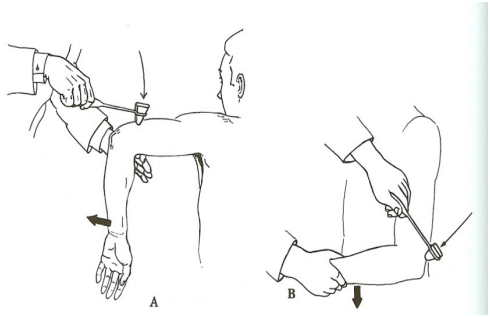
Laboratory – Reflexes

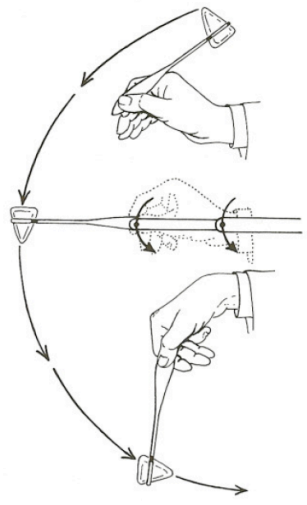
Execute each of the following reflex tests and observe how the body reacts:

A. Somatic reflexes

- *Triceps reflex*
  - **Either** dangle the subject forearm over your hand and strike the triceps tendon or cradle the subject's forearm in your hand and strike the triceps tendon. The subjects arm should be completely supported by the person using the hammer.
  - Test both arms.



- *Patellar (knee-jerk) reflex*
  - Seat the subject on the lab bench with legs hanging free.
  - Tap the patellar **tendon** sharply with the reflex hammer just below the knee to elicit response.
  - Proper hammer technique for the patellar reflex is illustrated to the left below. Firm, but not painful! Don't hit the patella (bone), but the TENDON!
  - Test both knees.
  - Test the effect of mental distraction on the patellar reflex by having the subject add numbers while you test the reflex again. Be sure you are confident that you are hitting exactly where you should be!



B. Autonomic Reflexes

- *Pupillary reflexes*
  - Obtain a flashlight
  - Conduct the test in an area where the lighting is relatively dim but you can still see the pupil.
  - Sit or stand to one side of the subject, instruct him or her to view a distant object. Using a quick rising motion, shine the light into one eye from the side. Watch the pupil change. Also observe what happens to the opposite eye.
- *Heart Rate:*
  - Choose one person to put on a heart rate monitor. This person will place the receiver around the chest and make sure the receiver is tight against the skin.
  - Then press the "heart rate" button on the watch and look for a black beating heart on the watch display. It may take about 30 seconds, but a number should display (probably between 60-90). This number represents the number of heartbeats per minute (bpm). If the black beating heart does not appear, try to place some water under the receiver to make it wet.

  - Have the subject sit in a chair for 3 minutes. Record the heart rate at the end of three minutes.
  - Instruct the subject to perform some sort of physical activity for 1 minute (ex. Jumping jacks, going up and down the building stairs, push-ups, etc.). Please do not disrupt other classes or run up and down the hallway. If you have any questions about whether or not an activity is appropriate and/or disruptive please ask the instructor.
  - Immediately after the minute of exercise is up, record the heart rate.
  - Instruct the subject to sit in the chair (exactly like they were before), wait about 5 minutes, and record the heart rate again.
  - IF YOU HAVE TIME, repeat with a second individual.

C. **Learned Reflexes & Reaction Time**

Learned reflexes are responses that become faster through practice of repetition (i.e catching a ball, driving, playing an instrument). They are often somatic but can also be autonomic reflexes (i.e. Pavlov's dogs)

First Trial

To test for learned reflexes, you will need a ruler. Hold the ruler so that its end is exactly 3cm above the subject's outstretched hand. The ruler should be in the vertical position with the numbers reading from the bottom up. When the ruler is dropped, the subject should be able to grasp it in between thumb and index finger as it passes, without having to change position. Have the subject catch the ruler five times. Record the distance at the fingertips for each trial plus the 3cm you started above on your data chart. For example, if the subject catches the ruler at 15cm, the subject was unable to catch the ruler until 18cm of length had passed through his or her fingers. Record this data on your assignment sheet.

Simple Word Association

Perform the test again, but this time say a simple word each time you release the ruler. Designate a specific word as the signal for the subject to catch the ruler. On all other words, the subject is to allow the ruler to pass through the fingers. (Example: the subject should catch on "rock" but not on any other word such as "roll"). Record the distance the ruler travels for five **SUCCESSFUL CATCHES** (successful means a catch on the correct word only) and the number o**f SUCCESSFUL DROPS** (successful drop means the "wrong" word was said and the ruler was dropped). Also record the number of times the subject failed at this task (when the ruler is dropped when it should have been caught or when the ruler is caught on the wrong word). Record this data on your assignment sheet.

Word Association & Response

Perform the testing once again to investigate the subject's reaction to word association. As you drop the ruler, say a word – for example "hot". The subject is to respond with a word associated with the stimulus word – for example "cold" – **AND simultaneously catching the ruler while responding**. If unable to make a word association, the subject must allow the ruler to pass through his or her fingers. Record the distance the ruler travels for five successful catches (success means simultaneously catching the ruler & saying the word). Also record the number of times the subject failed at this task (when the ruler is not caught, not caught while responding, or if the ruler is caught but NO correct word association was made).

LABORATORY ASSIGNMENT – REFLEXES

I. THE REFLEX ARC

1. *Identify* each of the following elements of the reflex arc on the image below **AND DESCRIBE THEIR FUNCTIONS**.

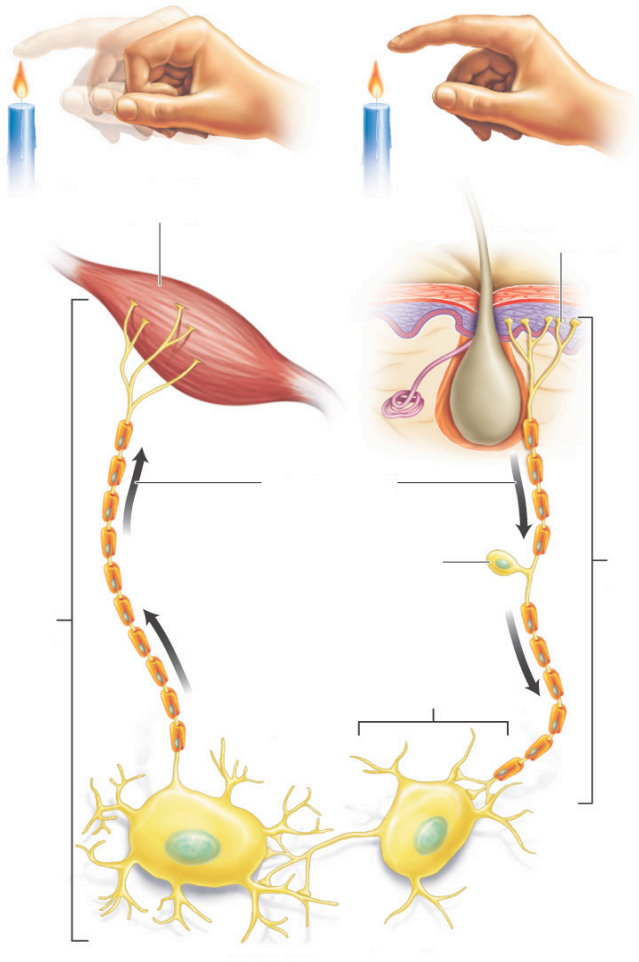
   A. Sensory receptor

   B. Sensory neuron

   C. Interneuron

   D. Motor neuron

   E. Effector



II. DATA & OBSERVATIONS FROM IN-CLASS REFLEX RESPONSES:

A. SOMATIC REFLEXES

- *Triceps reflex*
  - Test the triceps reflex as instructed on the procedure sheet.
  - Test both arms and record your observations here:

  - Which **type** of muscle was the effector (i.e. skeletal, smooth, cardiac)?

- *Patellar (knee-jerk) reflex*
  - Test the patellar reflex as instructed on the procedure sheet.
  - Test both knees and record your observations:

  - Which **type** of muscle was the effector (i.e. skeletal, smooth, cardiac)?

  - What would be the **type** of receptor for both the triceps and patellar reflex? (i.e. photoreceptor, chemoreceptor, thermoreceptor, pain receptor, or mechanoreceptor)

  - Did the response change when the subject was mentally distracted? Why do you think this is so?

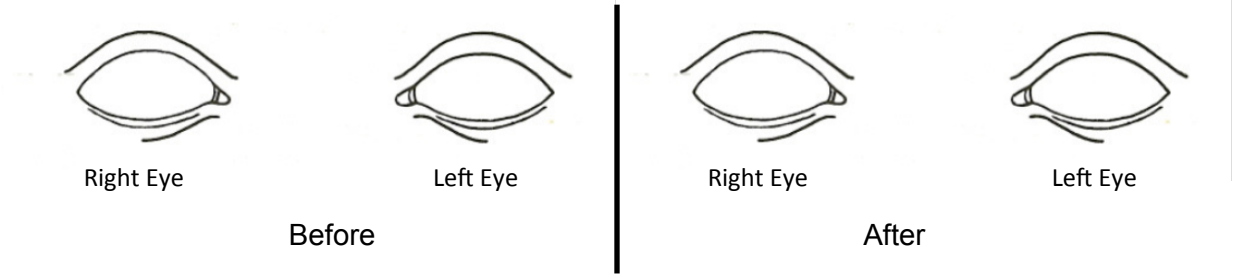
  - What makes these reflexes "somatic"?

  - What are some other somatic reflexes you can think of?

B. AUTONOMIC REFLEXES

- *Pupillary Reflex*

  - What is the pupillary response of the eye with the introduction of light? What is the pupillary response in the other eye when the light enters one eye? (this is called a consensual response) Draw what the pupils look like in the eyes below before & after light. Use the appropriate word (dilated or constricted) to describe the change:



- *Heart Rate*

At Rest

Individual	Heart Rate (bpm)
1	
2	

After 1 minute of physical activity:

Individual	Heart Rate (bpm)
1	
2	

5 minutes after stopping physical activity:

Individual	Heart Rate (bpm)
1	
2	

What was the stimulus, the receptor, the control center, the effector, and the effect were that contributed to the heart rate changes? Remember a stimulus can only be pressure, chemicals, temperature, light, or pain. **Note: "Movement" is not the stimulus!**

Stimulus -
Receptor -
Control Center -
Effector -
Effect -

C. **LEARNED REFLEXES:**
Perform the activities investigating learned reflexes on your procedure sheet and record the data below:

First Trial

Trial 1:_____cm Trial 2_____cm Trial 3:_____cm Trial 4:_____cm Trial 5:_____cm

Simple Word Association
SUCCESSFUL CATCHES:

Trial 1:_____cm Trial 2_____cm Trial 3:_____cm Trial 4:_____cm Trial 5:_____cm

Number of SUCCESSFUL DROPS _____

The number of times the subject failed at this task_____

Word Association & Response
SUCCESSFUL CATCHES:

Trial 1:_____cm Trial 2_____cm Trial 3:_____cm Trial 4:_____cm Trial 5:_____cm

The number of times the subject failed at this task_____

More questions on next page!

- Which situation of the three caused the longest reaction time?

- Why did the reaction time differ in each of the three trials?

- *Read this article and answer the question below:*

Study: Texting while driving increases crash risk 23-fold by Jennifer Guevin, July 27, 2009

It isn't exactly breaking news that texting while driving is a bad idea. But a study released Monday night reveals just how dangerous it really can be.

After examining the behavior of truck drivers covering more than 6 million miles of road, the Virginia Tech Transportation Institute concluded that people who send text messages while driving are 23 times more likely to be in a crash (or what they call a near-crash event) than nondistracted drivers.

To conduct the study, researchers mounted cameras inside drivers' vehicles. They studied where drivers' eyes were looking as they did various things, such as texting, dialing a cell phone, talking on a phone, and reaching for an object. Not surprisingly, the numbers (PDF) showed that the tasks that took people's eyes off the road caused the greatest amount of danger.

In crashes or near-crashes, texting took a driver's focus away from the road for an average of 4.6 seconds--enough time, the report point out, to travel the length of a football field at 55 mph.

By contrast, talking on a cell phone, which allows drivers to keep their eyes on the road, represented an increased risk of only 1.3 times that of a nondistracted driver.

The study's authors called into question past research that indicated driving while talking on a cell phone is as dangerous as driving drunk. While those results may have been found in lab tests and driving simulations, they say, the same was not true in real-world situations. They also noted that, contrary to popular belief, talking on a cell phone with a wireless headset is not substantially safer than talking on a regular handset. This is because the most significant factor as far as safety is concerned is to keep one's eyes on the road, the report said.

The institute says any task that takes a driver's eyes off the road should be avoided and suggests that all cell phone activity should be banned for newly licensed teenagers because they're more prone to using their phones.

- **What are the similarities between the observations from the learned reflex experiments you did using rulers and the observations of this study on talking on a cell phone and/or text-ing while driving? (In other words, how does response time change for learned reflexes when humans think about other things?) What would be the effect of just having a conversation with someone else in the car?**