UNIT I: MECHANICS
Chapter 6: Newton’s Second Law of Motion-Force and Acceleration

I. Force Causes Acceleration (6.1)
   A. Force causes ________________________
      1. Acceleration depends on ____________________
      2. Objects acceleration is ______________________
         to the net force acting on it.

         (the symbol $\propto$ stands for “is directly proportional to.”)

II. Mass Resists Acceleration (6.2)
   A. Acceleration depends on _________________
      1. acceleration produced is _____________________
         to the __________

      2. Inversely– means that the two values change in
         __________________ directions

III. Newton’s Second Law (6.3)
   A. Newton’s Second Law states:
      The _________________________ produced by a net force
      on an object is ________________ proportional to the
      _________________________ of the net force, is in the same
      direction as the net force, and is___________________
      proportional to the ____________ of the object
In equation form:

1. Using units of **newtons** (N) for force, **kilograms** for mass (kg), and **meters per second squared** (m/s\(^2\)) for acceleration, we get the new equation:

2. If we let \(a\) = acceleration, \(F\) = force, and \(m\) = mass:

IV. Friction (6.4)

A. Friction is a force

1. Acts on materials that are in _______________ with each other

2. **friction** acts IN _______________ direction to oppose motion

3. Friction mainly due to _______________ in the two surfaces.

B. Friction not restricted to solids sliding over one another

1. Occurs in _______________ and _______________

   a. both called _______________

   b. Friction of liquids appreciable even at low speeds.

2. _______________ (friction acting on something moving through air) is common form of fluid friction

3. When **friction is present**, an object may move with a _______________ even when outside force is applied to it.
a. In such case, friction force ________________ applied force

b. Can diagram using a ________________ diagram

V. Applying force— Pressure

A. Pressure—

B. In equation form:

\[ \text{(Pressure is measured in Newton’s per square meter, or pascals)} \]

VI. Free Fall Explained (6.6)

A. ________________ showed falling objects accelerate equally, regardless of their masses

1. strictly true if air resistance is ________________

2. approximately true when air resistance is very small

B. ________________ believed that an object weighing tens times as much would fall ten times faster (disproved by Galileo and others— Galileo’s famous demonstration at Leaning Tower of Pisa)

C. Use equation for weight:

\[ F_g = mg \]
Rearrange and get

(when ______________ is also considered, the acceleration of any object is the ______________)

VII. Falling and Air Resistance (6.7)

A. Air resistance ____________________ the net forces acting on a falling object

1. When air resistance _______________ downward force on falling object (force of gravity—also called ______________) then net force is ___________ and no further __________________ occurs.

2. _________________ speed—when acceleration terminates

3. When consider direction (which is down for falling objects) we call this maximum speed terminal ______________

B. Air resistance is often __________________ at low speeds, but very noticeable at ____________ speeds