Preview

Objectives

- **Describe** motion in terms of changing velocity.
- **Compare** graphical representations of accelerated and nonaccelerated motions.
- **Apply** kinematic equations to **calculate** distance, time, or velocity under conditions of constant acceleration.

End Of Slide

Changes in Velocity

- **Acceleration** is the rate at which velocity changes over time.

$$a_{avg} = \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{t_f - t_i}$$

$$\text{average acceleration} = \frac{\text{change in velocity}}{\text{time required for change}}$$

- An object accelerates if its **speed, direction, or both** change.
- Acceleration has direction and magnitude. Thus, acceleration is a **vector** quantity.

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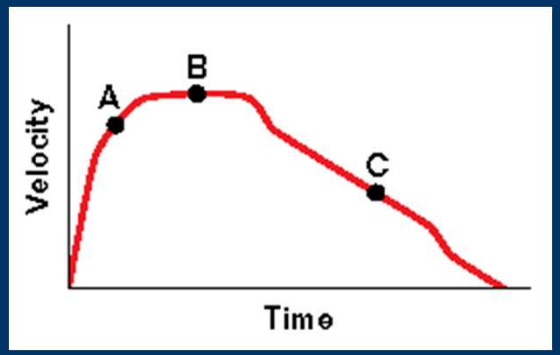
Acceleration

Click below to watch the Visual Concept.

Visual Concept

Changes in Velocity, *continued*

- Consider a train moving to the right, so that the displacement and the velocity are positive.
- The slope of the velocity-time graph is the average acceleration.
  - When the velocity in the positive direction is increasing, the **acceleration is positive**, as at **A.**
  - When the velocity is constant, there is **no acceleration**, as at **B.**
  - When the velocity in the positive direction is decreasing, the **acceleration is negative,** as at **C.**



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Graphical Representations of Acceleration

Click below to watch the Visual Concept.

Visual Concept

Velocity and Acceleration

v_f	a	Motion
+	+	speeding up
−	−	speeding up
+	−	slowing down
−	+	slowing down
− or +	0	constant velocity
0	− or +	speeding up from rest
0	0	remaining at rest