



Indian School Al Wadi Al Kabir

Assessment 1 (2026-27)

Sub: Physics (042)

SET- II

Class: XI

Date: 13/09/2026

Max. Marks: 70

Time: 3 hours

General Instructions:

Read the following instructions carefully and follow them:

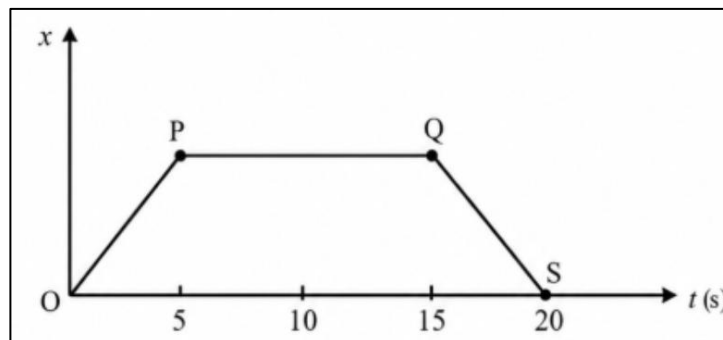
- (i) This question paper contains 33 questions. All questions are compulsory.
- (ii) This question paper is divided into five sections – Sections A, B, C, D and E.
- (iii) In Section A – Questions no. 1 to 16 are Multiple Choice type questions. Each question carries 1 mark.
- (iv) In Section B – Questions no. 17 to 21 are Very Short Answer type questions. Each question carries 2 marks.
- (v) In Section C – Questions no. 22 to 28 are Short Answer type questions. Each question carries 3 marks.
- (vi) In Section D – Questions no. 29 and 30 are case study-based questions. Each question carries 4 marks.
- (vii) In Section E – Questions no. 31 to 33 are long-answer type questions. Each question carries 5 marks.
- (viii) There is no overall choice given in the question paper. However, an internal choice has been provided in a few questions in all sections except Section A.
- (ix) Use of calculators is not allowed.

SECTION- A

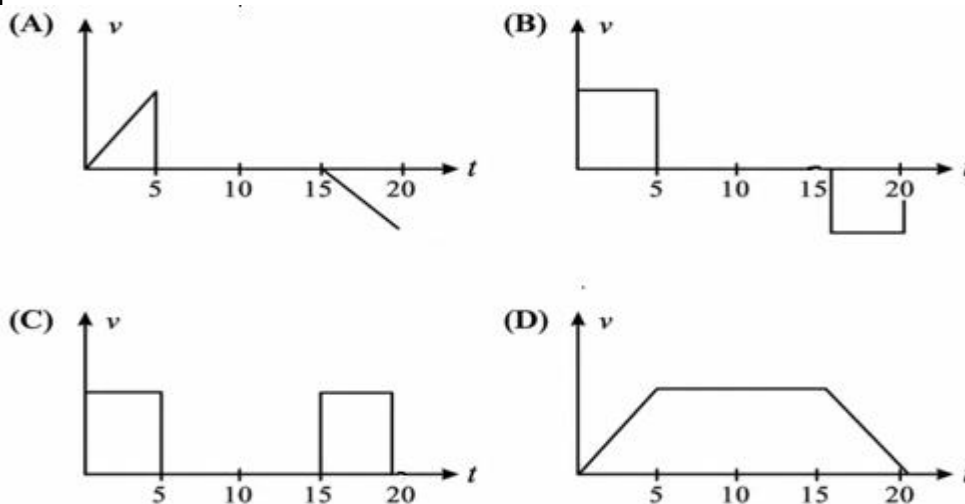
1. According to the work-energy theorem, the work done by the net force on a particle is equal to the change in its
(A) kinetic energy
(B) potential energy
(C) linear momentum
(D) angular momentum 1
2. The dimensional formula of relative density is:
(A) $ML^{-3}T^0$
(B) M^0LT^{-1}
(C) MLT^{-2}
(D) $M^0L^0T^0$ 1
3. If P, Q, R are physical quantities having different dimensions, which of the following combinations can never be a meaningful quantity?
(A) $(P-Q)/R$
(B) $PQ-R$
(C) PQ/R
(D) $(PR-Q^2)/R$ 1

4. The speed of sound in a gas is given by $v = \sqrt{\frac{\gamma P}{d}}$ where P is pressure and d is density. The dimensional formula for γ is: 1
- (A) $M^{-1}L^1T^2$
 (B) $M^0L^0T^0$
 (C) $M^0L^{-1}T^0$
 (D) $M^0L^0T^1$

5. The given figure represents the displacement (x)-time (t) graph for a particle in one-dimensional motion. 1



Which of the figures given below represents the variation in velocity of the particle with time?

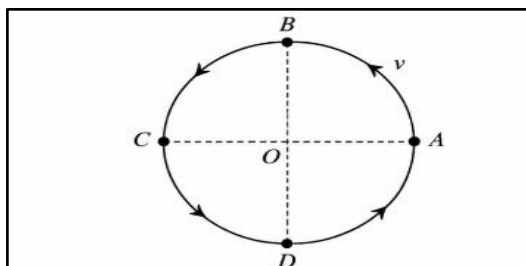


6. A vehicle is moving with a uniform velocity on a smooth horizontal road; then the power delivered by its engine must be: 1
- (A) uniform
 (B) increasing
 (C) decreasing
 (D) zero

7. A car travels half the distance L with speed v_1 and the other half with speed v_2 , then its average speed is: 1
- (A) $\frac{v_1 + v_2}{2}$ (B) $\frac{2v_1 + v_2}{v_1 + v_2}$
 (C) $\frac{2v_1 v_2}{v_1 + v_2}$ (D) $\frac{2(v_1 + v_2)}{v_1 v_2}$

8. Two vectors are perpendicular if 1
- (A) $\vec{A} \cdot \vec{B} = 1$
 (B) $\vec{A} \times \vec{B} = 0$
 (C) $\vec{A} \cdot \vec{B} = 0$
 (D) $\vec{A} \cdot \vec{B} = AB$

9. The figure alongside shows a body of mass m moving with a uniform speed v along a circle of radius r . 1



The change in velocity in going from A to B is:

- (A) $v\sqrt{2}$
 (B) $\frac{v}{\sqrt{2}}$
 (C) v
 (D) zero
10. Which of the following forces is self- adjusting? 1
 (A) Static friction
 (B) Kinetic friction
 (C) Limiting friction
 (D) Rolling friction
11. A monkey is climbing up a rope; then the tension in the rope: 1
 (A) must be equal to the force applied by the monkey on the rope
 (B) must be less than the force applied by the monkey on the rope
 (C) must be greater than the force applied by the monkey on the rope
 (D) may be equal to, less than, or greater than the force applied by the monkey on the rope
12. A block of mass 2kg is resting on a rough inclined plane of inclination 30° . The coefficient of friction is 0.8; the contact force between the plane and the block is ($g=10 \text{ ms}^{-2}$) 1
 (A) 20 N
 (B) 10 N
 (C) $10\sqrt{3}$ N
 (D) $20\sqrt{3}$ N

Questions 13 to 16 are Assertion (A) and Reason (R) type questions. Two statements are given: one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer from the codes (A), (B), (C) and (D) as given below.

(A) Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Both Assertion (A) and Reason (R) are false.

13. **Assertion(A):** A body can have acceleration even if its velocity is zero at a given instant of time. 1
Reason(R): A body is momentarily at rest when it reverses its direction of motion.
14. **Assertion (A):** The magnitude of the resultant of two vectors may be less than the magnitude of either vector. 1
Reason (R): Vector addition is commutative
15. **Assertion(A):** On a banked curved track, the horizontal component of normal reaction provides the necessary centripetal force. 1
Reason(R): Centripetal force is not always required for turning in a circular path.

16. **Assertion (A):** The area under a force-displacement graph gives the work done by the force. 1
Reason (R): Work done is defined as the cross product of force and displacement.

SECTION- B

17. (a) A man of mass 70 kg stands on a weighing scale in a lift which is moving 2
 (i) downwards with a uniform acceleration of 5 m s^{-2} ,
 (ii) upwards with a uniform acceleration of 5 m s^{-2} .
 What would be the readings on the weighing scale in each case?
 (Take $g=10 \text{ m/s}^2$)

OR

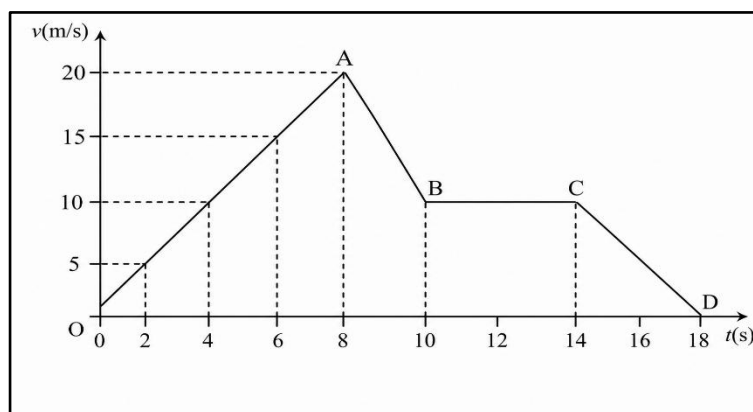
- (b) A ball of 0.5g mass moving with a speed of 10m/s rebounds after striking a perfectly elastic wall normally. Find the change in momentum of the ball.
18. State the triangle law of vector addition. 2
19. In the gas equation $(P + a/V^2)(V - b) = RT$, where T is the absolute temperature, P is the pressure, and V is the volume. What are the dimensions of constants a and b? 2
20. An electron and a proton are detected in a cosmic ray experiment, the first with kinetic energy 10keV and the second with 100keV. Which is faster, the electron or the proton? Justify ($m_e = 9.1 \times 10^{-31} \text{ kg}$, $m_p = 1.6 \times 10^{-27} \text{ kg}$) 2
21. Draw the velocity- time graph of uniform accelerated motion in one dimension. 2
 From the velocity-time graph of uniform accelerated motion, deduce the equation of motion $v^2 - u^2 = 2as$.

SECTION- C

22. (a) A particle starts from rest with constant acceleration for 100 s, then moves 3
 with constant velocity for 5 min. Finally, the particle retards uniformly and comes to rest in 150 s.
 (i) Draw a v-t graph.
 (ii) If the total distance travelled by the particle is 4250 m, then find the maximum speed.
 (iii) Also, find the value of acceleration and retardation.

OR

- (b) The velocity–time graph of a particle moving along a straight line is shown in the figure by curve OABCD. Calculate the distance covered by the particle between (i) $t = 0 \text{ s}$ to $t = 18 \text{ s}$, (ii) $t = 2 \text{ s}$ to 12 s , and the maximum value of acceleration during this interval.

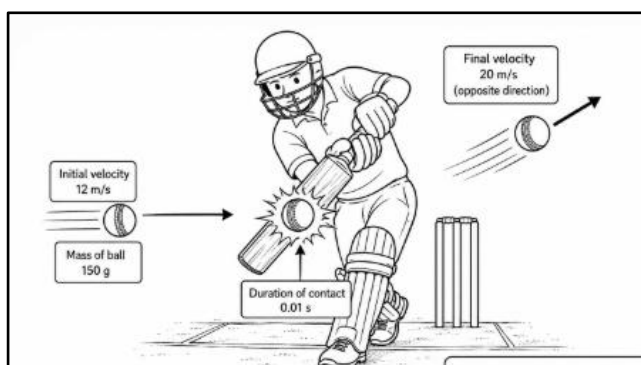


23. (i) State the homogeneity principle. 3
 (ii) The frequency of vibration (n) of a string depends upon the length (l) of the string, tension/force (T) of the string and mass per unit length (m) of the string. Using the method of dimensions, derive a formula for the frequency of vibration of the string.
24. (i) Can the scalar product of the vectors be zero even if neither of them is a zero vector? Explain. 3
 (ii) Find the angle between the vectors $\mathbf{A} = \hat{i} + 2\hat{j} - \hat{k}$ and $\mathbf{B} = -\hat{i} + \hat{j} - 2\hat{k}$.
25. State the parallelogram law of vector addition. Show that the resultant of two vectors $\mathbf{A}$ and $\mathbf{B}$ inclined at an angle θ is $R = \sqrt{A^2 + B^2 + 2AB\cos\theta}$. 3
26. (i) Two objects having different masses have the same momentum. Which one of them will move faster? 3
 (ii) An athlete runs some distance before taking a jump. Explain why?
 (iii) What is the effect on the acceleration of a particle if the net force on the particle is doubled?
27. Derive an expression for the acceleration and the tension in the string for a system of two masses connected by a string passing over a smooth, frictionless pulley. 3
28. Show that in the case of a freely falling body, the total energy remains constant at every point in its path. 3

SECTION- D

Questions numbered 29 and 30 are Case Study-based questions. Read the following paragraphs and answer the questions that follow.

29. During a cricket match, a batter hits a ball of mass 150 g that is initially moving towards him with a velocity of 12 ms^{-1} . After being struck by the bat, the ball reverses its direction and moves away with a velocity of 20 ms^{-1} . The bat remains in contact with the ball for only 0.01 s. Although the contact time is very short, the large change in velocity produces a significant change in the momentum of the ball. According to Newton's second law of motion, the force acting on an object is related to the rate of change of its momentum. The product of force and the time interval for which it acts is called impulse, and it is equal to the change in momentum of the object.



Based on the above information, answer the following questions:

- (i) The impulse of force imparted to the cricket ball is 1
 (A) 7.4 N s
 (B) 4.8 N s
 (C) 1.2 N s
 (D) 4.7 N s

- (ii) The average force exerted by the bat on the ball is 1
 (A) 480 N
 (B) 120 N
 (C) 1200 N
 (D) 840 N
- (iii) The retardation of the ball is 1
 (A) 1600 m/s^2
 (B) 320 m/s^2
 (C) 3200 m/s^2
 (D) 160 m/s^2
- (iv) (a) The force acting on the object whose linear momentum changes by 1
 20 kg m/s in 10 s is
 (A) 2 N
 (B) 20 N
 (C) 200 N
 (D) 0.2 N

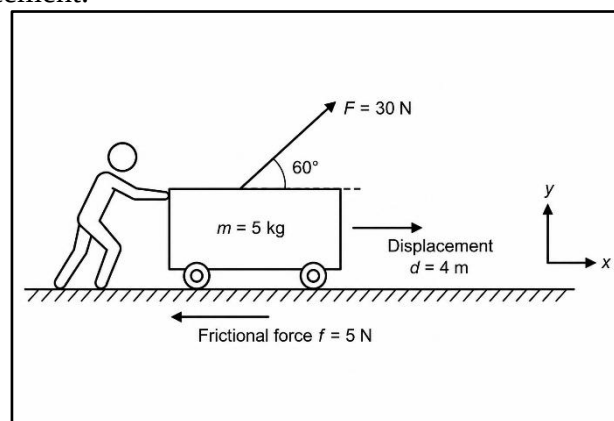
OR

- (b) An impulsive force of 100 N acts on an object for 1 s. The change in its linear momentum is
 (A) 10 Ns
 (B) 100 Ns
 (C) 1000 Ns
 (D) 1 Ns

30. During a physics activity, a student pushes a trolley of mass 5 kg along a horizontal floor. A constant force of 30 N is applied at an angle of 60° to the horizontal, and the trolley moves through a displacement of 4 m in the direction of the horizontal. The frictional force opposing the motion is 5 N. The student analyses the motion using the work-energy theorem, which states that the change in kinetic energy of an object is equal to the work done by the net force on it.

The work done by a force depends on the component of the force along the displacement. Thus, for a force (F) making an angle θ with displacement (d),
 $[W = Fd \cos \theta]$

A force can do positive, negative, or zero work depending on its direction relative to the displacement.



- (i) The work done by the student's applied force on the trolley is: 1
 (A) 30 J
 (B) 60 J
 (C) 120 J
 (D) 240 J

- (ii) The work done by the frictional force during the 4 m displacement is: 1
- (A) (+20) J
(B) (-20) J
(C) (+5) J
(D) (-5) J
- (iii) The net work done on the trolley is: 1
- (A) 40 J
(B) 60 J
(C) 100 J
(D) 140 J
- (iv) (a) If the trolley initially had a kinetic energy of 20 J, its kinetic energy after moving through 4 m would be: 1
- (A) 40 J
(B) 60 J
(C) 80 J
(D) 120 J

OR

- (b) Suppose the student stops pushing the trolley, but the trolley continues to move on a frictionless horizontal surface. Which statement correctly explains the work done by the gravitational force?
- (A) Gravity does positive work because the trolley is moving.
(B) Gravity does negative work because it acts downward.
(C) Gravity does zero work because the force is perpendicular to the displacement.
(D) Gravity does maximum work because its magnitude is $m \times g$.

SECTION- E

31. (a) What is meant by banking of a road? What is the need for banking? Obtain an expression for the maximum speed with which a vehicle can safely negotiate a curved road banked at an angle θ . The coefficient of friction between the wheels and the road is μ_s . 5

OR

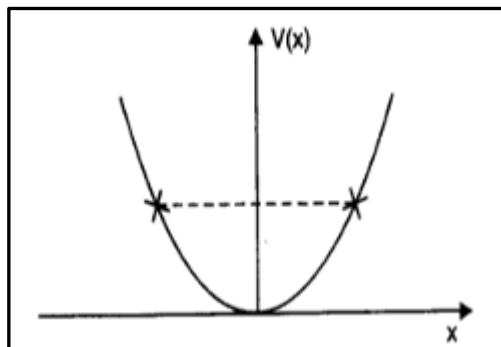
- (b)
- (i) State and prove the law of conservation of linear momentum.
- (ii) A boy and a girl skater are at rest at the centre of a large ice rink. They push away from each other. The girl, whose mass is 40 kg, moves off at 1.2 ms^{-1} . With what speed will the boy, whose mass is 60 kg, move off?
32. (a) 5
- (i) A body is projected at an angle θ with the horizontal with velocity 'u'. Derive an expression for its (I) Time of flight and (II) Horizontal range.
- (ii) A body A of mass m is thrown with velocity u at an angle of 30° to the horizontal, and another body B of the same mass is thrown with velocity u at an angle of 60° to the horizontal. Find the ratio of the horizontal range and maximum height of A and B.

OR

- (b)
- (i) Derive an expression for the centripetal acceleration of an object in uniform circular motion in a plane.
- (ii) What is the value of angular speed for 1 revolution?

33. (iii) A stone is tied to the end of a string 80 cm long and is whirled in a horizontal circle with a constant speed. If the stone makes 14 revolutions in 25 seconds, what is the magnitude and direction of acceleration?
- (a) (i) State the law of conservation of mechanical energy.
(ii) Obtain an expression for the potential energy stored in an elastic spring of force constant k that is stretched by an amount x .
(iii)

5



The potential energy function for a particle executing simple harmonic motion is given by $V = kx^2/2$, where k is the force constant of the oscillator. For $k = 0.5 \text{ N m}^{-1}$, the graph of $V(x)$ versus x is shown in the figure. Show that a particle of total energy 1J moving under this potential must turn back when it reaches $x = \pm 2\text{m}$.

OR

- (b) (i) Define elastic and inelastic collision.
(ii) Obtain the expression for the velocities of two bodies after an elastic collision in one dimension.
(iii) Show that in the case of a one-dimensional elastic collision of two bodies of masses m_1 and m_2 (initially at rest), if $m_2 \gg m_1$, the heavier mass m_2 will be undisturbed while the lighter mass reverses its velocity.

All the Best