



UNIT TEST (2023 - 24)

Class: XI
Date: 25.05.2023

Sub: PHYSICS (042)
Set - 1

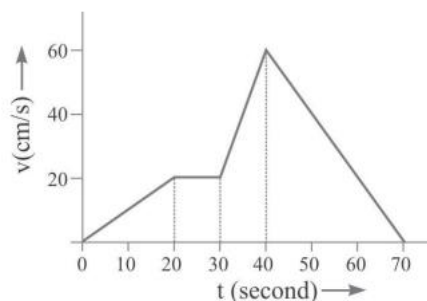
Max Marks: 30
Time : 1 hour

General Instructions:

- (1) There are 15 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.
- (3) All the sections are compulsory.
- (4) **Section A** contains eight questions, six MCQ and two Assertion Reasoning based of 1 mark each, **Section B** contains two questions of two marks each, **Section C** contains three questions of three marks each, **Section D** contains one case study based question of four marks and **Section E** contains one long answer questions of five marks.
- (5) There is no overall choice. However, an internal choice has been provided in one question in Section B, one question in Section C, one question in Section D and one question in Section E. You have to attempt only one of the choices in such questions.
- (6) Use of calculators is not allowed.

SECTION-A (1 X 8 = 8)

- 1) What happens if a vector is multiplied by a number -2 ?
 - a) The magnitude of the vector is doubled but its direction remains the same
 - b) The magnitude of the vector remains the same but its direction is reversed
 - c) The magnitude of the vector is doubled and its direction is reversed
 - d) Neither the magnitude nor the direction of the vector undergo any change
- 2) A The velocity versus time curve of a moving point is as given below. The maximum acceleration is
 - a) 1 cm/s^2
 - b) 2 cm/s^2
 - c) 3 cm/s^2
 - d) 4 cm/s^2
- 3) Choose the incorrect statement
 - a) The motion of an object along a straight line is a rectilinear motion
 - b) The area under the velocity – time graph gives displacement of the body
 - c) The speed in general is less than the magnitude of the velocity
 - d) The negative slope of velocity – time graph indicates a retarded motion



- 4) Speeds of two identical cars are u and $4u$ at a specific instant. The ratio of the respective distances at which the two cars are stopped at the same instant is
- 1:1
 - 1:4
 - 1:8
 - 1:16
- 5) If a unit vector is represented by $0.5\hat{i} + 0.8\hat{j} + c\hat{k}$ then the value of 'c' is
- 1
 - $\sqrt{0.8}$
 - $\sqrt{0.01}$
 - $\sqrt{0.11}$
- 6) The magnitude of the resultant of two vectors is maximum when the angle between them is
- 0°
 - 45°
 - 60°
 - 90°

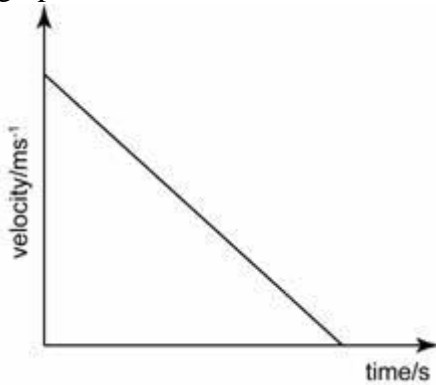
For Questions 7 to 8, two statements are given –one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options as given below.

- If both Assertion and Reason are true and Reason is correct explanation of Assertion.**
 - If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.**
 - If Assertion is true but Reason is false.**
 - If both Assertion and Reason are false.**
- 7) **Assertion:** A body may be accelerated even when it is moving uniformly.
Reason: When direction of motion of the body is changing, the body must have acceleration.
- 8) **Assertion:** A physical quantity cannot be called as a vector if its magnitude is zero.
Reason: A vector has only magnitude.

SECTION-B (2 X 2 = 4)

- 9) a) State triangular law of vector addition.
b) Find the unit vector of $2\hat{i} - 3\hat{j} + \sqrt{3}\hat{k}$

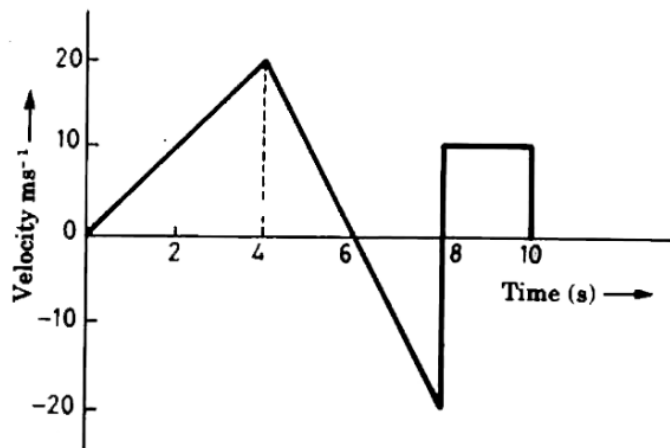
- 10) a) Velocity - time graph of any object is as shown in the figure. Draw displacement - time graph for this motion.



- b) The v-t graph of two objects make angles of 30° and 60° with the time axis. Find the ratio of their accelerations.

OR

- 10) The velocity – time graph of an object moving along a straight line is shown in the figure. Find the net distance covered by the object in time interval between $t = 0$ s and $t = 10$ s. Also find the displacement in time 0 to 10 s.



SECTION-C (3 X 3 = 9)

- 11) Derive an expression for the magnitude and direction of the resultant of two vectors making an angle Θ with each other.
- 12) a) What does the slope of position – time graph give?
- b) Define instantaneous velocity. What is the numerical ration of average velocity to average speed of an object when it is moving in a straight path without changing direction?

- 13) a) A body travelling along a straight line traversed one third of the total distance with a velocity 4 ms^{-1} . The remaining part of the distance was covered with a velocity 2 ms^{-1} for half the time and with velocity 6 ms^{-1} for the other half of time. What is the mean velocity averaged over the whole time of motion?
- b) Write two differences between speed and velocity.

OR

- a) On a 100 km track, a train moves the first 50 km with a uniform speed of 50 kmh^{-1} . How fast must the train travel the next 50 km so as to have average speed 60 kmh^{-1} for the entire trip?
- b) Write two differences between distance and displacement.

SECTION-D (4 X 1 = 4)

- 14) In one dimensional motion of the objects only two directions are possible. So the directional aspects of the quantities like displacement, position, velocity and acceleration can be described by using either positive or negative sign. Physical quantity shown along positive direction will be given the positive sign whereas the physical quantity shown along negative direction possesses negative sign but in the case of motion of objects in two dimensions or in three dimension any object can have large number of directions. So in order to deal with such situation we need to introduce the concept of new physical quantities in which we take care of both magnitude and direction in physics. The physical quantities are broadly classified into categories scalars and vectors.
- i. Angle between negative vectors is
- a) 0° b) 60° c) 90° d) 180°
- ii. What is the maximum number of rectangular components into which a vector can be resolved in a plane?
- a) Two b) three c) four d) any number
- iii. If the magnitude of the resultant of two vectors of equal magnitude is equal to the magnitude of either vector, then the angle between the two vectors is
- a) 30° b) 120° c) 90° d) 180°
- iv. A river is flowing from east to west at a speed of 5 m/min . A man on south bank of river, capable of swimming 10 m/min in still water, wants to swim across the river in shortest time. He should swim:
- a) Due north
b) Due north – east
c) Due north – east with double the speed of river
d) None of these

OR

iv. The component of a vector is –

- a) Always less than its magnitude
- b) Always greater than its magnitude
- c) Always equal to its magnitude
- d) None of these

SECTION-E (5 x 1 = 5)

- 15) a) Derive the equation of motion $s = ut + \frac{1}{2}at^2$ for an uniformly accelerated motion from velocity- time graph where all the terms in the equation have their usual meaning.
- b) A burglar's car had a start from rest with an acceleration of 2 ms^{-2} . A police vigilant party came after 5 seconds and continued to chase the burglar's car with a uniform velocity of 20 ms^{-1} . Find the time in which the police van overtakes the burglar's car.

OR

- a) Derive the equation of motion $v^2 - u^2 = 2as$ for an uniformly accelerated motion from velocity- time graph where all the terms in the equation have their usual meaning.
- b) An object is moving along positive x-axis with a uniform acceleration of 4 ms^{-2} . At time $t = 0 \text{ s}$, $x = 5 \text{ m}$ and $v = 3 \text{ ms}^{-1}$. What will be the velocity and position of the object at time $t = 2 \text{ s}$?

MARKING SCHEME

Q.NO.	ANSWERS	MARKS
1	c) The magnitude of the vector is doubled and its direction is reversed	1
2	d) 4 cm/s^2	1
3	c) The speed in general is less than the magnitude of the velocity	1
4	d) 1:16	1
5	d) $\sqrt{0.11}$	1
6	a) 0°	1
7	a) If both Assertion and Reason are true and Reason is correct explanation of Assertion.	1
8	d) If both Assertion and Reason are false.	1
9	a) Statement b) $\hat{A} = \frac{\vec{A}}{ \vec{A} }$ $= \frac{2\hat{i}-3\hat{j}+\sqrt{3}\hat{k}}{4}$	1 $\frac{1}{2} + \frac{1}{2}$

	Arriving at $s = ut + \frac{1}{2}at^2$	1/2
	b) Distance of burglar's car = distance of police car	1/2
	Formula, $s = ut + \frac{1}{2}at^2$	1/2
	$\frac{1}{2} * 2 (t+5)^2 = 20 t$	1/2
	$T = 5 \text{ s}$	1/2
	OR	
	a) Labelled graph	1
	Area under v-t graph gives displacement	1
	Steps	1/2
	Arriving at $v^2 - u^2 = 2as$	1/2
	b) $v = u + at$	1/2
	$= 3 + 4 * 2$	
	$v = 11 \text{ ms}^{-1}$	1/2
	$x = x_0 + ut + \frac{1}{2} at^2$	1/2
	$= 5 + 3 * 2 + \frac{1}{2} (4)^2$	
	$x = 19 \text{ m}$	1/2