Review for test #2

This review only include the new material for the second test (from the cardiovascular lectures to the kidney lectures). It will highlight the main topics having in mind the test questions you will see on Monday. Remember all tests are cumulative.

Review of cardiovascular lectures

- By the time you have finished with the CV section, and as a way to test your knowledge of the subject, you should be able to provide a good answer to the following essay question:
- Name and describe four characteristics of cardiocytes not present in skeletal muscle cells, indicate the underlying mechanism for each one of them, and their physiological importance. Make sure to use in your description at least once, and in the proper context, each one of the following terms: heart rate, stroke volume, cardiac output, peripheral resistance, intrinsic control of CO, extrinsic control of CO, baroreceptor mechanism.
- Make sure to relate your description of these physiological events to at least one aspect of their structural-function relationship, indicating its levels of organization and provide an outline of a homeostatic control mechanism involved in these cardiovascular events.
- Use text and diagrams to get your points across. Pay extreme attention to the organization and clarity of your answer.
Review of cardiovascular lectures

Characteristics of cardiocytes not present in skeletal muscles

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<tbody>
<tr>
<td>the heart is an electrical syncitium</td>
<td>intercalated disks</td>
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<tr>
<td>the heart does not tetanize</td>
<td>delay K gate opening due to increase intracellular calcium</td>
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<tr>
<td>the heart has automaticity</td>
<td>delay K gate opening cause Na leakage to reach threshold</td>
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<tr>
<td>the heart has a variable force of contraction under extrinsic and intrinsic control</td>
<td>Na / Ca channels and Ca channels</td>
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Review of respiratory lectures

- By the time you have finished with the respiration section, and as a way to test your knowledge of the subject, you should be able to provide a good answer to the following essay question:
- Describe how oxygen and carbon dioxide reach, exit, and are transported in blood. Make sure to use in your description at least once, and in the proper context, each one of the following terms: Boyle's law, Henry's law, diffusion rate, pulmonary surfactant, pulmonary compliance, tidal volume, alveolar ventilation.
- Make sure to relate your description of these oxygen and carbon dioxide related physiological event to at least one aspect of their structural-function relationship, indicating their levels of organization and provide an outline of a homeostatic control mechanism involved in these events.
- Use text and diagrams to get your points across. Pay extreme attention to the organization and clarity of your answer.
Let's say it's 6.15pm and you're driving home (alone of course) after an unusually hard day on the job. You're really tired, and frustrated......

You are really stressed and upset....

Suddenly you start experiencing severe pain in your chest that starts to radiate out into your arm and up into your jaw. You are only five miles from the hospital nearest your home. Unfortunately you don't know if you'll be able to make it that far.
WHAT TO DO ??

YOU HAVE BEEN TRAINED IN CPR, BUT THE GUY THAT CONDUCTED THE COURSE DID NOT TELL YOU HOW TO PERFORM IT ON YOURSELF !!!

HOW TO SURVIVE A HEART ATTACK WHEN ALONE?

SINCE MANY PEOPLE ARE ALONE WHEN THEY SUFFER A HEART ATTACK, WITHOUT HELP, THE PERSON WHOSE HEART IS BEATING IMPROPERLY AND WHO BEGINS TO FEEL FAINT, HAS ONLY ABOUT 10 SECONDS LEFT BEFORE LOSING CONSCIOUS

WHAT TO DO ??
ANSWER:

DO NOT PANIC, BUT START COUGHING REPEATEDLY AND VERY VIGOROUSLY.

A DEEP BREATH SHOULD BE TAKEN BEFORE EACH COUGH, THE COUGH MUST BE DEEP AND PROLONGED, AS WHEN PRODUCING SPUTUM FROM DEEP INSIDE THE CHEST.

A BREATH AND A COUGH MUST BE REPEATED ABOUT EVERY TWO SECONDS WITHOUT LET-UP UNTIL HELP ARRIVES, OR UNTIL THE HEART IS FELT TO BE BEATING NORMALLY AGAIN.

DEEP BREATHS GET **OXYGEN** INTO THE LUNGS AND COUGHING MOVEMENTS SQUEEZE THE HEART AND KEEP THE BLOOD CIRCULATING. THE SQUEEZING PRESSURE ON THE HEART ALSO HELPS IT REGAIN NORMAL RHYTHM. IN THIS WAY, HEART ATTACK VICTIMS CAN GET TO A HOSPITAL.
Review of renal lectures

- By the time you have finished with the renal section, and as a way to test your knowledge of the subject, you should be able to provide a good answer to the following essay question: Name the main functions of the kidney and the stages the nephron uses to fulfill its functions. In addition, describe using text and graphs the relationship between increasing plasmatic concentrations of inulin, glucose and paraaminohypurate (PAH) with respect to their filtration, secretion/reabsorption, excretion and clearance. Make sure to use in your description at least once, and in the proper context, each one of the following terms: nephron, ultrafiltration, clearance, glomerular filtration rate, autoregulation (of renal plasma flow or RPF), juxtaglomerular apparatus.
- Make sure to relate your description of renal event to at least one aspect of their structural-function relationship, indicating their levels of organization and provide an outline of a homeostatic control mechanism involved in these events.
- Use text and diagrams to get your points accross. Pay extreme attention to the organization and clarity of your answer.

Integration

Name physiological responses and/or relationships among respiratory, circulatory and renal systems involved in the homeostatic control following a metabolic acidosis.

Use text and diagrams. It is an absolute requirement that you answer this question based on the outline below. Precede each section of your answer with its heading, and make sure you answer all aspects outlined in each section.

The following are the section headings and their requirements:
Integration

- **a) the example:** which are the physiological responses and/or relationships among respiratory, circulatory and renal systems on which your answer will be based. Be as specific as you can in delimiting the boundaries of your example and the level(s) of organization your example will involve.

Integration

- **b) buffers involvement:** how does the buffer system attempt to control the homeostatic variable (blood pH). Which, how and where is the signal to the respiratory system recognized as input (receptors, afferent loop, and integration center), and how did the output of the integration center reached their targets (efferent loop, targets). The response this signal elicits is an acute (fast) or chronic (slow) compensatory mechanism.
• c) **respiratory involvement**: how does the respiratory system attempt to control the homeostatic variable (blood pH). Which, how and where is the signal to the respiratory system recognized as input (receptors, afferent loop, and integration center), and how did the output of the integration center reached their targets (efferent loop, targets). The response this signal elicits is an acute (fast) or chronic (slow) compensatory mechanism.

• d) **circulatory involvement**: how does the circulatory system attempt to control the homeostatic variable (blood pH). Which, how and where is the signal to the cardiovascular system recognized as input (receptors, afferent loop, and integration center), and how did the output of the integration center reached the targets (efferent loop, targets). The response this signal elicits is an acute (fast) or chronic (slow) compensatory mechanism.
• e) renal involvement: how does the renal system attempt to control the homeostatic variable (blood pH). Which, how and where is the signal to the renal system recognized as input (receptors, afferent loop, and integration center), and how did the output of the integration center reached the targets (efferent loop, targets). The response this signal elicits is an acute (fast) or chronic (slow) compensatory mechanism.

• f) integration pathways: how were these four physiological systems recruited (buffers, respiratory, cardiovascular, renal), to participate in the homeostatic response to a metabolic acidosis. Why did they got recruited in that order???
1. respiratory acidosis
2. respiratory alkalosis
3. metabolic acidosis
4. metabolic alkalosis

\[ \text{pH} = \text{pK} + \log \left( \frac{\text{HCO}_3^-}{\text{CO}_2} \right) \]

Renal comp
Primary Abnorm
Reflex alv comp

Uncorrected acid-base disorders
Compensated acid-base disorders

The lengths of the arrows of the balanced frames are not to scale.
“The little engine that could”

test #1  test #2  test #3