Study Guide for Lab Midterm 2 – Spring 2007 Leif Saul

General information:

- 40 points total.
- You are responsible for all information in chapters 5, 7, and 8 of the lab manual. In addition, you are responsible for techniques and predictions learned in the lab.
- Note that questions similar to the ones on lab write-ups and weekly quizzes could also show up on the exam.
- Be prepared for concepts, definitions, procedures, predictions, broad themes, minor facts, diagrams/graphs/traces, calculations, hands-on with computer or apparatus, etc.
- Be prepared for all types of questions: fill-ins, brief essay, true/false, multiple choice, etc.
- See sample questions at <http://spot.colorado.edu/~saul/physiology/index.html>.

Study questions

- Below I have given for each lab a list of skills and knowledge areas to think about. Keep in mind that this is not an exhaustive list.

Metabolic Response to Exercise lab

- Know what each abbreviation stands for (e.g. Fe_{O2}, P_{H2O}, etc.). (Note: You will *not* need to memorize the complex formulas used to calculate Ve_{STP} and V_{O2}).
- Know the general chemical equation for the oxidation of foodstuffs.
- Be able to calculate Ve = (Tidal Volume) x (Breathing Rate).
- Understand these concepts: internal vs. external work, calorie vs. Calorie, allometry, metabolic rate, direct vs. indirect calorimetry, metabolic equivalent (MET).
- Know that air contains 20.93% O_2, 0.03% CO_2, and about 79% N_2.
- What is the Respiratory Quotient? Given RQ, be able to draw conclusions.
- Understand the conditions implied by basal metabolic rate.
- Why should the subject's metabolic rate be higher when sitting on the bike, as compared with lying down?
- What is SSE? At what times during the experiment was the subject at SSE? What are the consequences if the subject is not at SSE?
- Why is it dangerous for the subject to suddenly stop pedaling and sit still?
- What is the caloric equivalent, and what is its relationship to the RQ?
- Be able to calculate metabolic rate if you are given RQ, V_{O2}, and Table 3 on p. 92.
- What is the difference between economy and mechanical efficiency?
- Understand the basis for the predicted graphs of V_{O2}, V_{CO2}, RQ, etc. versus workload.
- Understand the reasons for, and the shortcomings of, the methods used.

Cardiovascular Responses to Exercise lab

- Understand the overall design of the cardiovascular system and the difference between the pulmonary and systemic loops.
- Be able to calculate or define: systolic pressure, diastolic pressure, pulse pressure, mean arterial pressure, cardiac output, total peripheral resistance.
- Know the steps for obtaining sBP and dBP manually using a sphygmomanometer, and understand the physiological basis for this technique.

- Understand the role of arterioles and capillaries in regulating arterial blood pressure, the local blood supply, and total peripheral resistance.
- Understand the role of the sympathetic nervous system, pO2, pCO2, and temperature on vasoconstriction/vasodilation, and the consequences for flow blood flow and pressure.
- Explain the difference between systolic and diastolic blood pressure. What is the effect of exercise on these two variables?
- Understand the relationship between cardiac output, total peripheral resistance, and blood pressure.
- Be able to calculate Lung Ventilation-Perfusion Ratio and know what it indicates.
- Know the Frank-Starling law of the heart and its significance.
- Understand the predicted effects of increasing workload on HR, SV, Q, sBP, dBP, Ve/Q, and TPR.

ECG lab

- Know the path of blood flow through the heart.
- Know the path of the electrical conduction system through the heart, and its functional implications for coordinating the heartbeat.
- Understand the terms describing the phases of the cardiac cycle: systole, diastole, ventricular systole, ventricular diastole, atrial systole, atrial diastole.
- Understand the basic concepts behind how an ECG is produced.
- Identify the events associated with each component of the ECG.
- What is Einthoven's triangle, and how does it relate to the ECG? Which arrangement of electrodes was used in lab? Which arrangement is used for more detailed analysis in clinical settings?
- What is the difference between a lead and an electrode? In a 3-lead ECG, what electrical information about the heart does each lead provide?
- Be able to identify abnormal ECGs such as atrial flutter, ventricular fibrillation, bradycardia, and tachycardia.
- What causes the two major heart sounds?
- Be able to identify the following heart murmurs by verbal description: systolic murmur, diastolic murmur, stenotic valve, insufficient valve. Be able to identify a systolic or diastolic murmur from a phonocardiogram.
- How is the pulse wave velocity affected by vessel diameter and elasticity?
- Be able to relate the timing of the ECG, heart sounds, and peripheral pulse to one another.