Model Lesson Plan

Teacher Name-	Date -
Subject-Physics	CLASS XI
Topic- Position-time and Velocity-time graph	Duration-40-45 min

Learning Objectives

1) The teacher will make the students to understand and recognize the Position-time and Velocity-time graphs for Uniform and non-uniform motion.
2) The teacher will make the students to learn how to draw and interpret information from Position-time and Velocity-time graphs.
3) The teacher will develop the skill to solve numerical problems based on Position-time and Velocity-time graphs.

Learning Outcomes

After completion of this Topic, the students will be able to

1) Recognize Position-time and Velocity-time graphs for Uniform and non-uniform motion.
2) Identify the type of motion by visualizing the Position-time and Velocity-time graph.
3) Compare different cases of uniform and non-uniform motion from graphs.
4) Analyse the information from Position-time and Velocity-time graphs.
5) Explain the importance of Position-time and Velocity-time graphs.
6) Draw Position-time and Velocity-time graphs for different types of motion.
7) Apply the concept of importance of graphs in numerical problems.
8) Solve numerical problems based on Position-time and Velocity-time graphs.
9) Find the distance and displacement and acceleration from Velocity-time graph and velocity from Position-time graph.
10) Develop collaboration skills with peer group.

Learning Resources

Smart board/Chalk board , duster

Teaching Method

Inquiry training method

Previous Knowledge Assumed

1) The students already know about the terms distance, displacement, speed, velocity and acceleration.
2) The students know about basic rules to plot a graph between two variables, related to each other by some relation and one variable depends upon other.
3) They know the equation of straight line and how to find the slope of a line.
4) They know the formulae of area of simple geometrical shapes like triangle, rectangle, square, trapezium etc.

Execution

5E	Teacher activity	Student Response/ Activity
Engage	The teacher will start the class by asking the students that how do they come to school daily?	The students will reply accordingly. Some will say that they come by foot , some by cycle, some by school bus etc.
	How much time do you take to reach the school?	The students will reply accordingly.
	Can you tell about the approximate distance of your home from school.	The students will give different responses.
	Now find the speed of your means of transport using the total distance by the total time, which gives us the average speed.	The students will calculate the speed with their own data and share with other students.
	Now let's do something more. Make a table comprising of the position and time, starting from your home till you reach the school by dividing the time in 4-5 equal intervals.	The students will make a table as par their distance and time taken.
	Can you plot a graph between Position and time for the data you have with	Yes Sir, we know how to plot a graph

<table>
<tr>
<td></td>
<td>you?

The teacher will say yes, I can tell you.

Announcement of topic :
Students today we are going to study about Position-time and Velocity-time graphs.

Now let’s first discuss your query that which variable is to be taken along X axis and which along Y axis.
Here you can take time as independent variable i.e. along X-axis and Position along Y-axis.
Similarly you can plot Velocity-time graph by taking time along X-axis and Velocity along Y-axis.</td>
<td>between two variables but can you tell which variable we have to take along X-axis and which variable along Y-axis?

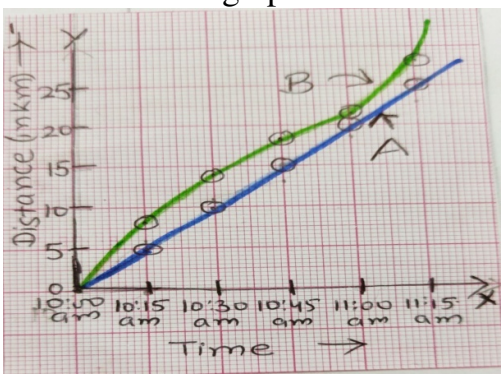
Students will understand what they have to do and plot Position-time graph for their data.</td>
</tr>
<tr>
<td>Explore</td>
<td>Now the teacher will ask the students to make a group of 4-5 students, and will provide each group a set of data comprising of distance and time or Velocity and time to each group and plot graphs.

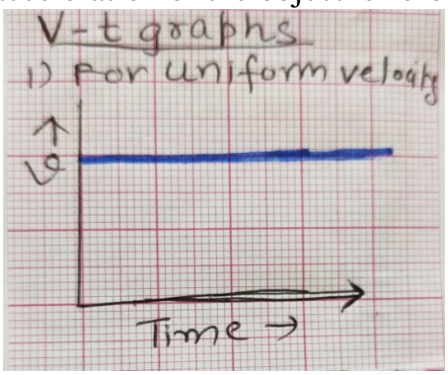
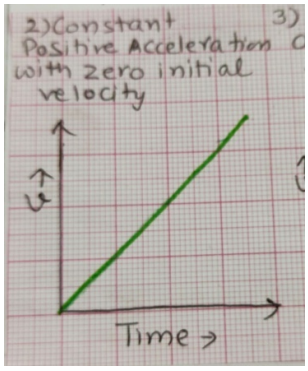
<table>
<tr><td>Time</td><td colspan="2">Distance (in km)</td></tr>
<tr><td></td><td>A</td><td>B</td></tr>
<tr><td>10:00 am</td><td>0</td><td>0</td></tr>
<tr><td>10:15 am</td><td>5</td><td>8</td></tr>
<tr><td>10:30 am</td><td>10</td><td>14</td></tr>
<tr><td>10:45 am</td><td>15</td><td>18</td></tr>
<tr><td>11:00 am</td><td>20</td><td>21</td></tr>
<tr><td>11:15 am</td><td>25</td><td>28</td></tr>
</table>

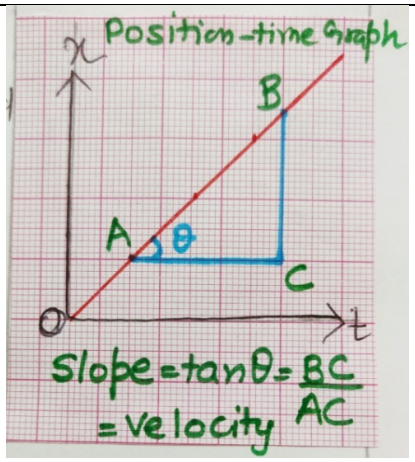
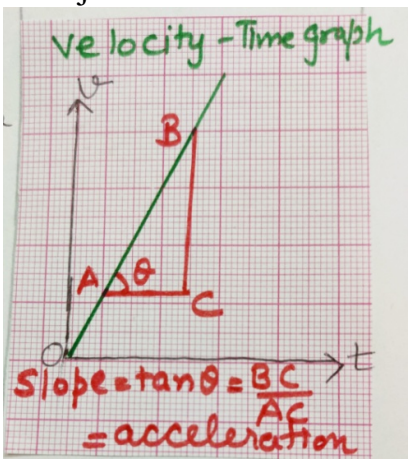
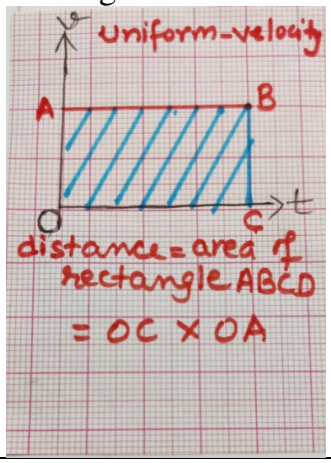
Now the teacher will ask each group to describe about the graph they have plotted by asking some concept points.

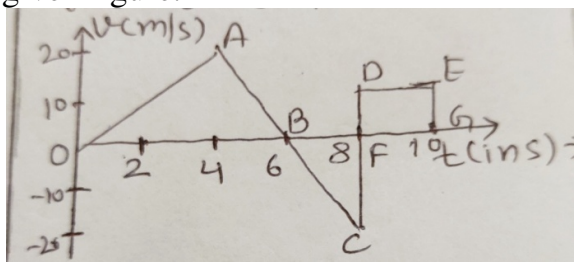
What is the shape of graph you have obtained?</td>
<td>The students will make groups and plot the graphs for the data provided to them by the teacher.

The students will share their observations.</td>
</tr>
</table>

	a) Is it a straight line? b) Is it a single straight line or there are 2, 3 or more straight lines in single graph? c) Is it a curved line? d) If it is curved or it is a straight line then can you tell about the type of motion of the object? e) Very good students, Can of think and tell about the more importance of these Position-time and Velocity-time graphs?	They will tell about shape of the graph that whether it is a straight line or curved line. They will try to understand the type of motion predicted by the graphs they have made and will share their observations.
Explain	From your observations you have learnt a lot about Position-time and Velocity-time graphs. Let's know some important points about these graphs. The teacher will again discuss the two data, which he has provided to the students earlier, one for Uniform and other for non-uniform motion and discuss the two graphs for these.  The Position-time graph for object A is a straight line and gives information that motion of object A is uniform, whereas for object B the shape of graph is a curved line and so the motion of object B is non-uniform. Similarly the teacher will explain about Velocity-time graph. 1) A straight line parallel to time axis tells that object is moving	The students will understand the concept and note in their note books.

	with uniform velocity and acceleration of the object is zero.  2) A straight line inclined to time axis tells that object is moving with uniform acceleration.  3) A curved line gives information that acceleration of the object is non-uniform. Do you know about how to find the slope of line in a graph ? OK, so here if we find slope of Position-time graph, then what information we can get from this? Then the teacher will explain the importance of Position-time and Velocity-time graphs. 1) The slope of Position-time graph gives the velocity of the object.	Yes the slope can be found by the tangent of the angle that the straight line makes with the X-axis. Students may not be able to tell this

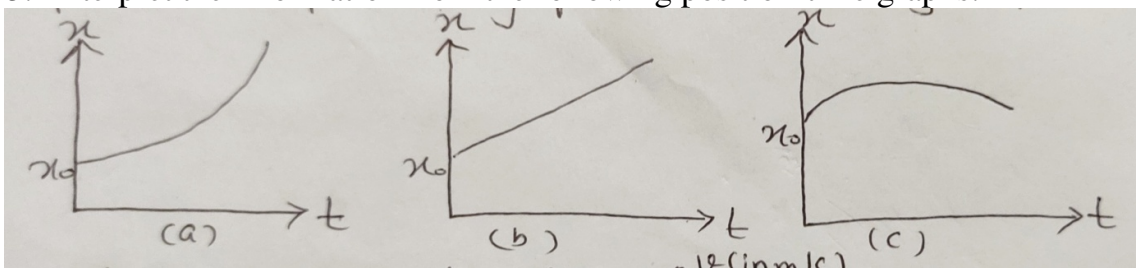
	 2) The slope of Velocity-time graph gives acceleration of the object.  3) The area under Velocity-time graph gives the distance/ displacement covered by object in the given intervals of time. 	The students will understand the concept.
Elaborate	The teacher will ask the students that can you apply the concept learnt in	

	practical from. OK, to understand the concept more accurately, let's try to solve a numerical problem. Let's see you can do it or not?	The students will be eager to do that as they have learnt the concept fully.
	Find the distance covered by an object from time interval t=0 to t=10 s, in the given figure.  	The students will solve the problem and ask the doubts what they have.
	Now you can explain group wise, the solution of problem.	The students will explain group wise. We will find area of shapes in figure, two triangles and one rectangle and by adding these areas we can find the total distance.
	Very good, now can you tell about how to find displacement from this graph, for the same interval of time?	The displacement can be negative also, so the area below the axis should be subtracted from the total distance.
	Fine, so we can say the area above the Time- axis should be taken positive and below should be taken as negative, to find the displacement.	
Evaluation	Now let's summarize what we have today.	The students will answer pointwise.
	What is the shape of Position-time graph for a stationary object?	It is a straight line parallel to time axis.

	From which graph Position-time or Velocity-time graph we can find the distance covered by an object in given time? Can you draw Velocity-time graph for an object moving with uniform acceleration with some initial velocity?	From Velocity-time graph The students will plot the graph

Homework
Questions

1. Write the importance of Velocity-time graph.
2. Draw the Velocity-time graph for the following conditions:
   i) An object moving with increasing acceleration.
   ii) An object moving with uniform negative acceleration with positive initial velocity.
3. Interpret the information from the following position-time graphs:



4. Find the distance and displacement travelled in 6 second, from the Velocity-time graph shown in the figure here.