Biology End of Course Exam
Study Guide

Directions: Answer the following. You may have to use your own paper for some of them, but most of it can be answered on this sheet. You can write on this. Remember the end of course exam accounts for 20% of your final grade in Biology. The study guide is due Thursday, December 9th and the EOC will be on Tuesday, December 14th!

THE SCIENTIFIC METHOD

1. Here is your problem: Besides white light, what color light is best suited for a plant to grow? Come up with a hypothesis in the form of an “if then” statement.

2. List laboratory apparatus/equipment that you would use to test your hypothesis from #1. Also describe what each does.

3. What are the metric units for:
   a) Mass
   b) Length
   c) Volume
   d) Temperature

4. Design an experiment using the problem in #1. What is your control?

5. Identify the independent and dependent variables in your experiment from above.

6. Create a table to organize your data from your experiment above.

7. What is the proper way to write a conclusion? List the steps that we discussed in class.

8. Illustrate a student being safe in lab.

THE CELL

9. Explain the 3 major tenants of the cell theory.

10. Who were Robert Hooke, Anton Van Leeuwenhoek, Schleiden, and Schwann and what were their contributions to the cell theory?
11. Label the cell organelles and/or cell parts below and describe the function of each one. Take Note: 
There are a few extra things to label than there are below the pictures to describe.

- Nucleus
- Endoplasmic Reticulum
- Mitochondria
- Golgi Apparatus/Golgi Bodies
- Chloroplast
- Cilia
- Lysosome
- Flagella
- Vacuoles
- Cell Membrane/Plasma Membrane
- Ribosomes
- Nuclear Membrane
- Cell Wall
- Nucleolus
- Cytoplasm
- Microtubules & Microfilaments

12. Illustrate a prokaryotic and eukaryotic cell in the table below and label important parts. Make sure you differentiate between the two and give me an organism that would have this type of cell.

| Prokaryotic (Example: ________________ | Eukaryotic (Example: ________________) |
13. Put the following terms in order from simple to most complex: Tissue, Organ System, Organ, Organism, and Cell.

14. Explain how active, passive, and facilitated transport serves to maintain the homeostasis of a cell. Label the phospholipid bilayer. Use the illustration below to help you.

![Diagram of passive and active transport]

15. Explain osmosis, hypotonic, hypertonic, and isotonic. Use the illustration below to help you.

![Diagram of osmosis and cell states]

16. Illustrate the cell cycle and explain, specifically interphase (called G1, S, and G2).
17. Summarize the phases of mitosis (called prophase, metaphase, anaphase, and telophase.) Also include in your answer the difference between plant and animal cytokinesis. Label some of the important parts in the illustration below. Remember the hand trick!!!

18. Explain the consequences of uncontrolled cell division.

19. Explain the factors that affect the rates of biochemical reactions (including pH, temperature, and the role of enzymes as catalysts). Include active site, activation energy, enzyme and substrate in your answer. Use the illustration below to help you.

20. Complete the table below on the 4 organic compounds.

<table>
<thead>
<tr>
<th>Organic Compound</th>
<th>Monomer</th>
<th>Function</th>
<th>Example</th>
<th>Caloric Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protein</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lipid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nucleic Acid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PHOTOSYNTHESIS & CELLULAR RESPIRATION

21. What is the overall equation for photosynthesis?

22. What is the overall equation for cellular respiration?
23. Differentiate between aerobic respiration and anaerobic respiration (fermentation). What are the 2 kinds of fermentation?

24. Compare and contrast photosynthesis and respiration using the table below.

<table>
<thead>
<tr>
<th></th>
<th>Photosynthesis</th>
<th>Cellular Respiration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location In Cell</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reactants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Products</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

25. Explain the picture below. Discuss what the molecules are and what the cycle is depicting.

GENETICS

26. Compare and contrast DNA with RNA using the table below.

<table>
<thead>
<tr>
<th></th>
<th>DNA</th>
<th>RNA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sugar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base Pairs (Nitrogenous Bases)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

27. Summarize the relationship among DNA, genes, and chromosomes. In addition, LABEL THE CHROMOSOME with the appropriate parts. Use the illustration below to help you.
28. I have a DNA molecule. Tell me what the complimentary strand should be:

<table>
<thead>
<tr>
<th>T</th>
<th>A</th>
<th>C</th>
<th>G</th>
<th>C</th>
<th>T</th>
<th>A</th>
<th>A</th>
<th>C</th>
<th>A</th>
<th>C</th>
<th>T</th>
</tr>
</thead>
</table>

29. Now take the same DNA strand and transcribe it into messenger RNA (mRNA).

<table>
<thead>
<tr>
<th>T</th>
<th>A</th>
<th>C</th>
<th>G</th>
<th>C</th>
<th>T</th>
<th>A</th>
<th>A</th>
<th>C</th>
<th>A</th>
<th>C</th>
<th>T</th>
</tr>
</thead>
</table>

30. Now take the mRNA and tell me what the anticodons on the transfer RNA (tRNA) will be.

----------  ----------  ----------  ----------

31. Now use the chart below to determine what the polypeptide (protein) will be using the mRNA.

----------  ----------  ----------  ----------

32. Use the chart below and decide what protein will be made for the frog tongue.

<table>
<thead>
<tr>
<th>Short Tongue</th>
<th>Methionine – Leucine - Tyrosine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medium Tongue</td>
<td>Methionine – Arginine - Tyrosine</td>
</tr>
<tr>
<td>Long Tongue</td>
<td>Methionine - Arginine – Leucine</td>
</tr>
</tbody>
</table>

The Frog will have a ______________ tongue.
33. Summarize the basic processes involved in protein synthesis (including transcription and translation). Label some of the important parts in the illustration below.

![protein synthesis illustration](image)

34. Compare mitosis with meiosis using the table below.

<table>
<thead>
<tr>
<th></th>
<th>Mitosis</th>
<th>Meiosis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>How many phases?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>How many nuclear divisions?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Results in how many cells?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cells are the same or different?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Resulting cells are haploid or diploid?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>What type of cells?</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

35. What is happening in the illustration below? When and where does this happen and what is the result?

![chromosome illustration](image)

36. Explain what happens when cells do not divide correctly through meiosis. Include in your answer how humans inherit Turner Syndrome or Down Syndrome.
37. Describe the following Mendelian principles.

Segregation –

Independent Assortment –

Dominance –

38. Give me an example of each in the table below.

<table>
<thead>
<tr>
<th>Genotype</th>
<th>Phenotype</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
</table>

39. Brown eyes are dominant to blue eyes. Mom has brown eyes, but is a “carrier.” Dad has blue eyes.

Complete the monohybrid cross. What is the phenotypic ratio of the offspring?

40. An aquatic insect has antennae that are either smooth or spiked. The allele for spiked is dominant. In the same organism, resistance to pesticides is a recessive trait. An insect that is resistant to pesticides and has smooth antennae is crossed with one that is heterozygous for both traits. Show the genotypes of the parents. Complete the dihybrid cross. What are the phenotypic ratios of the offspring?
41. Describe and give examples of each type of inheritance listed below:

   Incomplete Dominance –

   Codominance –

   Polygenic Inheritance –

   Sex-Linked Traits –

42. Discuss each of the following in terms of their significance in the biotechnology field.

   Gel Electrophoresis –

   Cloning –

   Human Genome Project –

   Recombinant DNA Technology –

   Centrifuge –

   Gene Therapy –

ECOLOGY

43. Describe each of the following interrelationships and give an example of each.

   Predation –

   Competition –

   Parasitism –

   Commensalism –

   Mutualism –

44. Complete the table below. Use a check mark to indicate whether the factor is biotic/abiotic and density dependent/density independent. There should be 2 check marks for each factor.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Biotic</th>
<th>Abiotic</th>
<th>Density Independent</th>
<th>Density Dependent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parasites</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pollution</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural Disaster</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
45. Use the pictures below. What is happening here? Is this primary or secondary? EXPLAIN. When would the other type occur?

46. Explain the following diagrams below on the life cycles.
47. Take the following picture and identify the following: individual, population, community, and an ecosystem.

![Image of an ecosystem with various animals and plants]

48. Take the following picture and identify the following: producer, primary consumer, secondary consumer, tertiary consumer, and decomposer.

![Image of a food web]

49. Take the same picture and identify the following: herbivore, omnivore, carnivore, autotroph, and heterotroph.

![Image of a food web]
50. Explain the following picture. Include in your answer biomass, the 10% rule, and trophic levels.

51. Explain how ecosystems maintain themselves through naturally occurring processes.

Maintaining the quality of the atmosphere –
Generating soils –
Controlling the water cycle –
Disposing of wastes –
Recycling nutrients –

52. Explain how human activities affect the physical and chemical cycles and processes of earth.

Population Growth –
Technology –
Consumption of Resources –

53. Complete the graph questions below:

**Graph 1: Rabbits Over Time**

a. The carrying capacity for rabbits is ______.

b. During which months did the rabbit population grow? ___________ & ___________
c. In 1800, about how many people surveyed had a 3 cm toe? _______

d. How many in 2000? _______

e. In 2000, what is the average toe length? _______

f. What is the average toe length in 1800? _______

---

**EVOLUTION**

54. Summarize the process of natural selection.

55. Explain how genetic processes result in the continuity of life-forms over time.

56. Explain how diversity within a species increases the chance of its survival. Use the picture below to help you.

57. Explain how genetic variability and environmental factors lead to biological evolution. Hint: Think about all the different biomes/climates on earth and all the different species. Why might a species evolve?
58. Explain each of the following pictures in terms of evidence of evolution.

<table>
<thead>
<tr>
<th>Anatomy</th>
<th>Embryology</th>
<th>Biochemistry</th>
<th>Paleontology</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Images of human, horse, cat, bat, bird, whale limbs]</td>
<td>[Images of fish, turtle, salamander, human embryos]</td>
<td>[Genetic structure and biochemical data]</td>
<td>[Fossil fish]</td>
</tr>
</tbody>
</table>

59. According to the diagram below, which 2 members of the animal kingdom are the most closely related? Which 2 members are the least related? What is the name of this diagram and what does it show?

[Tree diagram of fish, amphibians, reptiles, birds, mammals]

60. How is taxonomy useful? What are dichotomous keys? What are the 6 kingdoms?