Dr. Reichler's Bio 311D class time:_____ Print Name:____Key_____
Exam #3 April 2, 2008

Read each question carefully and don't hesitate to ask if a question seems unclear. If possible, answer each question in the space provided, but if needed, continue on the back. If you use a drawing as part of your answer, be sure to also include a written explanation. These questions have specific answers, although for some, more than one answer is possible. To receive full credit you must clearly and fully answer the question being asked. The points for each question are noted in parentheses totaling 103 points.

1. What **two** problems might a plant with reduced lignin have? Why would reduced lignin lead to these problems? (10 pts)
Reduced strength, lignin crosslinks cellulose making it stronger. Reduced water transport, lignin makes xylem (vessels) waterproof allowing water transport and/or makes xylem cells stronger to support water transport.

2. Would high temperature and high levels of CO_2 have additive or opposite affects on stomata aperture? Why? (10 pts)
Opposite. High temperature would induce stomata to open to allow transpirational cooling (unless the high temp. is combined with low water) while high CO_2 would induce stomatal closing since the cells would already have plenty of CO_2.

3. Describe one function in a leaf for each of the **three** plant cell types. (6 pts)
Parenchyma- epidermis, photosynthesis, sieve tubes. Collenchyma- support at mid rib, flexible support. Sclerenchyma- xylem in leaf for water transport.

4. You have identified a mutant plant with irregular circadian rhythms. You identify the mutated gene that codes for a protein, but how would you determine if this protein is involved in the input or the oscillations? (10 pts)
If when exposed to a light/dark cycle it cannot set a pattern, it is perceiving the input. If it can set a pattern during light/dark cycles, but the pattern breaks down after constant conditions, it is part of the oscillator.

5. If you touched, but did not wound, a plant that was grown in the shade, would it grow tall or short? Why? (10 pts)
Either answer is ok, need sufficient explanation:
Tall- the shade would expose the plant to far-red light that would keep phytochrome inactive, and the plant would grow tall.
Short- touch induces short growth to protect the plant from being too spindly and easily damaged by wind.

6. Are plant responses to insect herbivory, being eaten by insects, more similar to the human specific or non-specific immune system? Why? (10 pts)
Specifc- These protections are not barriers like the non-specific immune system. Each herbivore

response is specific for the type of herbivore.
OR
Non-specific- protease inhibitors are a general protection against herbivore like stomach acid is against pathogens.

7. What is the minimum number of neurons for a nervous system to be able to integrate incoming information? How many sensory, central nervous system, and/or response neurons would there be? (10 pts)
Three- Two sensory, one excitatory and one inhibitory both attached to one response neuron.

8. Nerve signaling involves four different types of channels. How are these channels different from each other? Also for each type of channel, describe what would happen to nerve signaling if this type of channel was not present? (10 pts)
2 types of NA^+ channels, one activated by a stimulus (without these the action potential cannot start) or neurotransmitters and the other activated by depolarization (without the action potential cannot travel). K^+ channels activated after the depolarization (without these the cell cannot repolarize). Ca^{++} channels which are only found at the end of the axon (without these the neurotransmitter cannot be released).

9. How do some bacteria protect us from other bacteria? (4 pts)
The bacteria that normally live on our skin outcompete pathogens for the scarce resources available on our skin.

10. Would a viral or bacterial infection be more dangerous to a person that lacked B-cells, but had normal T-cells? Why? (10 pts)
Bacteria- T-cells can help eliminate viruses because they infect cells. Bacteria are normally outside cells and B-cells produce antibodies the mark them for destruction.

11. A few hours after someone dies, muscle cells lack ATP but have a lot of calcium. This causes a condition known as *rigor mortis,* wherein the body becomes stiff and difficult to move. Why does this happen? (10 pts)
The calcium causes the tropomyosin move out of the way, but without ATP the myosin cannot move so it is locked to the actin and the body is stiff.

Bonus: Based on topics we covered in class, are biofuels, like ethanol, a viable solution to future energy needs? Why or why not? (3 pts)
Probably not- our food consumption is outpacing increased food production. Biofuels will only increase the pressure on food supplies.