

**IMPORTANT TERMS:**

- Acceleration
- Average speed
- Elapsed time
- Free fall
- Instantaneous speed
- Rate
- Relative
- Speed
- Velocity

# UNIT I: MECHANICS

## Chapter 4: Linear Motion

### I. Motion Is Relative (4.1)

A. Everything moves. Even things that appear to be at rest move.

1. Motion is described by-

a. Relative to the sun, the center of the galaxy, etc.

b. We will discuss motion (things in our environment) relative to the surface of the Earth.

### II. *Speed* (4.2)

A. **Speed** is a measure of how \_\_\_\_\_ something is moving (\_\_\_\_\_ at which \_\_\_\_\_ is covered)

1. \_\_\_\_\_ – term used to describe something divided by \_\_\_\_\_.

2. **Speed** = Units of \_\_\_\_\_ / units of \_\_\_\_\_ (distance covered per unit of time)

3. Common Units

a. miles/hour (mi/h)

b. kilometers/hour (km/h)

c. \_\_\_\_\_ (\_\_\_\_/\_\_\_\_) Used in physics

B. **Instantaneous Speed**– the speed at any \_\_\_\_\_ (What you see on a car's \_\_\_\_\_)

C. **Average Speed**–

1. Does not indicate \_\_\_\_\_ in speed over time.

2. still describes rate at which distance traveled

D. **Velocity** (4.3)

1. Velocity and speed are often used interchangeably, but in physics are different.

a. **Velocity** is-

b. Speed is how fast object moves

( \_\_\_\_\_ does not matter)

E. **Constant Velocity**– must have constant \_\_\_\_\_

and \_\_\_\_\_

1. Object moves in \_\_\_\_\_

2. Object's path **does not** \_\_\_\_\_

F. **Changing Velocity**

1. Velocity will change if either \_\_\_\_\_ or \_\_\_\_\_ changes.

2. Constant speed and constant velocity are \_\_\_\_\_ the same.

III. **Acceleration** (4.4)

A. **acceleration** is the rate at which the velocity is changing

1. applies to \_\_\_\_\_ as well as \_\_\_\_\_ in velocity.

2. decrease in velocity often called \_\_\_\_\_ or \_\_\_\_\_ **acceleration**

B. Acceleration applies to changes in \_\_\_\_\_ as well as speed

1. When motion is in \_\_\_\_\_ line the term speed and velocity are often used interchangeably.

2. Units for acceleration a bit more complicated

#### IV. Free Fall: How Fast (4.5)

A. The **force of** \_\_\_\_\_ causes object to accelerate downward

1. If we disregard air resistance (air friction) then free falling objects only affected by gravity. Called

\_\_\_\_\_

2. Use letter (\_\_\_\_\_) to represent gravity

3. gravity varies slightly around the Earth. Average value is about \_\_\_\_\_

4. More accurately,  $g$  is \_\_\_\_\_

B. The instantaneous speed of an object falling from rest is equal to the acceleration multiplied by the amount of time it falls.

( $v$  symbolizes both speed and velocity)

1. speed decreases at the \_\_\_\_\_ rate with an object moving \_\_\_\_\_ as it increases when moving \_\_\_\_\_

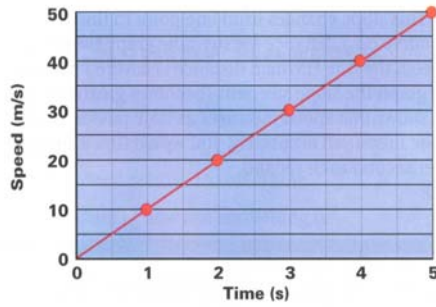
2. An object thrown upward will reach a velocity of \_\_\_\_\_ when it gets to its \_\_\_\_\_ point

#### V. Free Fall: How Far (4.6)

A. Relationship between distance traveled, acceleration, and velocity

#### VI. Graphs of Motion

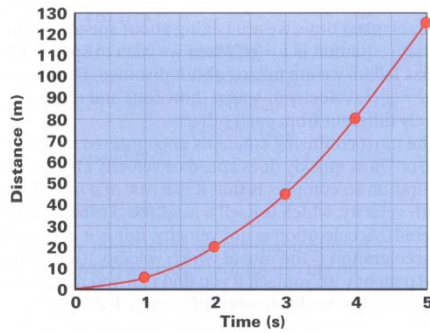
A. Equations and tables not the only way to describe relationships such as velocity and acceleration.



1. **Linear relationship**- e.g. speed and time

a. Forms \_\_\_\_\_ curve.

b. Has \_\_\_\_\_ slope (direct proportion)



2. **Parabolic relationship**- e.g. distance versus time

a. Not straight line. \_\_\_\_\_ line

b. \_\_\_\_\_ at any point gives **slope** at that point (slope of this curve is **instantaneous speed**.)

Remember that slope is rise/run or change in y over change in x. Distance/time = speed

## VII. Air Resistance and Falling Objects (4.8)

A. \_\_\_\_\_ noticeably alters the motion of things (like feathers, paper, etc.)

B. Less effect on more \_\_\_\_\_ (compact) objects

C. Air resistance is small enough to be \_\_\_\_\_ in most cases.

## VIII. How Fast, How Far, How Quickly. How Fast Changes (4.9)

A. speed and velocity-used to describe **how** \_\_\_\_\_ something free falls from rest.

equation to use:

B. To specify **how far** the object has fallen we are talking about \_\_\_\_\_.

equation to use:

C. Acceleration-

1. Very complex concept

2. \_\_\_\_\_ of a \_\_\_\_\_