Name: _____ Lab Section: _____

SCI141: Biology Lab Sections

Lab 3: Metabolism/ Homeostasis

Procedure #1: Metabolism of Germinating Pea Seeds

Intro:

Why do athletes warm-up before their event? What benefit does a warm-up provide for an athlete? Do all organisms benefit from warming up?

Picture a seed as it starts developing (i.e. there are no green leaves yet). What metabolic process dominates this early stage? Photosynthesis? Respiration?

As you may have deduced, seeds are undergoing respiration. In fact, seeds are metabolizing sugar and oxygen rapidly in order to grow strong roots. In turn, the seed give excess Carbon Dioxide.

CO_2 dissolves in water and produces carbonic acid (H_2CO_3). We will be using an acid/base indicator called Phenol Red. Under basic conditions, Phenol red is red. Under acidic conditions, Phenol red changes to an orange color.

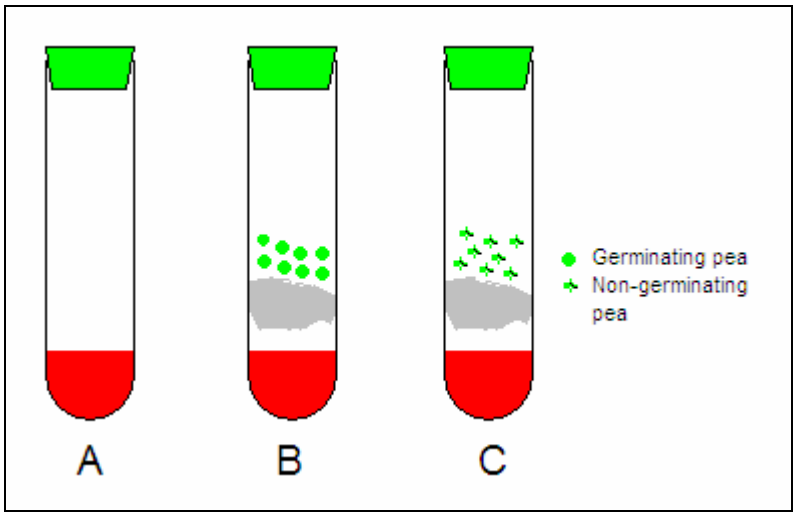
Materials:

Three test tubes
0.04% Phenol red indicator
cotton balls
16 pea seeds (8 need to be germinated, placed in water overnight)
3 rubber stoppers
parafilm

Method:

1. Label 3 test tubes A, B, and C. Using a dropper, place about 20 drops of **Phenol red** indicator into the each test tube.

2. Using tweezers, place a cotton ball in test tubes B and C so that it sits just above the level of the indicator (see picture below).



General Diagram of Setup

3. Set up the test tubes as following:

Test Tube A Place stopper in tube and seal.
Test Tube B Place 8 germinating seeds in tube, insert stopper, seal.
Test Tube C Place 8 non-germinating seeds in tube, insert stopper, seal.

4. Write a hypothesis for what you think will happen in each test tube below:

Test Tube A:

Test Tube B:

Test Tube C:

5. Check your setup every 15 minutes over the course of the lab. Fill out your final data in the chart below.

Pea Seed Metabolism Data			
Test Tube	***Description Before***	***Description After***	***Explanation***
A			
B			
C			

Questions:

1. Describe the color changes in each test tube and describe what the color changes indicate?

2. Does your data support your hypotheses from above? Why or why not?

3. Is there any evidence of CO_2 production by the dry pea seed?

4. Are the pea seeds still considered living if they lack the ability to metabolize?

5. What is the experimental purpose tube A?

Procedure #2: Human Examples of Homeostasis

Intro:

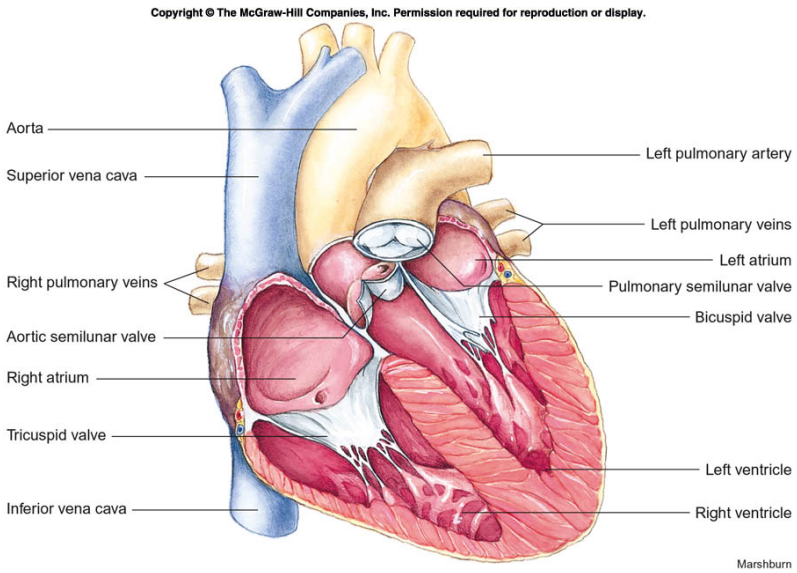
How is blood pressure an example of homeostasis?

Here are the facts; you tell me the answer to that question.

The Facts:

- Heartbeats create a lub-dub noise. The lub comes from the closing of the AV valves. The dub comes from the closing of the ***semilunar valves*** (see anatomy below).
- When the ventricles contract, it creates a surge of pressure through the arteries. This surge is called ***Systole***.
- The arteries are muscular and very elastic. When the systolic pressure pushes through the arteries they push back. This is called ***elastic recoil***.
- When the arteries bush back, the semilunar valves close, preventing blood from flowing back into the heart.

- Because the semilunar valves close and elastic recoil occurs at the same time, a second pressure occurs in the blood vessels. This is called ***diastole***.



Heart Anatomy

Materials:

Stethoscope
Sphygmomanometer

Methods:

Resting Measurements →
Heart Rate – Stethoscope method
1. Using a stethoscope, position the bell directly over the center of you partner's chest.

2. Listen for the lub-dub.

3. Count the heartbeats for 15 seconds. Record that number and multiply it by 4.

HR = _____ x 4 = _____ BPM

4. Switch and determine your partner's heart rate.

HR = _____ x 4 = _____ BPM

Heart Rate – Pulse method
1. Position your 1st two fingers over the thumb side of your partner's wrist and feel for the pulse.

2. Count the heartbeats for 15 seconds. Record that number and multiply it by 4.

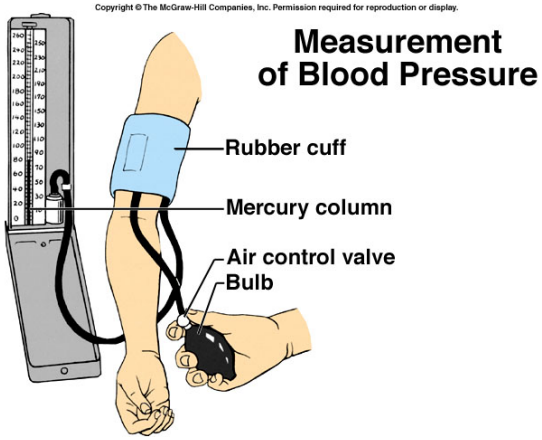
HR = _____ x 4 = _____ BPM

4. Switch and determine your partner's heart rate.

HR = _____ x 4 = _____ BPM

Add all of your data to the table at the end of the lab.

Blood Pressure



1. Apply the sphygmomanometer to your partner's arm as pictured above. Make sure that the rubber hoses come out of the cuff towards the inside of the elbow.

NOTE: You are about to apply enough pressure to close off a major artery in your partner's arm. DO NOT keep the cuff inflated for too long.

2. Position the bell of your stethoscope directly under the hoses coming form the cuff.

3. Make sure that your partner's arm is resting on the table. Inflate the cuff past 170 mmHg.

4. Slowly release the air valve. You will make two recordings: 1st when you start hearing a noise (systolic pressure), 2nd when the noise goes away (diastolic pressure).

5. Record your resting blood pressure below and in the table at the end of the lab.

6. Switch and measure your partner's blood pressure.

Blood Pressure = $\frac{\text{Systolic}}{\text{Diastolic}}$ = _____ Your BP _____Partner'sBP

After Exercise

1. Have your partner run in place for 1 minute.

2. After running in place for 1minute, take you partner's blood pressure again. Record it below.

3. Have your partner run in place again for 30 seconds.

4. Take your partner's pulse again. Record the data below.

Heart Rate and Blood Pressure Data		
Category	***You***	***Your partner***
Resting HR ***(Stethoscope Method)***		
Resting HR ***(Pulse Method)***		
Resting BP		
Exercise HR ***(Any Method)***		
Exercise BP		
Change in HR ***(Exercise HR – Resting HR)***		
Change in BP ***(Exercise BP – Resting BP)***		

Questions:

1. What happened to your blood pressure and heart rate as a result of exercise?

2. Why is this an important advantage to your body?

3. How is blood pressure an example of homeostasis?