**Newton’s Laws of Motion**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Period: \_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_

**There are four fundamental forces that make up all the forces in the universe:**

1.

2.

3.

4.

**Force**:

**Units of forces are:**

**The formula for force of gravity (weight) is:**

Where

m=

g=

=

**Force on Gravity:**

Mass (kg):

Weight (N):

Mass is \_\_\_\_\_\_\_\_\_\_\_ throughout the universe but weight \_\_\_\_\_\_\_\_\_\_\_\_\_ depending on where you are (planet’s gravitational field)

Determine your weight on erath, the moon and Jupiter (In Newtons)

Your mass: \_\_\_\_\_\_\_\_\_\_\_\_kg (1kg=2.2lbs)

Weight on Earth:

FG=mg

=

Weight on the Moon:

Weight on Jupiter:

g varies depending on…

For example:

* On earth at sea level, g=
* On the moon, g=
* On Jupiter, g=
* On the sun, g=

**Inertia**

* **Inertia** is how much an object does not want to \_\_\_\_\_\_\_\_\_\_\_ how it is moving. It is the tendency of an object to

**\_\_\_\_\_\_\_\_\_\_\_\_**a change in motion. The greater the mass, the \_\_\_\_\_\_\_\_\_\_\_ its inertia.

* + Smaller masses will change velocity easily because they have \_\_\_\_\_\_\_\_\_\_ inertia.
  + Larger masses do not change their velocity easily because they have \_\_\_\_\_\_\_\_\_\_ inertia

***Balanced vs Unbalanced Net Forces***

Net Force:

**Newton’s Law of Motion**

**1st Law** – Objects at \_\_\_\_\_\_\_\_\_\_ tend to stay at \_\_\_\_\_\_\_\_\_\_ and objects in \_\_\_\_\_\_\_\_\_\_ tend to stay in \_\_\_\_\_\_\_\_ (same speed and direction), unless acted upon by an unbalanced \_\_\_\_\_\_\_\_\_\_\_.

First Law is also known as **law of inertia**.

Ex. If I drop the book from 2 m, there is only a downwards, gravitational force acting on it. Now that the forces on it are unbalanced, what does the book do?

Ex. Imagine a book sitting on a table. There is a force of gravity pulling down on the book, but there is also a supporting (normal) force pushing up on the book.

**Normal Force (FN):**

Ex. A 5.0 kg block is pushed to the right along a frictionless track with a force of 10.0 N. What is its acceleration?

**2nd Law:**

An unbalanced force results in acceleration.

Stated as a formula:

**Note that…**

Where:

F: Force [N]

m: mass [kg]

a: acceleration [m/s2]

Ex: A 1500 kg ice cream truck accelerates from rest to a top speed of 45 km/h in 8.0 s. What was the net force acting on the truck?

Ex. A 650 kg car accelerates at 4.0 m/s2 south. What is the net force acting on it?

To find FNET when many forces act on an object:

To find FNET when two forces work together…

Ex: The Batmobile exerts a force of 8.50x103N east while friction pulls back on it with a force of 1500 N. If it has a mass of 1250 kg, what is its acceleration?

Ex. Stan and Kyle are pushing a 75 kg sled along a frictionless ice rink. Stan pushes with 55 N and Kyle pushes with 45 N. Find the sled’s acceleration.

**Free Body Diagrams**

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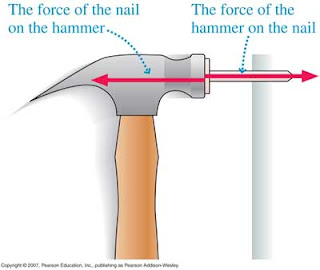
Ex. 2: A hockey player glides on frictionless ice at a constant velocity

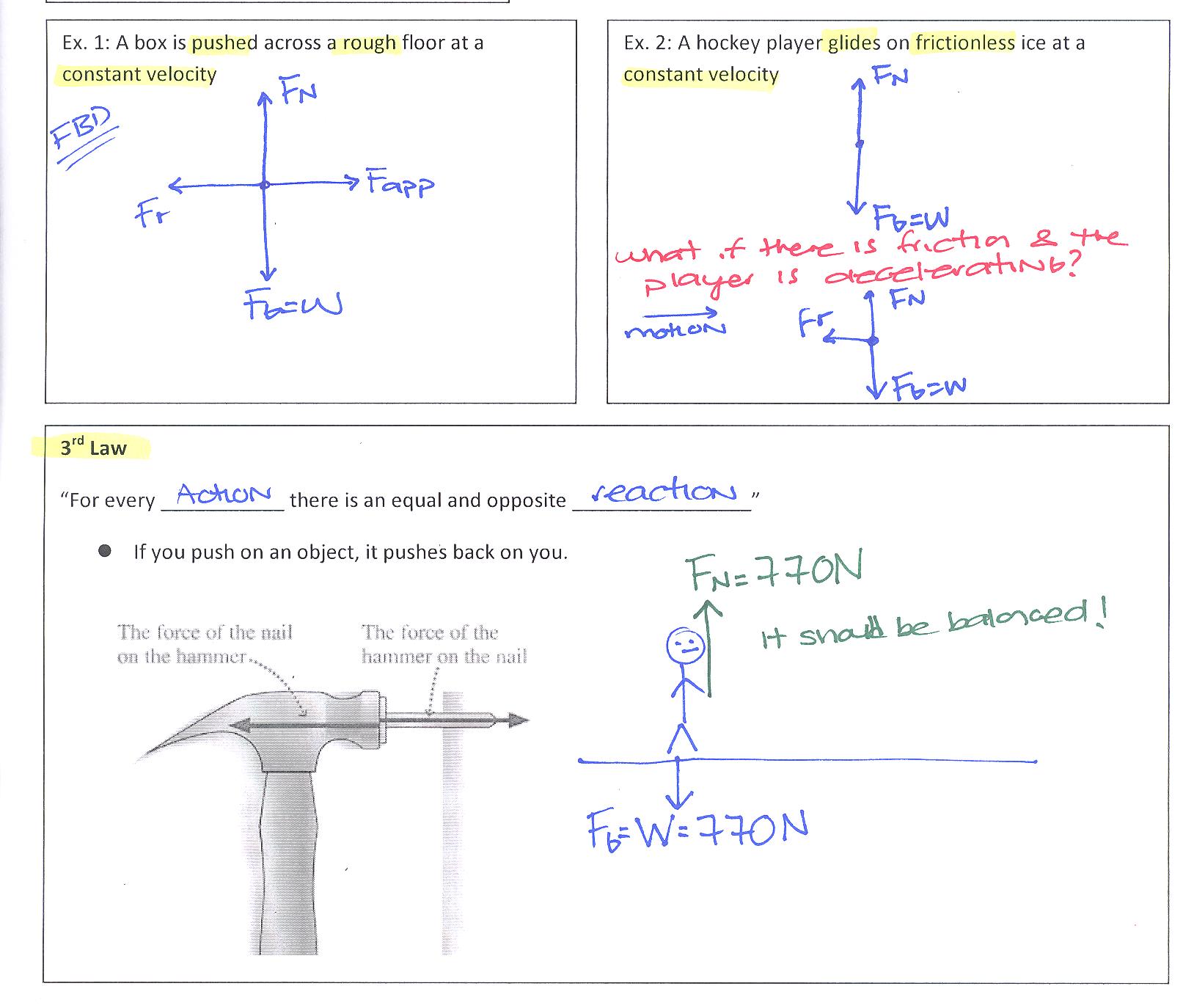
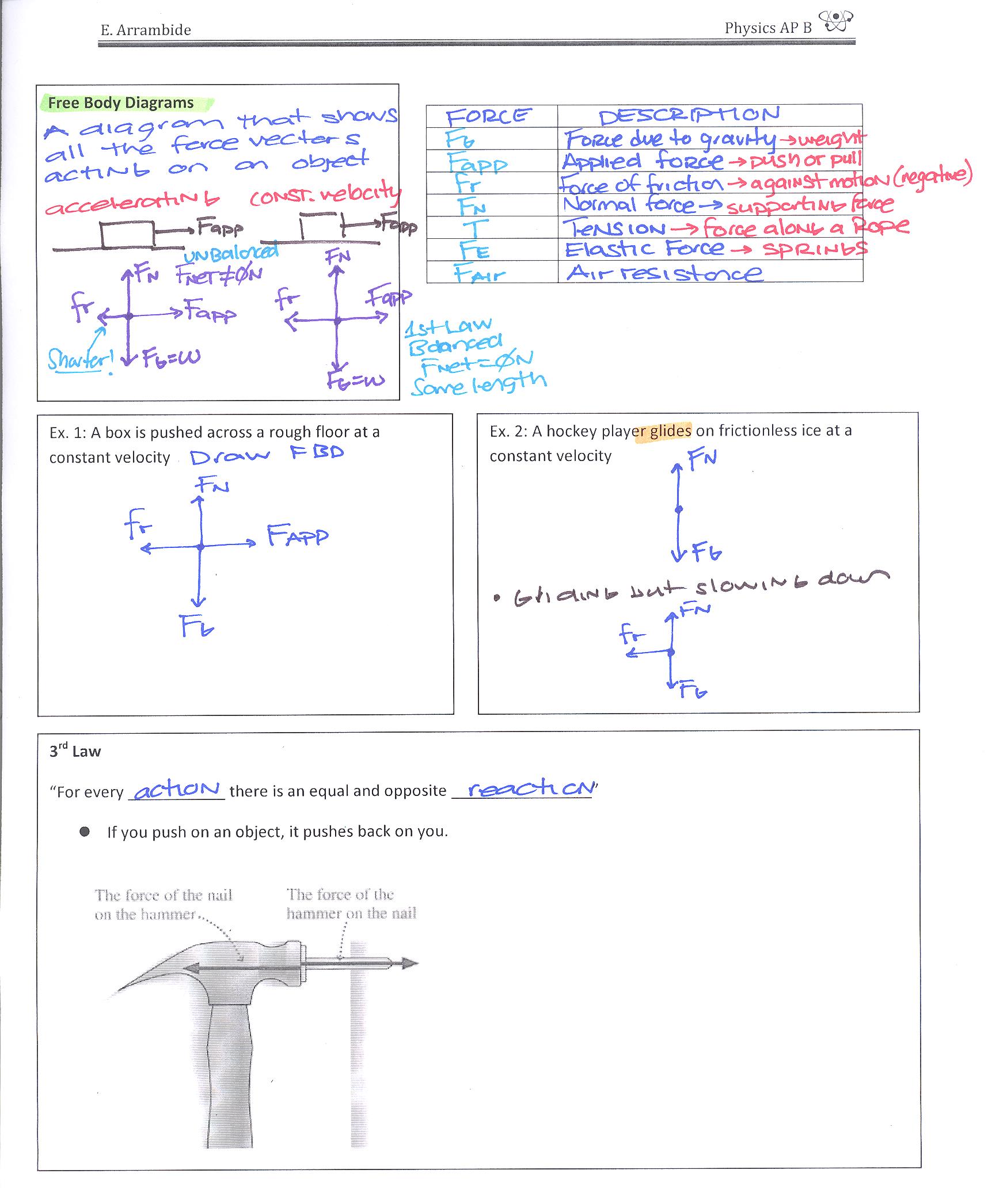
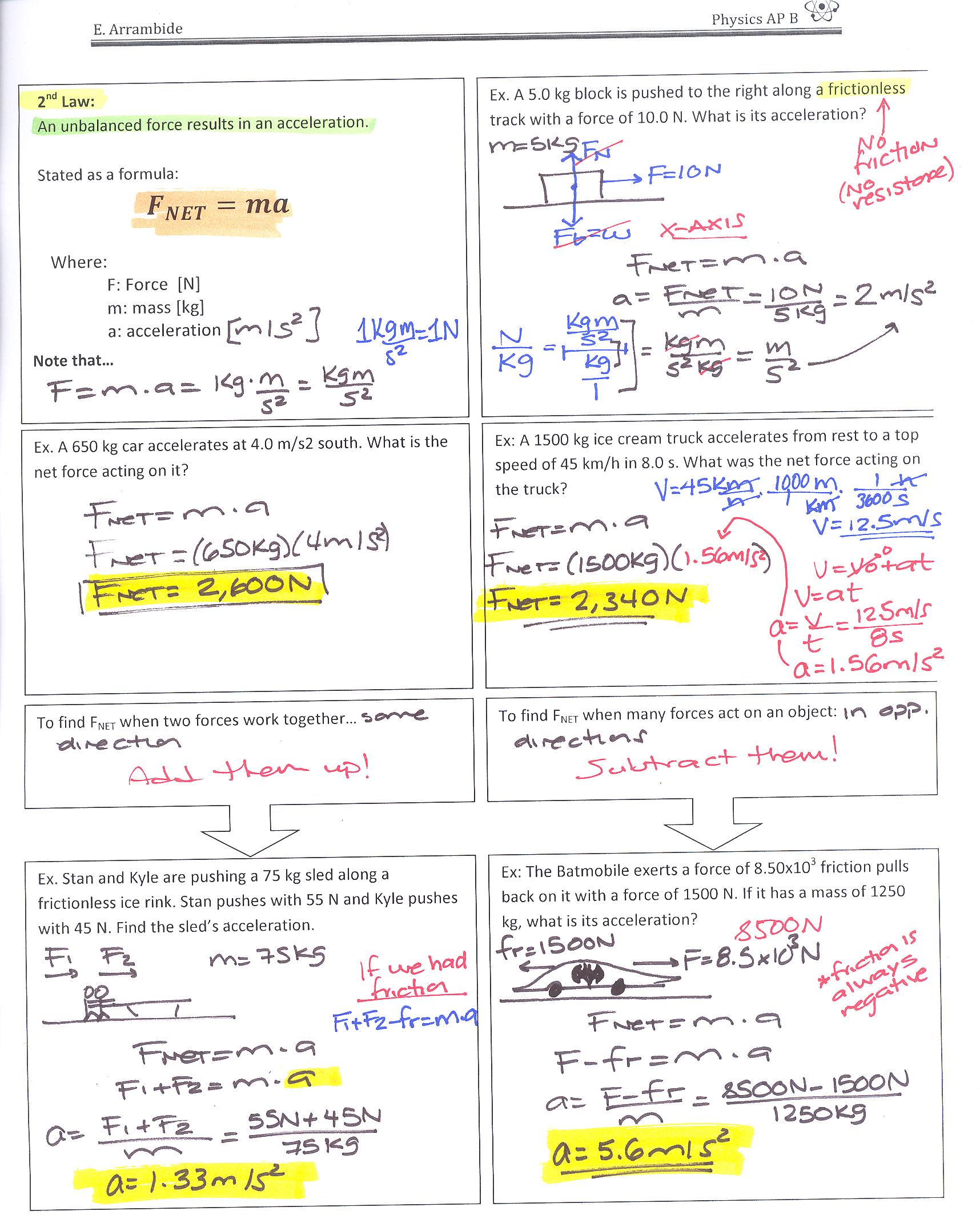
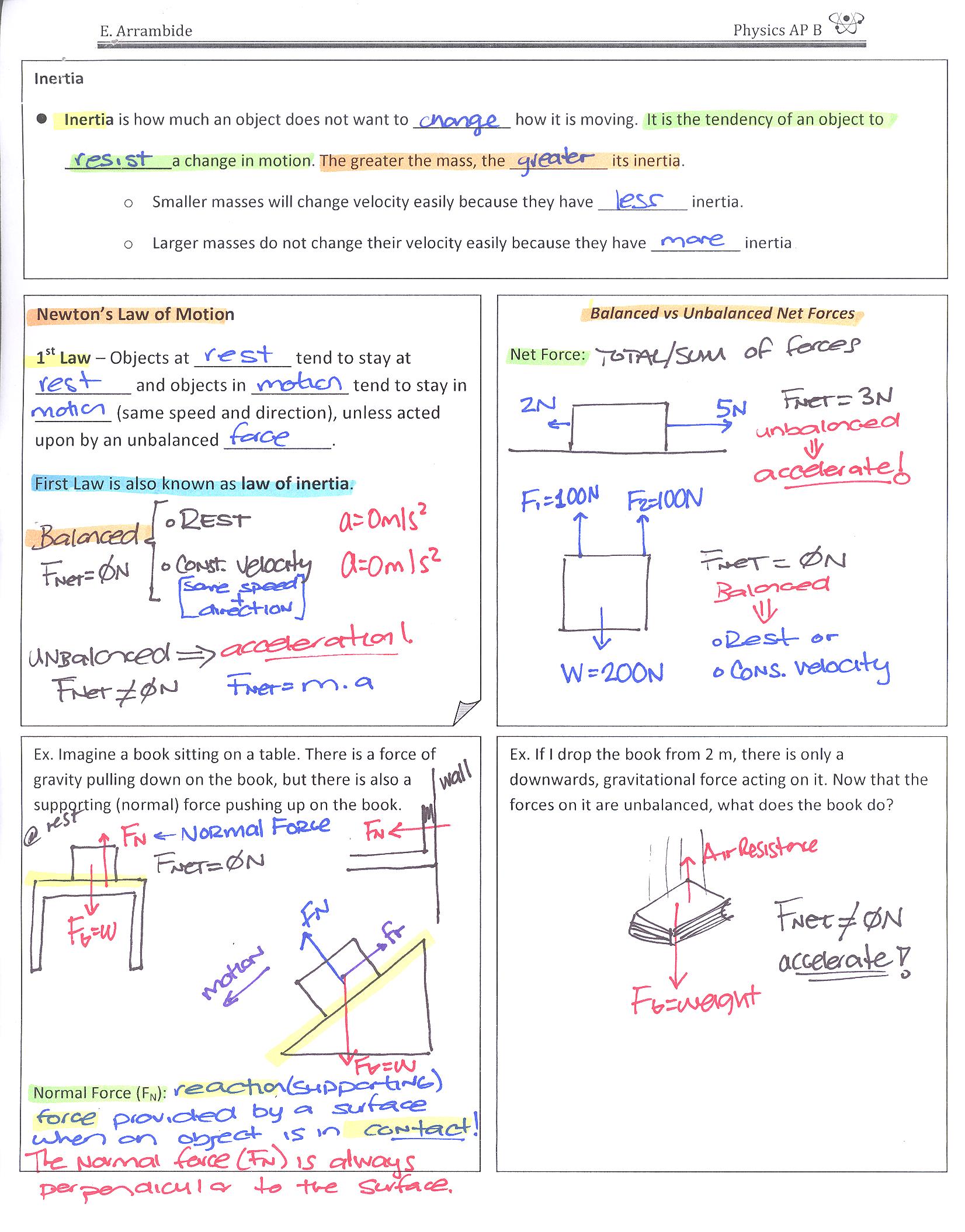
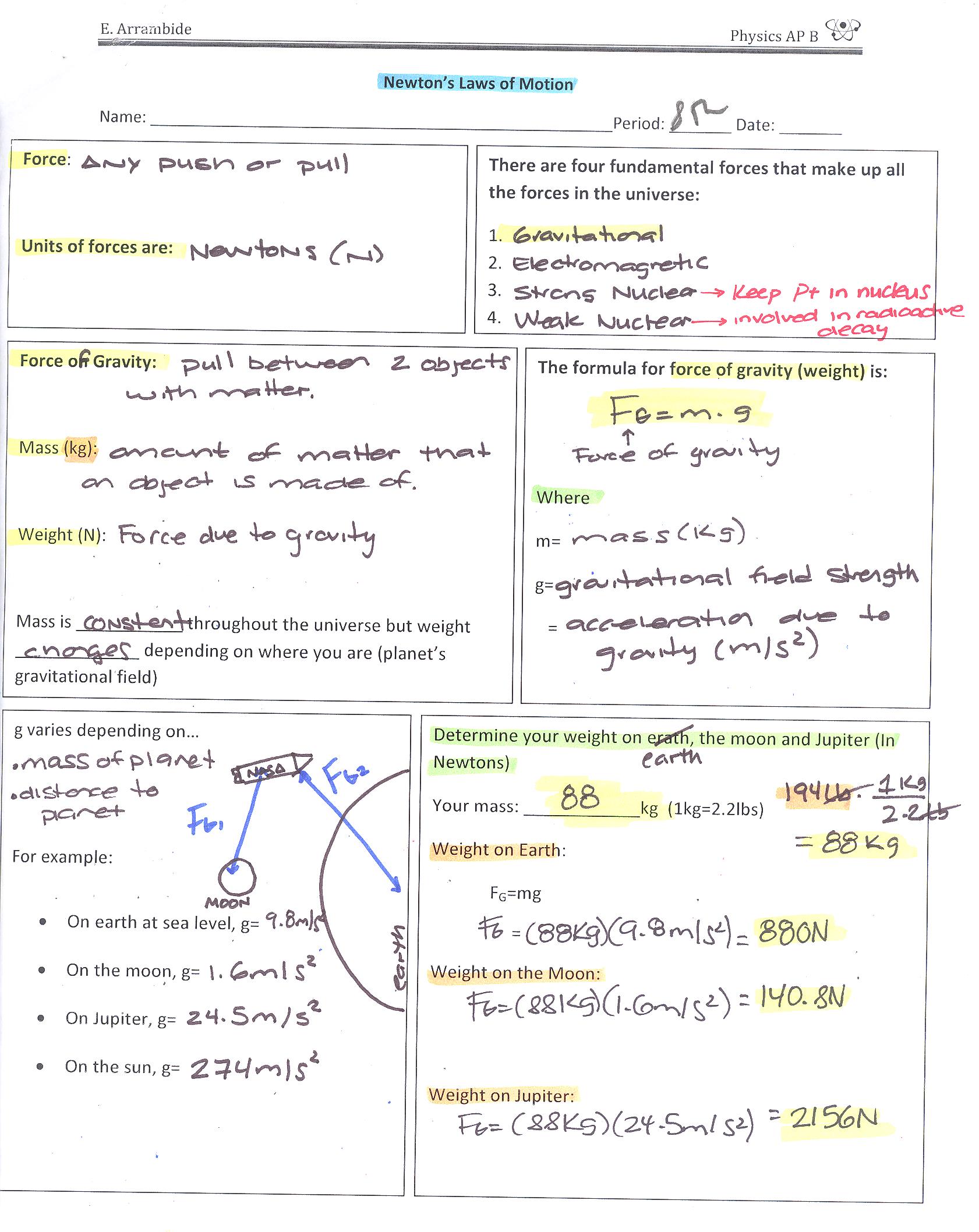
Ex. 1: A box is pushed across a rough floor at a constant velocity

**3rd Law**

“For every \_\_\_\_\_\_\_\_\_\_\_ there is an equal and opposite \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_”

* If you push on an object, it pushes back on you.

**[](http://www.zimbio.com/go/vC-tdl2BEfd/http:/1.bp.blogspot.com/-_rd3xaTJI_I/Tv2oFh7mxkI/AAAAAAAAAqk/fzT4RUccGFY/s1600/04_30Figure.jpg)**

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