Biology 113 Closed Book Take-Home Exam #2 – Chapters 4 - 6

There is no time limit on this test, though I have tried to design one that you should be able to complete within 3 hours. There are 6 pages in the exam, including this cover sheet and the data gallery. You are not allowed to look at someone else’s test, nor use your notes, old tests, the internet, any books, nor are you allowed to discuss the test with anyone until all exams are turned in no later than 12:30 pm on Monday October 22. **EXAMS ARE DUE BY 12:30 pm ON MONDAY OCTOBER 22.** If you turn in your exam late, then you lose a letter grade for each day you are late. The **answers to the questions must be typed immediately below each question unless you are instructed to draw something.** If you do not write your answers in the appropriate location, I may not find them.

I have provided you with a “Data Gallery” in the form of figures and tables. To choose a figure in support of your answer, simply state Figure #x. You can refer to subparts of figures by letter or say upper vs. lower or left vs. right panels. You do NOT need to move the figure on your test. Do not assume how many of the data images you will use, or not use. Simply choosing the data is not sufficient support for your answer. You must explain the significance of the data and how they support your answer. I have given you sentence limits so be concise.

**-3 pts if you do not follow this direction.**

Please do not write or type your name on any page other than this cover page. Staple all your pages (INCLUDING THE TEST PAGES) together when finished with the exam.

Name (please print):

Read the pledge and sign if you can do so with honor:

________________________________________

On my honor I have neither given nor received unauthorized information regarding this work, I have followed and will continue to observe all regulations regarding it, and I am unaware of any violation of the Honor Code by others.

How long did this exam take you to complete?
Lab Questions:

4 pts.
1) A particularly excited student, Gimme Morelab, obtained some results from lab but was not sure how to interpret them. Please help Gimme by answering this question:
   a) What can you say about the relative strength of the promoter called “bigbang”? Bars in the graph represent the average of three experiments and the error bars are standard deviation. For + vs − controls, \( p = 0.005 \). For − control vs. “bigbang + inducer”, \( p = 0.0812 \). Gel image shows PCR products around the promoter: 1 = + control; 2 = - control; 4 = bigbang + inducer; 5 = bigbang - inducer. Limit your answer to a maximum of 2 sentences.

   ![Graph and Gel Image]

6 pts.
2) You **may NOT USE the Guided Tour file**. You must answer this question using your own experience of analyzing DNA sequences. I emailed you a zipped file that contains two sequences. I want you to use ApE to:
   a) Tell me how many SNPs are in “variant 1” and their nucleotide positions.
   b) Translate both ORFs and describe the variant protein compared to the original mystery protein. This question is a bit tricky so be careful when you analyze the translation. Do not list all the amino acids, just describe the differences.

Lecture Questions:

10 pts.
3) Analyze the relationship between light flash interval and temperature for male and female fireflies. Support your answer with data. **Limit your answer to a maximum of 4 sentences.**

10 pts.
4) *Vibrio fischeri* is able to communicate more information than you might have predicted prior to taking Bio113.
a) What is the physical form for *V. fischeri* communication? Support your answer with data. **Limit your answer to a maximum of 2 sentences.**

b) Describe the population outcome when *V. fischeri* uses its communication. Support your answer with data. **Limit your answer to a maximum of 3 sentences.**

10 pts.

5) Most people fail to understand how plants communicate. If anything, they will cite the colors or fragrances of flowers as the only communication produced by plants, but those lucky enough to take Bio113 know better. Give three examples (A – C) of plant communication that we have studied. Support your answer with data. **Limit your answer to a maximum of 6 sentences total (two per example).**

A. 
B. 
C. 

10 pts.

6) 

a) What information do mole crickets convey with sound? Support your answer with data. **Limit your answer to a maximum of 2 sentences.**

b) Do other species use mole cricket sound information? Explain your answer. Support your answer with data. **Limit your answer to a maximum of 2 sentences.**

c) Compare and contrast frog-eating bats with the mole cricket example. Support your answer with data. **Limit your answer to a maximum of 3 sentences.**

10 pts.

7) In the space provided below, sketch a picture that shows when a horned lizard should stop feeding at one ant nest and move onto the next one. In your diagram, you must indicate:

a) the average time it takes to travel between nests
b) the average time when a lizard should leave.

c) Explain in a maximum of two sentences what the response of a lizard would be if the ant density of each nest doubled.
10 pts.

8) a) What evidence exists to support the claim that pre-biotic Earth contained the necessary organic molecules to assemble the first cell? Support at least part of your answer with data. **Limit your answer to a maximum of 2 sentences.**

b) What property of lipids enables them to form abiotic membranes? Support your answer with data. **Limit your answer to a maximum of 2 sentences.**

c) Living cells exhibit three characteristics that separate them from inanimate objects. List all three (A – C) and choose at least one figure (one may be sufficient but you might see more than one which is allowed) for each characteristic that shows abiotic processes could have produced the first living cell. Support your answer with data. **Limit your answer to a maximum of 6 sentences (two for each characteristic).**

A.

B.

C.

10 pts.

9) A very popular anti-evolution arguments can be summarized as, “Complexity cannot derive naturally from simplicity.” Use data from the gallery to illustrate how complex properties can emerge by combining simple components. Bias your data selection towards big leaps of complexity rather than minor variations of structures. **Limit your answer to a maximum of 6 sentences.**

10 pts.

10) In my many years of parenting, I have seen good and bad parents. A good parent exhibits behaviors that nurture the next generation. Choose three examples from the data gallery of species providing for their progeny with the assistance of information. Each example needs to come from very different species. In other words, don’t chose two or more examples from the same or closely related species. Think broadly about next generation and do not limit yourself to examples of sexual reproduction. **Limit your answer to a maximum of 6 sentences total.**
Dr. Campbell’s Bio113 Exam #2 – Fall 2012

Data Gallery

![Graphs and tables showing data on bird calls and responses.]

- **Mean # of petrels responding (± 1 s.e.):**
  - Southern: 24
  - Tawny: 51
  - Minor: 33
  - Chant: 0
  - Northern: 0

- **Playback Call of Chattering Call:**
  - Response rates:
    - Direct Flight: 38
    - Circle Flight: 41.5
    - Landed: 48.7

- **Call uttered by bird:**
  - Situation of the bird:
    - Bird alone (n = 96):
      - 38 Chattering
      - 35 Chattering + Grating
      - 23 Grating
    - Flown over by another bird (n = 69):
      - 23 Chattering
      - 18 Chattering + Grating
      - 18 Grating
    - Facing another bird (n = 95):
      - 9 Chattering
      - 16 Chattering + Grating
      - 70 Grating

- **Compared situations:**
  - Alone vs. flown over: 2.05 (p = 0.36)
  - Flown over vs. facing another: 4.15 (p = 1 x 10^-2)
  - Alone vs. facing another: 48.7 (p = 2 x 10^-14)

- **Male-male interactions:**
  - Percentage:
    - Graffing cell 1: 29%
    - Graffing cell 2: 16%
    - Chattering: 64%
    - Chattering + Grating: 36%
    - Grating: 10%
  - p-value:
    - 0.03

- **Male-female interactions:**
  - Percentage:
    - Graffing cell 1: 4%
    - Graffing cell 2: 33%
    - Chattering: 117%
    - Chattering + Grating: 89%
    - Grating: 25.57
  - p-value:
    - 2.5 x 10^-7

Ovule with associated pollen tube after 20 hours | Ovule without associated pollen tube after 20 hours
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Normal ovule | 124 | 60
Abnormal ovule | 0 | 189

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### Additional Information

- **Temperature vs. interpulse interval:**
- **Crickets and crickets:**
- **Control (no sound):**

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