

KENDRIYA VIDYALAYA SITAPUR (FIRST SHIFT)

Unit Test – 1 (Session 2023 – 2024)

Class – XI (Subject – Physics)

Time – 90 minutes

M.M. – 40

General Instructions :

- 1) There are 19 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 eight MCQ and two assertion reason questions of 1 mark each, Section B contains three short questions of 2 marks each, Section C contains two short questions of 3 marks each, Section D contains two long questions of 5 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. You have to attempt only one of the choices in such questions.
- 5) Use of calculators is not allowed.

Section A (1 mark each)

Q.1) State the number of significant figures in 0.0030 :

- (a) 4 (b) 3 (c) 2 (d) 1

Q.2) The dimensional formula of work done is :

- (a) $[MLT^{-2}]$ (b) $[ML^2T^{-2}]$ (c) $[MLT^{-3}]$ (d) $[ML^2T^{-3}]$

Q.3) The area under the velocity – time graph represent :

- (a) displacement (b) distance (c) speed (d) acceleration

Q.4) The slope of position – time graph represent :

- (a) displacement (b) distance (c) velocity (d) acceleration

Q.5) If a cycle wheel of radius 4 m completes one revolution in 2 s, then acceleration of the cycle is :

- (a) $\pi \text{ m/s}^2$ (b) $\pi^2 \text{ m/s}^2$ (c) $2\pi^2 \text{ m/s}^2$ (d) $4\pi^2 \text{ m/s}^2$

Q.6) Two bodies are projected with the same velocity. If one is projected at an angle of 30° and the other at 60° to the horizontal, then ratio of maximum height reached is. :

- (a) 1 : 3 (b) 3 : 1 (c) 1 : 2 (d) 2 : 1

Q.7) A boy of 50 kg is standing in a lift moving down with an acceleration 10 m/s^2 . The apparent weight of the boy is ($g = 10 \text{ m/s}^2$) :

- (a) 50 N (b) 100 N (c) 1000 N (d) zero

Q.8) If the coefficient of friction of a surface is $\sqrt{3}$, then the angle of inclination of the plane to make a body on it just to slide is :

- (a) 30° (b) 60° (c) 45° (d) 90°

Instructions: For Question numbers 9 and 10, two statements are given - one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) are as given below.

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true and R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false and R is also false.

Q.9) Assertion (A) : Displacement of a body may be zero, when distance travelled by it is not zero.

Reason (R) : Displacement is the longer distance between initial and final positions.

Q.10) Assertion (A) : Impulsive force is large and acts for a short time.

Reason (R) : Finite change in momentum should be produced by the force.

Section B (2 marks each)

- Q.11) Find the dimensions of $(a \times b)$ in the equation : $E = (b - x^2) / at$, where E is energy, x is distance and t is time.
Q.12) Using parallelogram law of vector addition, show that the resultant **R** of two vectors **A** & **B** inclined at an angle θ is given by $R = \sqrt{A^2 + B^2 + 2 AB \cos\theta}$.
Q.13) State Newton's second law of motion. Prove that $F = m \times a$.

Or

State impulse – momentum theorem. A batsman hits back a ball straight in the direction of the bowler without changing its initial speed of 12 m/s . If the mass of the ball is 0.15 kg , determine the impulse imparted to the ball.

Section C (3 marks each)

- Q.14) The time period of simple pendulum 'T' depends on the mass m of the bob, length l of the pendulum and acceleration due to gravity g. Derive the expression for its time period using method of dimensions.
Q.15) Derive second equation of motion by graphically method.

Or

Derive third equation of motion by graphically method.

Section D (5 marks each)

- Q.16) What is a projectile and projectile motion ? A projectile is fired with a velocity u making an angle θ with the horizontal. Derive expression for its :
(a) time of flight
(b) maximum height
(c) horizontal range
Q.17) State the law of conservation of linear momentum . Derive this law for two bodies of masses m_1 and m_2 moving with initial velocities u_1 and u_2 ($u_1 > u_2$) in a straight line collide each other and after collision their velocities becomes v_1 and v_2 .

Or

What is meant by banking of roads ? 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 .

Section E (4 marks)

Q.18) Case Study 1 : Uniform Circular Motion

Read the following paragraph and answer the questions given below.

When an object follows a circular path at a constant speed, the motion of the object is called uniform circular motion. The word 'uniform' refers to the speed which is uniform (constant) throughout the motion. Suppose an object is moving with uniform speed v in a circle of radius r . Since the velocity of the object is changing continuously in direction, the object undergoes acceleration .

- (a) Define angular velocity.
(b) Define angular acceleration.
(c) Define centripetal acceleration. Write its formula.

Q.19) Case Study 2 : Friction

Read the following paragraph and answer the questions given below.

Whenever a body moves or tends to move over the surface of another body, a force comes into play which acts parallel to the surface of contact and opposes the relative motion. This opposing force is called friction.

- (a) Define static friction.
(b) Define limiting friction.
(c) Define angle of friction. Deduce its relation with coefficient of friction.