**Chapter 3 Summary of terms**

**Relative** - Regarded in relation to something else, depending on point of view or frame of reference. Sometimes referred to as “with respect to”

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**Motion is relative –**

Both objects are moving-If we look out through the window of an airplane and another plane is flying at the same speed in the opposite direction, we will see it flying twice as fast.

Only one object is moving-When we are sitting inside our car in a parking lot at rest, & then another car (next to our car) reverses, we feel our car is moving,

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**Speed –** Distance an object travels per unit time

Speed = distance **/** time

Units- meters /second (m/s), miles /hour (mph), kilometer/hour (km/h)

**Instantaneous Speed –** Speed at any instant (as seen in speedometer)

Car travels along a street at 50 km/h for half an hour,

Stops at the red light at 0 km/h

And then travels at 25 km/h for one hour

**Average Speed** (for the entire trip) –

It doesn’t indicate the different speeds and variations that may have taken place during short time intervals

Average speed = total distance covered **/** time interval

Total distance covered = average speed x time interval

(check point page 37, Ex. #3 page 49)

**Velocity –** When we know **both speed and direction** of an object, we know its velocity.

**Constant Velocity –** When an object

1. has steady speed (= constant speed) **and**
2. steady direction (= straight line),

Then it has constant velocity

**Changing Velocity –** When either the object’s

1. speed changes (= speed increases or decreases)
2. or its direction changes (in a curved or circular path)
3. or both speed and direction changes (speed varies and direction varies)

Then it has changing velocity

(Check point page 38 #2 and # 3)

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**Acceleration –** It is the **rate** at which an object’s **velocity changes with time**

Acceleration = Change in velocity **/** Time interval

e.g., when driver presses accelerator, car speeds up and driver presses against seat

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Deceleration = Change in velocity **/** Time interval

e.g., when driver presses brakes, car slows down and driver lurches forward

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**Difference in velocity and acceleration (experience)**

When velocity is constant, we can stand without holding in a bus, and flip a coin

When velocity is changing, the bus accelerates & we have difficulty standing

**Distinguish between velocity and acceleration**:

Acceleration is a rate of a rate and velocity is just rate

Acceleration is not velocity or change in velocity

Acceleration is the rate at which velocity changes

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**Special Case of Acceleration**

When motion is along a straight line, the direction of speed does not change, then

Acceleration = Change in speed **/** Time interval

(Check point page 40, Ex. 5, 9, 11, 13 page 49)

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**Free Fall – Motion under the influence of gravity alone** (no friction or air)

**Free Fall Acceleration** – g (called gee) = 9.8 m**/**s**/**s or 10m**/**s**/**s,

Here, 10 m**/**s is the speed & **/**s is the per unit time

In Acceleration = change in velocity**/**time interval

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g on Earth **>** g on Moon

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In free fall, e.g., a rock thrown straight downward from a cliff It accelerates downward with its speed increasing by the same amount = 10m**/**s in each succeeding second (Fig 3.7, page 44)

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Now, object is thrown straight upward (Fig. 3.8, page 43)

* Once released, it continues to move upward for a certain time slowing down.
* It reaches a peak, stops there (with velocity = 0m**/**s).
* And then moves downward under free fall.
* But acceleration is same throughout its journey

(Ex 15, 17, 21, 27, 35; page 49)