true but R is false (4) A is false and R is also false **Assertion** There is no loss in energy in elastic collision. **Reason** Linear momentum is conserved in elastic collision.	1
18	Two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (1), (2), (3) and (4) as given below. (1) Both A and R are true and R is the correct explanation of A (2) Both A and R are true and R is NOT the correct explanation of A (3) A is true but R is false (4) A is false and R is also false **Assertion** The velocity of the satellite increases as its height above earth's surface increases and is minimum near the surface of the earth. **Reason** The velocity of the satellite is directly proportional to square root of its height above earth's surface.	1

SECTION B

19	Check the correctness of the given relation $h = \frac{2T\cos\theta}{r\rho g}$, where letters have their usual meaning	2
20	How long will it take a shell fired from a cliff at an initial velocity of 800m/s at an angle 30°below the horizontal to reach the ground 150 m below?	2
21	ABCD is a parallelogram and AC and BD are its diagonals. Prove that (i) $\overline{AC} + \overline{BD} = \overline{2BC}$ (ii) $\overline{AC} - \overline{BD} = \overline{2AB}$ OR Two forces equal to P N and 2P N act on a particle. If the first be doubled and 20 N increase the second, the direction of the resultant is unaltered. Find the value of P.	2
22	The railway bridge over a canal is in the form of an arc of a circle of radius 20 m. What is the minimum speed with which a car can cross the bridge without leaving contact with the ground at the highest point?	2

23	What are conservative forces? OR Give the conditions for a collision to be inelastic.	2
24	Write the law of conservation of angular momentum.	2
25	Derive an expression for the rotational kinetic energy.	2

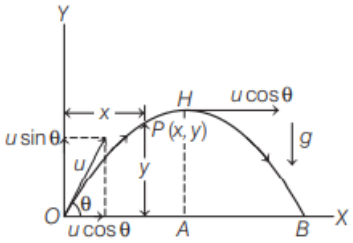
SECTION C

26	In a new system, unit of mass is 10kg, unit of length is 5m and unit of time is 10s. Then in the new system find the value of 5N.	3
27	A projectile is fired horizontally with a velocity of 98m/s from the top of a hill 490m high. Find the (i) the time taken to reach the ground (ii) the distance of the target from the hill and (iii) the velocity with which the projectile hits the ground.	3
28	What percentage of K.E. of a moving particle is transferred to a stationary particle, when moving particle strikes with a stationary particle of mass (a) 9 times in mass (b) Equal in mass (c) $\frac{1}{19}^{th}$ of its mass?	3
29	Find the acceleration of a cylinder rolling on an incline without slipping OR Show that $\overrightarrow{L} = 2m\frac{\overrightarrow{dA}}{dt}$ Where letters have their usual meaning.	3
30	What are the conditions for a satellite to be geostationary?	3

SECTION D

31	(a) Find an expression for centripetal acceleration. 2 (b) Find the relation between linear acceleration and angular acceleration. 3 OR (a) Show that the path of a projectile is parabolic in shape. 2 (b) Show that there are two angles of projections for which horizontal range is same. 3	5
32	(a) Discuss the motion of a body in a vertical circle. 3 (b) Why passengers sitting in a vehicle thrown outwards, when the vehicle rounds a curve suddenly? 2 OR (a) Write the laws of Limiting friction. 2 (b) Derive expression for maximum speed of a vehicle on a banked road without skidding. 3	5
33	(a) State and explain Kepler's laws of planetary motion. 3 (b) Establish the relation; $g = \frac{4\pi}{3} GR\rho$, where ρ is mean density of earth, g is acceleration due to gravity, G is universal gravitational constant, R is radius of earth 2 OR (a) Define escape velocity and find a relation for it near earth's surface. 3 (b) Find expression for binding energy of a satellite. 2	5

SECTION E

34	**Case Study: Projectile motion** **Read the following paragraph and answer the questions.** Projectile motion is a form of motion in which an object or particle is thrown with some initial velocity near the earth's surface and it moves along a curved path under the action of gravity alone. The path followed by a projectile is called its trajectory, which is shown below. When a projectile is projected obliquely, then its trajectory is as shown in the figure. Here velocity u is resolved into two components, we get (a) u cosθ along OX and (b) u sinθ along OY.  (a) Define projectile motion. 1 (b) What is the vertical component of velocity at the top of its trajectory? 1 (c) What is the acceleration along horizontal direction? 2 OR (c) what is the angle between velocity and acceleration at the top of its path? 2	4
35	**Case Study: Momentum and Newton's Second Law of Motion** **Read the following paragraph and answer the questions.** Momentum of a body is the quantity of motion possessed by the body. It depends on the mass of the body and the velocity with which it moves. When a bullet is fired by a gun, it can easily pierce human tissue before coming to rest resulting in casualty. The same bullet fired with moderate speed will not cause much damage. The greater the change in momentum in a given time, the greater is the force that needs to be applied. The second law of motion refers to the general situation, where there is a net external force rating on the body. (a) Define linear momentum. 1 (b) Linear momentum is a vector or scalar quantity? 1 (c) What is basis of Newton's 2nd law? 2 OR (c) How does force and linear momentum related? 2	4