Monica H. Moss Watkins (USM Bio Sci) and Desshondra Walker (Hattiesburg High)
USM GK-12: Molecules to Muscles
2010-2011 School Year
Theme Based Lesson

Name _____ Class Period_____

Using Heart Rate to Approximate Energy Use

Your group will participate in an activity designed to understand the effect of food on energy use during exercise. You will learn to take heart rate and get to eat a snack! ***DO NOT EAT YOUR SNACK BEFORE YOU ARE TOLD TO- YOU MUST COMPLETE STEPS 1 & 2 FIRST.***

1. Which food do you think provides the best energy source for a pre-workout snack?
   a. carbohydrate
   b. protein
   c. fat
   d. water

2. Choose an exercise participant for your group and write their name below:

3. Measure the resting heart rate of your exercise participant and write it in the table below. You need to feel their heartbeat on their wrist and use a watch to counts the beats in 10 seconds. Multiply by 6 to get the number of beats per minute (bpm). The typical healthy resting heart rate in adults is 60–80 bpm; note that conditioned athletes often have resting heart rates below 60 bpm.

4. Eat your snacks! Wait 5 minutes for your body to begin digestion of your snack and for the energy to enter your circulatory system. Now take your exercise participants heat rate again. Write it in the table below.

5. Now, your participant (the person you choose to represent your group in #1) will complete the aerobic activity that your teacher has assigned. This could include running, hula hooping, jumping jacks, or any other exercise that gets you heart rate up. Immediately after exercise is over, take the participant's heart rate again and write it in the table below. Flip over to the back side of this worksheet to learn about the target heart rate, or the heart rate reached during aerobic exercise to get the most benefit from a workout.

6. Rest for 5 minutes after exercise, then take your exercise participants heat rate again. Write it in the table below. *Recovery heart rate* is the heart rate measured at a fixed (or reference) period after ceasing activity. A slow reduction in the heart rate after exercise is beneficial to the heart. Training regimes sometimes use recovery heart rate as a guide of progress and to spot problems such as overheating or dehydration. After even short periods of hard exercise, it can take a long time (about 30 minutes) for the heart rate to drop to rested levels.

7. Compile the class results in the table below. Which group had the highest resting heart rate? Which group had the lowest resting heart rate? Which groups had the highest and lowest heart rate during the other time periods? Did the different snack have an effect? What about differences between the participants?

Heart rate (bpm)	Water	Protein	Fat	Carbohydrate	Other
Resting					
After snack					
Just after exercise					
5 minutes after exercise					

The *Target Heart Rate* or *Training Heart Rate* (THR) is a desired range of heart rate reached during aerobic exercise which enables one's heart and lungs to receive the most benefit from a workout. This theoretical range varies based on a person's physical condition, gender, and previous training. Below are two ways to calculate one's THR. In each of these methods, there is an element called "intensity" which is expressed as a percentage. The THR can be calculated as a range of 65%–85% intensity. However, it is crucial to derive an accurate HR_{max} to ensure these calculations are meaningful (see above).

Example for someone with a HR_{max} of 180 (age 40, estimating HR_{max} as 220 − age):

65% intensity: (220 − (age = 40)) × 0.65 → 117 bpm
85% intensity: (220 − (age = 40)) × 0.85 → 153 bpm

Source: Wikipedia article, Heart rate. http://en.wikipedia.org/wiki/Heart_rate:

- Resting Heart Rate, American Heart Association. http://www.americanheart.org/presenter.jhtml?identifier=4701
- Heart-Rate Recovery Immediately after Exercise as a Predictor of Mortality, Study by: Christopher R. Cole, M.D., Eugene H. Blackstone, M.D., Fredric J. Pashkow, M.D., Claire E. Snader, M.A., and Michael S. Lauer, M.D. ; Art. ref. from the NEJM, Volume 341:1351-October 28, 1357, 1999. Abstract online at http://content.nejm.org/cgi/content/short/341/18/1351.
- Hydration effects on physiological strain of horses during exercise-heat stress J Appl Physiol Vol. 84, Issue 6, 2042-2051, June 1998.