**Chapter 4 Summary of terms**

**Force causes acceleration** – Acceleration is directly proportional to Net Force

* if Net Force doubles, then the acceleration doubles
* if Net Force = zero, then acceleration = zero and the object remains at rest or moves with constant velocity
* (Check point page 52, #1 and #2)

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**Friction –** Force that acts to resist the relative motion

(or attempted motion) of objects or materials that are in contact

* When we apply force to an object, friction usually reduces

the net force and the resulting acceleration

* The direction of friction force is always in a direction opposing motion
* No friction exists on an object that sits at rest on a level floor
* Sliding Friction- Contact force produced by the rubbing together of the surface of a moving object with the material over which it slides
* Static Friction - Force between two objects at relative rest by virtue of contact that tends to oppose sliding
* For given surfaces, static friction **>** sliding friction
* Force of sliding friction does not depend on the speed of the object
* Friction does not depend on the area of contact
* Fluid (gas or liquid) friction increases with speed
* Air resistance felt at higher speeds e.g., biking vs walking
* (Activity – drop a plain sheet and then crumbled sheet from same height,

Which takes longer to hit the ground?)

* (Fig. 4.4 page 53, check point page 54)

**Acceleration-** depends on

* applied forces
* friction forces
* and inertia of a body

**Mass –** (m; unit Kg, g, pounds)

* It is a fundamental quantity
* The quantity of matter in an object.
* Mass is neither weight nor volume
* It is also the measure of inertia of a body
* The more the matter (mass), the more the inertia
* Also, it is the sluggishness that an object exhibits

in response to any effort made to start it, stop it,

or change its state of motion in any way

**Weight –** The force upon an object due to gravity (W =m x g, unit N)

* In the absence of acceleration or when Fnet = 0;

Mass and weight are directly proportional to each other

* On Earth - 1kg (mass) brick (weighs) 10 N; g = 10 m**/**s**/**s
* On Moon, the same brick same mass, but it weighs 1.6N,

because on moon the gravitational force is 1**/**6, of that on Earth

* Same amount of push to accelerate a huge truck to a

given speed on a level surface on the Moon or Earth

(Check point page 55 #1 and #2)

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**Mass Resists Acceleration –** For a given force,

Acceleration produced is inversely proportional to the mass of the object

(Activity - Push the ball on floor and ball on chair and share observation)

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**Newton’s Second Law of Motion**- The acceleration of an object is:

* directly proportional to the net force acting on the object,
* **is in the direction of the net forc**e,
* and is inversely proportional to the mass of the object

**Acceleration = Net Force / Mass**

**a = Fnet / m**

* This implies, if Net Force increases, Acceleration increases
* And if Mass increases, Acceleration decreases
* The acceleration of an object is always in the direction of net force
* Applied in the direction of object’s motion ,

a force will increase the object’s speed

* Applied in the opposite direction of object’s motion ,

a force will decrease the object’s speed

* Applied at right angles to object’s motion,

a force will deflect the object

* Any other direction of application will result

in a combination of speed change and deflection

(Activity with rolling the tennis balls on floor and share observation)

(check point page 57, #1 and #2)

**When acceleration is g – Free Fall**

* In Free Fall, a falling object accelerates toward Earth, with acceleration, g
* Because of the gravitational force of attraction between the object and the Earth
* The greater the mass of an object, greater is this force of attraction.
* Acceleration of an object depends on
  + Force due to gravity = weight

Force produces acceleration

* + Resistance to motion = inertia

but inertia is resistance to acceleration

* The ratio of weight to mass for freely falling objects equals g

g = Weight **/** mass = m x g **/** m

* Therefore, acceleration of free fall is independent of an object’s mass. The greater force offsets the equally greater mass
* Activity – Drop a crumbled sheet of paper and tennis ball together.
* Do they hit the floor together?
* (Check point page 58)
* Page 63 & 64 Ex. 1, 3, 5, 13, 15, 17, 21, 23, 25, 29, 33