Biology 220: Exam #1
Animal Physiology
July 6, 2004

NO CALCULATORS NEEDED OR ALLOWED DURING EXAM

1. PLEASE PRINT YOUR NAME ON EVERY PAGE. 
   ONLY pages with names on them will be graded.

2. Read the questions carefully.

3. Most questions require only a brief and concise answer. Length of expected answer is positively correlated with number of points the question is worth --
   ---DO NOT write on the back of exam-answers on back of exam are NOT graded.

4. If you have a question during the test, raise your hand and we will come to you.

5. At the end of the exam, check to see that you have answered EVERY question.

Helpful facts

***** accepted abbreviations on back page*****

\[
\begin{align*}
\log_{10} 100 &= 2 \\
\log_{10} 10 &= 1 \\
\log_{10} 1 &= 0 \\
\log_{10} 0.1 &= -1 \\
\log_{10} 0.01 &= -2 \\
\end{align*}
\]
1. I have a solution of 200 mM glucose in a bag, only water can move across the bag. I put this bag in a beaker of a NaCl solution and notice that over time the bag swells. What is the molarity of the NaCl solution?
   A. 100 mM NaCl  
   B. 250 mM NaCl  
   C. 150 mM NaCl  
   D. 10 mM NaCl  
   Defend your answer.

2. The concentration of sodium in the extracellular space and intracellular space of 4 hypothetical cells are listed below. When the V-Na channels open – across which cell membrane is the rate of flow of sodium into the cell the greatest?
   . ----------------extracellular Na+-------------------intracellular Na+  
   A. cell A = 15 mM------------------150 mM  
   B. cell B = 200 mM-----------------100 mM  
   C. cell C = 150 mM---------------15 mM  
   D. cell D = 100 mM---------------150 mM

3. What is the molecular mechanism that causes AP to propagate down an axon?

   Why is the amplitude of the AP at the Axon hillock the same as the amplitude of the AP at they synaptic knob?

4. List the two factors that determine the value of the RMP.
   1.)

   2.)

   What would you have to do to the cell (proteins on or in cell) to change the RMP from −70 mV to +40 mV.
5. a) The following is a recording from an axon of an interneuron. Show what the recording for the stimulus and the graded potential that generated this AP pattern would look like.

b) In the graph to the right, show what the AP pattern would like if the stimulus doubled in strength.

6. The following is a recording from a neuron.

what type of summation is happening in panel 2 __________________________

panel 3 __________________________ panel 4 __________________________

The recording of C in panel 5 is caused by the movement of ions across membrane. Give 2 examples of ions and the direction they would be moving in to cause recording C.

IF the electrode was placed beneath neuron A what would the recording look like (compared to the recording in panel 1). Explain your answer.
7. LIST where in your body V-gated K channels are located (name the cell and part of cell)—no explanation necessary?

8. What is the function of the myelin sheath?

   What is the effect on neuron function of having myelinated axons?

   What determines the distance between Nodes of Ranvier? (that is how long a myelin sheath can be)

9. If I inhibit the activity of Acetylcholinesterase with a drug what will happen to the EPP? (explain your answer)

   How will this affect the muscle contraction. Defend your answer.

10. The T-tubule/SR junction is most like what part of a motor neuron? (defend your answer)
11. What happens to skeletal muscle function
   a) IF tropomyosin is removed. (explain answer)

   IF Ca pump on SR is inhibited (explain answer)?

12. For the sake of argument, say that the gastrocnemius (calf) muscle of the frog that you dissected in lab contained 10,000 motor units and each motor unit contained 1,000 muscle cells.
   a) How many axons would there be in the sciatic nerve that you stimulated? (explain your answer)

During the lab you got Recording 1 (below) and your neighbor got recording #2.

![](image)

This is an example of _______________________. In lab you generated this graph by holding the ____________ constant and varied the _______________.

What is causing point B to be higher than point A?

Your neighbor got recording #2. Their frog had the same number of motor units and muscle cells as your frog. What could explain why the peak tension their frog’s muscle produced is less than yours? (explain your answer)
13. This is the picture I showed you of an action potential in class (fig. _34.13a___)
What cell generated this action potential?

What intramembrane protein is responsible for establishing the RMP in this cell?

**Bonus Question:**
In honor of having just celebrated July 4, the day of our declared independence from Great Britian, and given we are both citizens and scientists, here is a bonus question.

state of residence (state you vote in) _____________________,

county of residence ________________________

Select one of the following questions for extra credit.
(3 pts.) Either name one of your U.S. senators OR your US congressional representative.

(1 pt) name the governor of your state of residence