Study Guide for BSCS Final Exam 2013/2014

\*\*\*\*\*\*This is not an assignment. However, if you answer all questions from units 4-7 (semester 2 units) on a separate piece of paper you may replace one of your Journal, Lab or Honor grades from quarter 4. Questions must be turned in on the day you take the midyear exam, no extensions.\*\*\*\*\*\*\*

Format of Exam: The Final Exam will be composed of multiple choice questions to test your knowledge of the entire year of Biology Material

Content of Exam: You are responsible for understanding the concepts from in-class activities, laboratory experiments, homework assignments, and readings. You should also be able to apply the concepts learned in these units to new examples.

**Students taking the course for standard credit can make a 3 x 5” index card, front and back.** It must be hand-written unless you have an accommodation (see me ahead of time). I suggest that as you study, you identify concepts that give you the most difficulty and use the index card for those concepts. You will supply your own index card for this exam – it must be 3.5” x 5” or smaller (I will check on exam day!).

## ENGAGE (Unit 1): Being a Scientist, Evolution: Natural Selection

1. Making Observations, asking questions, and gathering information to help you answer your questions are the steps that scientists use when they attempt to solve a problem (Scientific Method).
   1. What kinds of observations are the most meaningful when recording data?
   2. What is the difference between observation and inference?
   3. Think back to one of the experiments from this unit – identify the control group, the variable(s), at least 3 constants, and tell whether the sample size was large enough or would you have to change this?
2. Identify relationships between various events in earth’s history and explain them.
3. Explain the contributions Darwin made to the theory of evolution including:
   1. Descent with Modification
   2. Natural Selection and the role of variation in natural selection
   3. Reproductive Success
4. Using the Jelly Bean lab or other specific example (such as the Galapagos Finches), thoroughly explain natural selection, including the variation and environmental factors that lead to it (OCVSRS).
5. Explain the evolution of a strain of bacteria because of variation and selective pressures caused by antibiotics.
6. How is reproductive success important to the evolution of such bacteria?
7. Explain the effect of fitness for a particular environment on natural selection (use striped versus plain clovers to illustrate your points).

## ECOLOGY (Unit 2): Interaction and Interdependence in Living Systems

1. Define: population, community, ecosystem.
2. How might the waste of one organism be useful to another organism? Give examples.
3. What is a food web? Identify: producers, first order (primary) consumers, second order (secondary) consumers, third order (tertiary) consumers?
4. Why is there a decrease in energy at each level in the food chain? Explain how the pyramids of energy, numbers, and biomass illustrate this principle.
5. What are some of the cycles that operate in an ecosystem? How are these cycles illustrated in your bottle ecosystem?
6. What is the role of decomposers in the ecosystem? Why are these organisms essential to the continued existence of the ecosystem?
7. What is the ultimate source of energy in an ecosystem? What is the immediate source of energy for the cells of the different organisms in an ecosystem?
8. Be able to look at a food web or food chain and determine producers and consumers from the diagram and then determine how an increase (or decrease) in the numbers of one organism would affect the other organisms in the food web.
9. What factors affect the carrying capacity of a habitat?
10. How might climate (temperature, rainfall, wind, etc.), light, and space limit the size of a population?
11. How is available space affected by population density?
12. What idea did Thomas Malthus report about population growth versus growth of food supply?
13. What is the difference between logistic growth and exponential growth? What causes logistic growth rather than exponential growth?
14. What factors affect population size?
15. How would a puddle or a pond change to a forest?

**BIOCHEMISTRY AND DIGESTION (Unit 3)**

1. Write the molecular formula for a molecule of glucose.

2. Draw the following molecules’ structural formula.

a. Glucose

b. Amino Acid

c. Glycerol

d. Fatty Acid

3. When two amino acids join together, what is the name of the C-N bond that forms?

4. What is the difference between a saturated and unsaturated fatty acid?

5. Complete the chart:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Carbohydrate | Protein | Lipid |
| General Monomer |  |  |  |
| General Polymer |  |  |  |
| Example of Monomer |  |  |  |
| Example of Polymer |  |  |  |
| Use(s) (in body) |  |  |  |
| Indicator used to test for presence of |  |  |  |
| Color change from \_\_\_\_\_ to \_\_\_\_\_\_ |  |  |  |
| Found in what foods? (name 2) |  |  |  |

6. What is hydrolysis? What is dehydration synthesis? Be specific (discuss H2O).

7. What are the four different levels of protein structure?

8. What happens to a protein if a hydrophilic amino acid is replaced by a hydrophobic one? Discuss the effects on the protein in terms of structure and function.

9. What is a catalyst? What is activation energy?

10. What type of macromolecule is an enzyme? Describe how an enzyme works.

11. List at least 4 characteristics of enzymes.

12. List at least 3 things that would decrease the activity of an enzyme.

13. What is mechanical digestion and where does it take place in the digestive system?

14. Which organs are part of the digestive tract, where food goes through? Name them in order and tell which macromolecule(s) is/ are being chemically digested in each.

15. Which organs are part of the digestive system, but function as accessory organs? What do each of these organs provide?

16. What is the major organ of digestion and why?

17. What is the structure and function of villi and where are they located?

18. What two important functions does the large intestine have?

19. For the enzymes pepsin and amylase, what macromolecule does each digest and what are the locations that these enzymes work? What approximate pH is required for these enzymes to function?

**CELLS AND SYSTEMS (Unit 4); How They Maintain Homeostasis**

1. What is meant by the term homeostasis?
2. Some of the internal compartments (organelles) in a cell include nucleus, ribosomes, mitochondria, rough ER, smooth ER, and Golgi body. What are their functions?
3. What do all cells have in common? What do plant and animal cells have in common? How do plant and animal cells differ from each other?
4. What is the chemical make up of the cell membrane?
5. Explain the difference between the following terms: permeable, impermeable, and selectively permeable.
6. Explain the difference in the following terms: hydrophobic, hydrophilic.
7. Explain how charge and molecular size influence whether a substance can pass through a membrane.
8. Be able to explain the differences and similarities between diffusion, osmosis, and active transport.
9. What is the purpose of the large central vacuole in plant cells? How can you explain what happened to the vacuole when the onion was placed in salt solution?
10. Explain what happens to blood cells when placed in isotonic, hypertonic, and hypotonic solutions. Explain why these changes occur.
11. How are many salts, carbon dioxide, and water eliminated from the body?
12. What role does the circulatory system play in maintaining balance?
13. Explain the path that a red blood cell carrying oxygen takes through the system using the terms, lungs, heart, arteries, capillaries, veins, cells.
14. The exchanges of materials that the circulatory system is responsible for delivering occur over the membranes of what blood vessels?
15. Explain how the urinary system can be considered a regulatory system. What waste products are eliminated through the urinary system? What is a diuretic? Why is alcohol considered a diuretic?
16. Explain the function of these different structures in the urinary system: kidneys, ureters, urethra, and nephron.
17. Explain the processes of filtration, reabsorption, and secretion as these processes relate to what happens in the nephron.
18. Why does acute kidney failure lead to death from fluid imbalances, incorrect ion levels in the blood, and accumulation of metabolic wastes?

**DNA & GENE ACTION (Unit 5)**

1. Describe the Watson-Crick Model for DNA
2. What are the three parts of a nucleotide? How are they connected to each other?
3. In what part of the DNA molecule is the coded information stored? Explain.
4. How is DNA replicated? How does the DNA “code” ensure that genetic information is maintained from cell to cell?
5. What are the differences between DNA and RNA?
6. What are transcription and translation?
7. Given a sequence of DNA, you must know how to transcribe and translate it.
8. Explain how DNA directs the formation of protein. Give the functions of: DNA, messenger RNA, transfer RNA, ribosome, and amino acids.
9. What is a codon? What is an anticodon?
10. How does a certain genotype result in a certain phenotype? Explain fully.
11. What is the significance of proteins? How do proteins determine phenotypic traits?
12. What are the different types of mutations? What effect will each type have on the final protein?
13. What is recombinant DNA?
14. What is the Human Genome Project and what are its goals?
15. What do restriction enzymes do?
16. How is gel electrophoresis used in criminal and paternity cases?

**REPRODUCTION AND DEVELOPMENT (Unit 6)**

1. What is the difference between sexual and asexual reproduction? Be able to give examples of each from all the kingdoms.
2. Describe some of the diverse reproductive strategies found in plants, animals, fungi, protists, and bacteria. (See pp. 406-7 for proper terminology.)
3. Why is it best to describe mitosis as a process of duplication and division rather than just a simple cell division?
4. What are the stages in mitosis, and what happens in each stage?
5. How can you use the process of mitosis to explain how a cut heals? How a cancerous tumor develops? How planaria regenerate new parts?
6. What are chromosomes? Why are they necessary for the continued existence of cells?
7. Be able to label and tell the function of each of the parts of the human male and female reproductive system. Where are male gametes formed? Female gametes?
8. What is the goal of meiosis? What types of cell undergo meiosis?
9. What are the causes of variation in offspring?
10. What is the difference between oogenesis and spermatogenesis?
11. How do hormones (LH, FSH, estrogen, progesterone) regulate the production of eggs (menstrual cycle +ovulation) in the human female?
12. Be able to trace the path of the egg from where it is made in the ovary to where it is fertilized and if it is fertilized, where it develops in the female. If it is not fertilized, what will be the result?
13. Why are the testes of the human male located outside the body?
14. What are some of the difficulties that the sperm encounters as it journeys to fertilize the egg?
15. Be able to trace the path of a sperm from where it is made in the testes through the various parts of the male reproductive system until it exits the body.
16. How do the prostate gland, seminal vesicle, and bulbourethral (Cowper’s) gland help the sperm in its journey to the egg?
17. Where does fertilization occur in the female body? What is a zygote?
18. Be able to label the parts of a flower and describe their functions.

**Genetics (Unit 7)**

1. What is an allele? What is the relationship between genes and chromosomes?
2. What is meant by Genotype? Phenotype? Dominant? Recessive? Homozygous? Heterozygous?
3. What role does probability play in genetics? What is the relationship between sample size and accuracy of predictions?
4. Be able to solve simple genetics problems using a Punnett Square.
5. Describe the following modes of inheritance: co-dominance, incomplete dominance, and sex-linked recessive.
6. Be able to do problems involving blood-type analysis.
7. Be able to use a pedigree chart to solve genetics problems. Which symbol represents male? Females? Affected? Carriers? Normal?
8. Draw a homologous pair of chromosomes with the linked genes A and B. Assume the individual has a genotype AaBb. Describe how linked alleles can become unlinked.
9. What are genotypes that when crossed illustrate Mendel’s Law of Segregation?