

Honors Biology Fall Final Exam Study Guide

Helpful Information:

Exam has 100 multiple choice questions. Be ready with pencils and a four-function calculator on the day of the test. Review ALL vocabulary, focus questions, learning goals, reading notes, lecture notes, labs, and activities.

Topics included:

1. Science of Biology
 - a. Textbook Chapters/Notes: 1.1-1.2, 1.7, Characteristics of Life, Microscope Use, Designing a Controlled Experiment
 - b. Activities/Labs: Scientific Process & Lab Safety, Characteristics of Life, Microscope Rotation
2. Chemistry
 - a. Textbook Chapters/Notes: 2.1-2.5, 3.1-3.5, Properties of Water, Atomic Structure, Chemical Bonds, Basic Chemistry, Macromolecules, Calculating PNE, Isotopes, Calculating pH
 - b. Activities/Labs: Properties of Water, Macromolecules: What's in Your Food?
3. Cell Structure and Function
 - a. Textbook Chapters/Notes: 4.1-4.9, Cell Theory & Types of Cells
 - b. Activities/Labs: Eukaryotic Cell Tour Presentations, Cell Membrane Diagram, Plant & Animal Cells
4. Cell Transport
 - a. Textbook Chapters/Notes: 4.10-4.14, Cell Transport Worksheets
 - b. Activities/Labs: Diffusion & Osmosis, Osmosis in Plant Cells
5. Photosynthesis & Cellular Respiration
 - a. Textbook Chapters/Notes: 1.3, 5.3, 6.1-6.2, 7.1, 7.5-7.6
 - b. Activities/Labs: Stomata Lab, Pigments in Photosynthesis, Factors Influencing Photosynthesis
6. Geochemical Cycles
 - a. Textbook Chapters/Notes: 36.3-36.5, Nitrogen Cycle, Carbon Cycle
 - b. Activities/Labs: Geochemical Cycle Diagrams
7. DNA
 - a. Textbook Chapters/Notes: 11.1-11.5, 5.4-5.5, DNA History, DNA Structure, Enzymes, DNA Replication
 - b. Activities/Labs: Toothpick-ase, DNA Model, DNA Replication modeling
8. Cell Cycle
 - a. Textbook Chapters/Notes: 8.1-8.7, Prokaryotic vs. Eukaryotic Cell Cycle
 - b. Activities/Labs: Duration of Mitosis Lab, Cancer and the Cell Cycle
9. Protein Synthesis & Mutations
 - a. Textbook Chapters/Notes: 11.5, 12.1-12.3, RNA vs. DNA, Transcription, Translation
 - b. Activities/Labs: How Genes Make Proteins, Mutations and Proteins

Science of Biology

1. How do you calculate the magnification under a microscope?

2. How do you calculate the area of the field of view under a microscope?
3. What are some of the general safety procedures that have been used this semester?
Reference your safety list in your lab book.
4. What is the difference between something that is biotic versus something that is abiotic?
5. What are the characteristics of something that is considered to be living?
6. What are the two components of a hypothesis?
7. What is the difference between qualitative and quantitative data?
8. What are the six kingdoms of living things? How can they be classified into two groups?
9. What are the levels of organization at the cellular level, organismal level, and ecological level?
10. Why is a control group essential to any valid experiment?

A student was investigating the relationship between different concentrations of substance X and the height of bean plants. He started with six groups, each of which contained the same number of bean plants with identical heights. Conditions were kept the same except that each group was watered with a different concentration of substance X for a period of two weeks. Then the concentration of substance X used in watering each group of plants and the average height for each group of plants were recorded by the student as follows:

Group A – 6%, 32.3 cm
Group B – 0%, 28.7 cm
Group C – 2%, 29.4 cm

Group D – 8%, 37.1 cm
Group E – 4%, 31.5 cm
Group F – 10%, 30.7 cm

11. What is a potential hypothesis for this scenario?

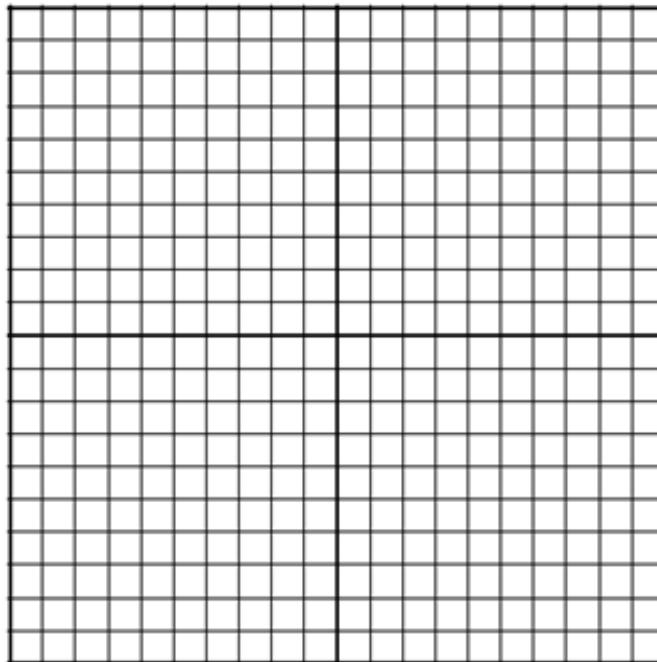
12. What is the independent variable in this scenario?

13. What is the dependent variable in this scenario?

14. What are two controlled or standardized variables that would be in place for this scenario?

15. Create a data table to communicate the significant information.

16. Be able to properly graph the data including all appropriate labels on a graph (title, labels and units for axes, consistent interval labels, legend, if applicable)



17. What claim can be made from the results of this scenario? Justify the claim made with at least one piece of quantifiable data.

Chemistry

18. What are the three components of an atom and where are they found? What charges, if any, are associated with each one?

19. How do you calculate the number of protons, neutrons, and electrons in an atom if you have a periodic table?

20. How do atoms bond to one another?

21. What are the different types of bonds and how do they form? Know examples of each type of chemical bond.

22. Diagram and label a water molecule including the partial charges.

23. What is cohesion and where is it found in biological systems?
24. What is adhesion and where is it found in biological systems?

25. What is specific heat? Water has a high specific heat. Why is this property of water important to life?

26. What is capillary action and where is it found in biological systems?

27. Diagram the pH scale and be able to label the location of acids, bases, and neutral substances.

28. What are the four major classes of macromolecules and what are their monomers?

29. What are the processes involved in the making and breaking of macromolecules?

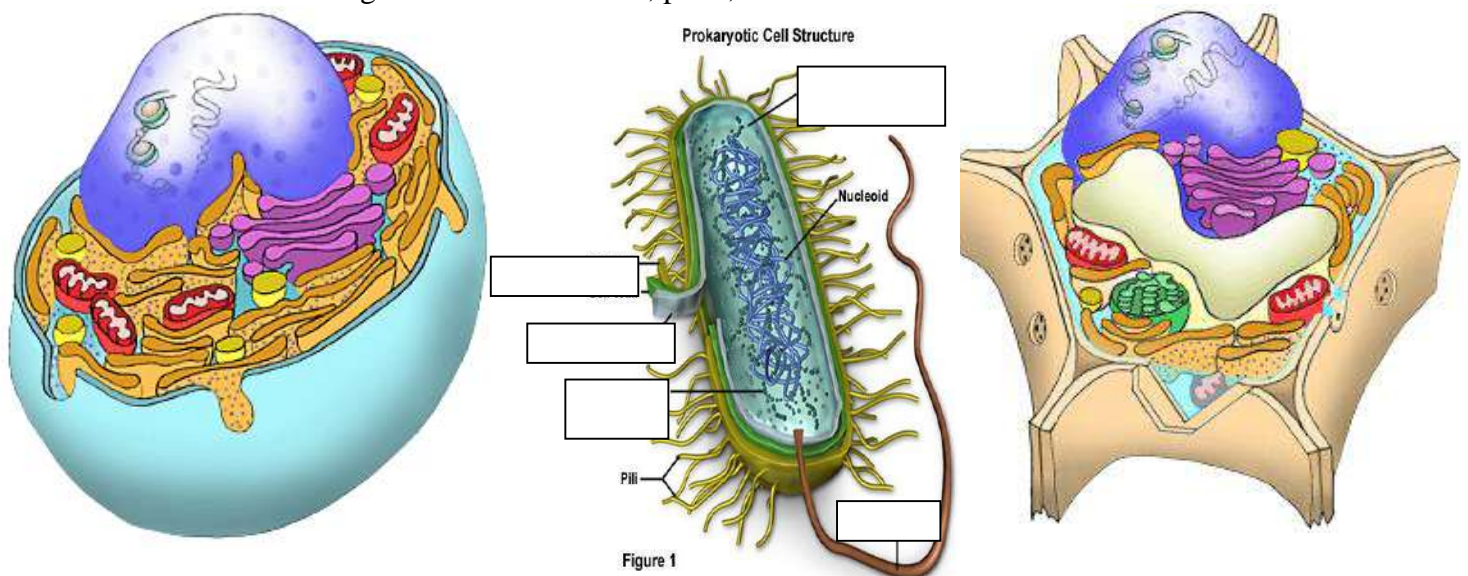
30. What are the four levels of protein structure and what happens in each?

31. What environmental conditions cause a protein to become denatured?

32. What is the difference between saturated and unsaturated lipids?

Cell Structure & Function

33. Label the organelles on the animal, plant, and bacterial cell.



34. What characteristics describe a prokaryotic cell? Give an example of a prokaryotic cell.

35. What characteristics describe a eukaryotic cell? Give an example of an eukaryotic cell.

36. List 2 differences between prokaryotes and eukaryotes?

37. What cells were most likely the first cells on Earth and why? (prokaryotic or eukaryotic)

38. What are three shapes of bacteria and what are the terms used to describe them?
39. Contrast plant and animal cells.
40. What are the three parts of the cell theory?
41. What scientist first observed cork cells under a microscope?
42. What is the theory of endosymbiosis? Which organelles are a part of the theory of endosymbiosis?
43. What evidence supports the theory of endosymbiosis?
44. Why do we describe the cell membrane as being semi-permeable?
45. Draw out a cross section of a plasma membrane. Be able to label the hydrophobic and hydrophilic regions as well as label phospholipids, phosphate heads, fatty acid tails, peripheral proteins, and transmembrane proteins.
46. What organic macromolecules are the main component of the plasma membrane?
47. In the table below list the function of each of the organelles.

Organelle	Function
Cell membrane	
Cytoplasm	

Organelle	Function
Nucleus	
Nucleolus	
Mitochondria	
Ribosomes	
Endoplasmic Reticulum	
Golgi Apparatus	
Lysosomes	
Cytoskeleton	
Cilia	
Cell wall	
Vacuole	
Chloroplast	

Cell Transport

48. What is homeostasis? Give at least two examples found in biological systems.

49. What do the following solute concentrations mean: hypertonic, hypotonic, isotonic?

50. How are active transport and passive transport different? How are they the same?

51. What are the three types of passive transport? Be able to provide an example of each.

52. What are the three types of active transport? Be able to provide an example of each.

53. What is the difference between osmosis and diffusion?

54. A solute will diffuse in water until it reaches what condition?

55. Complete the following table.

Type of solution	Where is solute concentration the highest (inside cell or outside cell)	Will water move in or out of cell?	Will the cell swell, shrink, or stay the same size?
Hypertonic			
Hypotonic			
Isotonic			

Photosynthesis & Cellular Respiration

56. What is the equation for photosynthesis? Be able to identify the reactants and products with proper subscripts and coefficients.

57. What organelle is associated with photosynthesis?

58. What is the equation for cellular respiration? Be able to identify the reactants and products with proper subscripts and coefficients.
59. What organelle is associated with aerobic cellular respiration?
60. Why do the leaves of plants appear to be green?
61. Why is it an advantage for plants to have multiple pigments?
62. What are the dominant & accessory pigments of photosynthesis?
63. What is the source of oxygen produced during photosynthesis?
64. What three factors affect the rate of photosynthesis?
65. Graph each factor with increasing factor on the x-axis and rate of photosynthesis on the y-axis.
66. What are the three stages of photosynthesis?
67. What are the two stages of cellular respiration?

68. What is ATP and why is it important to living organisms?

69. Where do the light reactions of photosynthesis occur?

70. What kinds of organisms go through glycolysis?

71. What is the purpose of fermentation and what conditions are necessary for fermentation to take place?

72. What types of organisms use aerobic respiration? What types of organisms use anaerobic respiration?

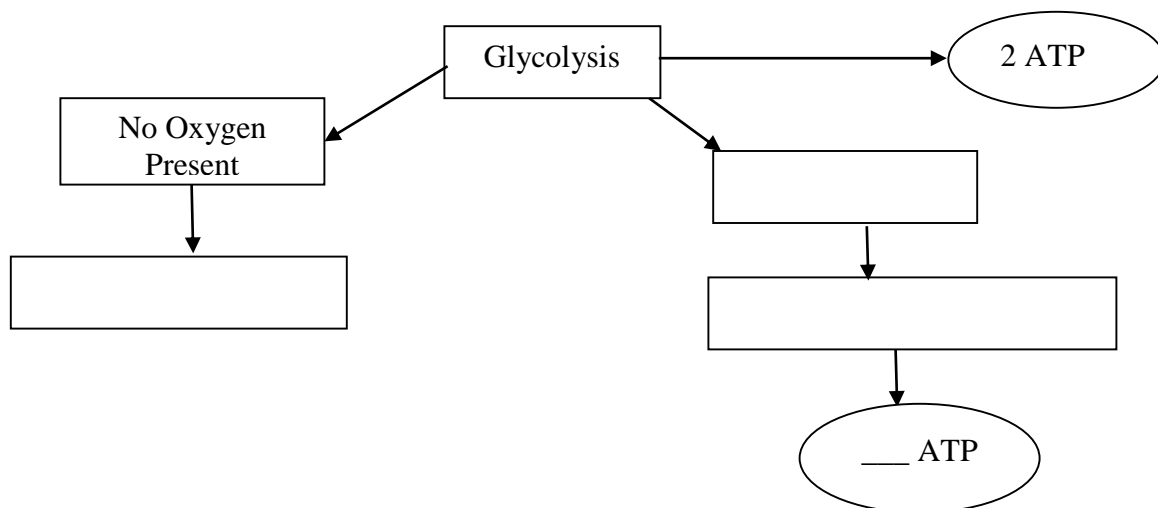
73. What is the difference between these two types of respiration?

74. In general, what is the difference between ethanol and lactic acid fermentation?

75. What organisms undergo cellular respiration?

76. Which biochemical pathway would a large organism be more efficient at producing energy?

77. Fill in missing parts of graphic organizer for energy and cellular respiration below:



Geochemical Cycles

78. What are the reservoirs and processes of the carbon cycle? Be able to label parts on a diagram. Practice by diagramming it yourself.

79. How have humans significantly impacted the carbon cycle?

80. What are the reservoirs and processes of the water cycle? Be able to label parts on a diagram. Practice by diagramming it yourself.

81. By what process does nitrogen get fixed from the atmosphere?

82. What organism plays a dominant role in the nitrogen cycle?

83. What are the major processes in the nitrogen cycle?

DNA

84. Who are the major scientists associated with the discovery of the structure and function of DNA? Know their last names and what they are known for.

85. What is a chromosome?

86. What is a chromatid?

87. What is chromatin? What protein is important in forming chromatin?

88. What is a gene?
89. What do genes code for?
90. What is the monomer of DNA? What are the three parts of this monomer?
91. Use Chargaff rules to solve this problem. An organisms DNA is made up of 15% Adenine nucleotides. _____%Thymine _____%Guanine _____%Cytosine
92. What key characteristics describe the structure of DNA? Make sure to label the orientation of the monomers.
93. Where does the DNA molecule separate during replication? What enzyme is responsible for this?
94. What organic macromolecule is responsible for catalyzing reactions in living systems?

Cell Cycle

95. What is the correct order of the phases of the cell cycle? Include all of the phases included in mitosis.
96. Why is the process of mitosis important for an organism? Give two reasons.
97. Are all of the phases of mitosis the same length of time?
98. How many cells are produced during mitosis? Are the resulting daughter cells genetically identical or different from the parent cell?
99. Are diploid or haploid cells produced in the process of mitosis?
100. What are somatic cells?

101. What happens in each phase of mitosis? Be able to identify each phase.

Protein Synthesis & Mutations

102. What are the differences between DNA and RNA?

103. What is the central dogma of biology?

104. Transcribe the mRNA from the following piece of DNA:
3' T-A-C-C-G-A-A-T-T-A-C-T-A-G-T-A-C-G 5'

105. In which direction would the complementary strand be written for the example above?

106. Translate the mRNA that was produced in the previous problem into an amino acid chain.

107. Describe the steps of transcription? Where does it occur in a eukaryotic cell? Where does it occur in a prokaryotic cell?

108. Describe the steps of translation? Where does it occur in a eukaryotic cell? Where does it occur in a prokaryotic cell?

109. What types of mutations are possible from protein synthesis?

110. What results are possible from mutations in protein synthesis?

111. What are the five chemical properties of amino acids?