**Course Syllabus\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

# General Biology A and B

**10th Grade Requirement**

## Instructor

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## Text

### Modern Biology

**Holt,Rinehart,Winston**

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**ISBN# 0-03-036771-9**

## Description:

Biology is the branch of science which deals with living organisms. This course will cover the fundamental areas; cytology, genetics, evolution, ecology, botany, and zoology.

Biology A contains the areas of: cytology, genetics and evolution.

Biology B contains the areas of ecology, botany, and zoology.

Labs will be held as often as the material in the chapter presents itself. The number of labs will vary from unit to unit.

ELECTIVES:

After successfully completing the general biology course students may enroll in the human biology or microbiology courses that are offered at Madison Central.

TIME ALLOWED FOR THE COURSE:

The class schedule is set up in an A and B block format with 90 minutes for the class period on the day the students meet during their assigned days.

**SOUTH DAKOTA STANDARDS**

9-12.L.1.1 Students are able to relate cellular functions and process to specialized structures within cells.

9-12.L.2.1 Students are able to predict inheritance patterns using a single allele.

9-12.L.2.2 Students are able to describe how genetic recombination, mutations, and natural selection lead to adaptations, evolutions, extinction, or the emergences of new species.

9-12.L.3.1 Students are able to identify factors that cause changes on stability or populations, communities, and ecosystems.

**Cytology: the branch of biology that studies the structure and function of cells.**

### Genetics: the branch of biology that deals with heredity, especially the mechanisms of

**hereditary transmission and the variation of inherited characteristics among**

**similar or related organisms.**

Evolution: the theory that groups of organisms change with passage of time, mainly as a

result of natural selection, so that descendants differ morphologically and

physiologically from their ancestors.

Ecology: the study of the relationship between organisms and their environment.

Botany: the science of plants; the branch of biology that deals with plant life.

Zoology: the science or branch of biology dealing with animals.

Requirements:

Students are graded on class participation (lab), quizzes and test.

RESOURCES:

Textbook Study Aids

<http://my.hrw.com> <http://go.hrw.com>

Students will be given passwords to access the online text and study aids available for them during the school year. The textbook and supplement material for the class have been downloaded to the students hard drive on their school computer.

EVALUATION:

Test will be given at the completion of each chapter. If there is time a review of the material will proceed the handing out of the test. The tests will consist of completion questions, true and false, matching, labeling of drawings and short answers.

The weight of the scores.

Test 60% Comprehensive Final Exam 7%

Assignments 30%

Lab 10%

**\*The semester grade is calculated by weighing the semester exam grades as 53% of their grade with 7% being contributed by their final exam**.

GRADING SCALE:

100 – 94………….A

93 – 87………….B

86 – 78………….C

77 – 68………….D

67 – 01………….F

INSTRUCTIONAL METHODS USED:

Lectures, question and answer periods, small and large group sessions, charts, computer, DVD, and VCR video and CDs.

MATERIALS NEEDED:

The teacher will use teaching resources that include: worksheets with answer key, chapter tests with answer key, transparencies, lab program with answer key, one-step planner CD-ROM with test generator.

The equipment would consist of basic laboratory equipment for a science class. Material would have to be ordered for example a kit for testing blood typing, or electrophoresis.

METHODS OF REPORTING TO PARENTS AND OR GUARDIANS:

Grades are recorded on the computer; the parents/guardian may access their child’s grade using a porthole provided by the district. If the home does not have internet access grades are sent to every child’s parent/guardian midway through the semester and again towards the end. Parent/teacher conferences are held approximately after the first nine week period for parents to meet with individual instructors. If the parent is unable to meet with the instructor they may call the school, and set up a time to meet. A parent can e-mail the instructor for any information.

CLASSROOM GUIDELINES

* No sleeping.
* No cheating.
* If the student is caught cheating; copying of another student’s work ( test, worksheet, quiz or other types of assignments) or is caught with any type of device used for cheating the student will receive a zero for the assignment and the parent/guardian will be notified. The principal’s office will receive a written explanation of the action taken to be placed into the student’s file.
* No food, but a drink will be allowed.
* No profanity.
* No consumption of lab material, unless it is part of the lab procedure.
* Unexcused absent/kicked out of class will result in a zero for that work done in class that day.
* The student will lose their computer usage if they fall below a 78% in the class. If they look on another student’s computer during class that student will also lose their computer privileges. When the student gets their grade to a 78% or better they will be allowed to use their computer during class. The student who loses the computer because of the other student will gain their computer usage back at the discretion of the teacher.
* The computer usage for the class is at the discretion of the teacher.
* Make-up work can be done in the class if there is time, after school, before school, study table on Friday mornings and during study hall. It is the responsibility of the student to ask for the make-up work so it can be placed in the make-up folder in the library before or after school for them.
* No bulling or degrading of any student will be tolerated.
* No cell phones
* No I pods or other devices to listen to media can be used during lecture, labs, or when taking an evaluation.
* I pods or other devices for media use will be used only if the teacher gives permission.

Course Schedule

Units of study

1. Biological Principles
2. Chapter One: The Science of Life

1. Themes of Biology

a. Objectives:

1. List six unifying themes of biology

2. Explain how organisms get the energy they need to survive.

1. Describe the main difference between the structure of a living thing

and that of a nonliving thing.

1. The World of Biology

a. Objectives:

1. List characteristics of life.

2. Describe how a living thing is organized.

3. Explain why all living things on Earth are not yet well understood.

3. Scientific Methods

a. Objectives:

1. Define and give examples of observing, measuring, organizing and

analyzing data, inferring, and modeling.

1. Explain the relationship between hypothesizing, predicting, and experimenting.
2. Explain why good communication is so important in science.
3. Describe the methods that scientists use in their work.

4.. Microscopy and Measurements

a. Objectives:

1. Compare light microscopes with electron microscopes in terms of

magnification and resolution.

1. Explain the advantage of the Systeme International d’ Unites
2. Chapter Two: Chemistry

1. Composition of Matter

1. Objectives:
2. Define element, atom, compound, and molecule.
3. Draw a model of the structure of an atom.
4. Explain what determines at atom’s stability.
5. Contrast ionic and covalent bonds.

2. Energy

1. Objectives:
2. List the three states of matter, and explain how matter can change

state.

1. Describe how energy changes are involved in chemical reactions.
2. Explain how enzymes affect chemical reactions in organisms.
3. Explain what a redox reaction is.

3. Solutions

1. Objectives:
2. Define solution, solute, solvent, and concentration.
3. Explain the dissociation of water.
4. Contrast properties of acids and bases.
5. Describe the use of the pH scale.
6. Explain the action of buffers.
7. Chapter Three: Biochemistry
8. Water
9. Objectives:
10. Describe the structure of a water molecule.
11. Explain how water’s polar nature affects its ability to dissolve substances.
12. List two of water’s properties that result from hydrogen bonding
13. Carbon Compounds
14. Objectives:
15. Define organic compound and name three elements often found in

organic compounds.

1. Explain why carbon forms so many different compounds.
2. Define functional group and explain its significance.
3. Compare a condensation reaction with hydrolysis
4. Molecules of Life
5. Objectives:
6. Define monosaccharide, disaccharide, and polysaccharide, and

discuss their significance to organisms.

1. Relate the sequence of amino acids to the structure of proteins.
2. Relate the structure of lipids to their functions.
3. List two essential functions of nucleic acids.
4. Cells
5. Chapter Four: Structure and Function Of The Cell
6. Introduction To The Cell
7. Objectives:
8. Outline the discoveries that led to the development of the cell theory.
9. State the cell theory.
10. Identify a limiting factor on the size of cells.
11. Distinguish between prokaryotes and eukaryotes.
12. Parts Of the Eukaryotic Cell
13. Objectives:
14. Describe the structure, composition, and function of the cell

membrane.

1. Name the major organelles found in a eukaryotic cell, and describe

their functions.

1. Describe the structure and function of the nucleus.
2. Describe three structures characteristic of plant cells.
3. Multicellular Organization
4. Objectives:
5. Distinguish between tissues, organs, and organ systems.
6. Describe the features of a colonial organism.
7. Chapter Five: Homeostasis and Transport
8. Passive Transport
9. Objectives:
10. Explain how an equilibrium is established as a result of diffusion.
11. Distinguish between diffusion and osmosis.
12. Explain how substances cross the cell membrane through facilitated diffusion.
13. Explain how ion channels assist the diffusion of ions across the cell membrane.
14. Active Transport
15. Objectives:
16. Distinguish between passive transport and active transport.
17. Explain how sodium-potassium pump operates.
18. Compare and contrast endocytosis and exocytosis.
19. Chapter Six: Photosynthesis
20. Capturing The Energy In Light
21. Objectives:
22. Explain how the structure of the chloroplast relates to its function.
23. Describe the role of chlorophylls and other pigments in photosynthesis.
24. Summarize the main events of electron transport.
25. Describe what happens to a water molecule in photosynthesis.
26. Explain how ATP is synthesized during the light reactions.
27. The Calvin Cycle
28. Objectives:
29. Summarize the main events of the Calvin cycle.
30. Describe what happens to the compounds made in the Calvin cycle.
31. Distinguish between C3, C4, and CAM plants.
32. Explain how environmental factors influence photosynthesis.
33. Chapter Seven: Cellular Respiration
34. Glycolysis And Fermentation
35. Objectives:
36. Define cellular respiration.
37. Describe the major events in glycolysis.
38. Compare and contrast lactic acid fermentation and alcoholic fermentation.
39. Calculate the efficiency of glycolysis.
40. Aerobic Respiration
41. Objectives:
42. Summarize the events of the Kreb’s cycle.
43. Summarize the events of the electron transport chain.
44. Relate aerobic respiration to the structure of a mitochondrion.
45. Calculate the efficiency of aerobic respiration.
46. Chapter Eight: Cell Reproduction
47. Chromosomes
    1. Objectives:
48. Describe the structure of a chromosome.
49. Compare prokaryotic chromosomes with eukaryotic chromosomes.
50. Explain the differences between sex chromosomes and autosomes.
51. Give examples of diploid and haploid cells.
52. Cell Division
    1. Objectives:
53. Describe the events of binary fission.
54. Describe each phase of the cell cycle.
55. Summarize the phases of mitosis.
56. Compare cytokinesis in animal cells with cytokinesis in plant cells.
57. Meiosis
    1. Objectives:
58. List and describe the phases of meiosis.
59. Compare the end products of mitosis with those of meiosis.
60. Explain crossing-over and how it contributes to the production of unique individuals.
61. Summarize the major characteristics and oogenesis.
62. Genetics

A. Chapter Nine: Fundamentals of Genetics

1. Mendel’s Legacy

a. Objectives:

* 1. Describe the steps involved in Mendel’s experiments on garden peas.
  2. Distinguish between dominant and recessive traits.
  3. State two laws of heredity that were developed from Mendel’s work.
  4. Explain the difference between an allele and a gene.
  5. Describe how Mendel’s results can be explained by scientific knowledge of genes and chromosomes.

1. Genetic Crosses

a. Objectives:

* 1. Explain how probability is used to predict the results of genetic crosses.
  2. Use a Punnett square to predict the results of monohybrid and dihybrid genetic crosses.
  3. Explain how a testcross is used to show the genotype of an individual whose phenotype is dominant.
  4. Differentiate a monohybrid cross from a dihybrid cross.

B. Chapter Ten: Nucleic Acids And Protein Synthesis

1. DNA

a. Objectives:

1. Explain the principle function of DNA.

2. Describe the structure of DNA.

3. Define the term *complementary base pairing.*

4. Explain the role of complementary base pairing in the replication of

DNA.

* 1. Summarize the main features of DNA replication.

2. RNA

a. Objectives:

1. Explain the primary functions of RNA.

2. Compare the structure of RNA with that of DNA.

3. Describe the structure and function of each type of RNA.

4. Summarize the process of transcription.

1. Protein Synthesis

a. Objectives:

* 1. Describe the genetic code.
  2. Distinguish between a codon and an anticodon, and state where each is found.
  3. Explain the roles of the start codon and stop codons.
  4. Summarize the process of translation.

1. Chapter Eleven: Gene Expression
2. Control Of Gene Expression
   1. Objectives:
3. Define the term *gene expression.*
4. Describe the regulation of the *lac* operon in prokarotes.
5. Distinguish between introns and exons
6. Describe the role of enhancers in the control of gene expression.
7. Gene Expression And Development
   1. Objectives:
8. Recognize the relationship between gene expression and morphogenesis.
9. Describe the influence of homeotic genes on *Drosophila* development.
10. Summarize the role of the homeobox in eukaryotic development.
11. List the key characteristics of cancer cells.
12. Compare and contrast the roles of oncogenes and tumor-suppression genes.
13. Chapter Twelve: Inheritance Patterns And Human Genetics
14. Chromosomes and Inheritance
    1. Objectives:
15. Explain the role of sex chromosomes in sex determination.
16. Describe how sex linkage affects the inheritance of traits.
17. Summarize the procedure involved in constructing a chromosome map.
18. Explain the effect of crossing-over on the inheritance of genes in linkage groups.
19. Distinguish between chromosome mutations and gene mutations.
20. Human Genetics
    1. Objectives:
21. Show how pedigree analysis can be used to illustrate the inheritance of traits.
22. Explain the inheritance of ABO blood groups.
23. Give examples of traits or disorders transmitted by autosomal dominant, autosomal recessive, polygenic, and X-linked recessive inheritance.
24. Compare sex-linked traits with sex-influenced traits.
25. Explain how nondisjunction can cause human genetic disorders.
26. Chapter Thirteen: DNA Technology
27. The New Genetics
    1. Objectives:
28. Define genetic engineering.
29. Explain how restriction enzymes can be used to make recombinant DNA.
30. Explain how cloning vectors can be used to clone and transfer genes.
31. List steps in a gene transfer experiment.
32. DNA Technology Techniques
    1. Objectives:
33. Explain what a DNA fingerprint is and how it is prepared.
34. Distinguish between the following laboratory techniques: RELP analysis, gel electrophoresis, and polymerase chain reaction.
35. Describe the purpose of the Human Genome Project and the potential uses of the information collected in the project.
36. Explain how gene therapy may be used in humans.
37. Practical Uses Of DNA Technology
    1. Objectives:
38. Explain how DNA technology can be used to produce medical products.
39. Describe some ways that DNA technology can be used to improve crop yields and the food supply.
40. Discuss some environmental and ethical issues in genetic engineering.
41. Evolution

A. Chapter Fourteen: Origin Of Life

1. Biogenesis
   1. Objectives:
2. Define spontaneous generation, and list some of the observations that led people to think that life could arise from nonliving things.
3. Summarize the results of experiments by Redi and by Spallanzani that tested the hypothesis of spontaneous generation.
4. Describe how Pasteur’s experiment disproved the hypothesis of spontaneous generation.
5. Earth’s History
   1. Objectives:
6. Outline the modern scientific understanding of the formation of Earth.
7. Summarize the concept of half-life.
8. Describe the production of organic compounds in the Miller-Urey apparatus.
9. Summarize the possible importance of cell-like structures produced in the laboratory.
10. The First Life-Forms
    1. Objectives:
11. Explain the importance of the chemistry of RNA in relation to the origin of life.
12. List three inferred characteristics that describe the first forms of cellular life on Earth.
13. Name two types of autotrophy and explain the difference between them.
14. Explain how photosynthesis and aerobic respiration are thought to be related.
15. Define endosymbiosis, and explain why it is important in the history of eukaryotes.

B. Chapter Fifteen: Evolution: Evidence And Theory

1. The Fossil Record
   1. Objectives:
      1. Define fossil, and tell how the examination of fossils led to the development of evolutionary theories.
      2. Explain the law of superposition and its significance to evolution theory.
      3. Describe how early scientists inferred a succession of life-forms from the fossil record.
      4. Tell how biogeographic observation suggest descent with modification.
2. Theories Of Evolution
   1. Objectives:
      1. Define evolution.
      2. Explain Lamarck’s theory of evolution and describe how it was flawed.
      3. List some of the evidence that led Darwin to his idea of how species might change over time.
      4. Explain Darwin’s two major theories.

3. Evolution In Process

a. Objectives:

* + 1. Describe the difference between homologous, analogous, and vestigial structures.
    2. Tell how similarities in macromolecules and embryos of different species suggest a relationship between them.
    3. Explain the difference between coevolution, and divergent and convergent evolution

C. Chapter Sixteen: The Evolution Of Populations and Speciation

1. Genetic Equilibrium
   1. Objectives:

1. Explain the importance of the bell curve to population genetics.

2. Describe two causes of genotypic variation in a population.

3. Explain how to complete allele frequency and phenotype

frequency.

4. Explain Hardy-Weinberg genetic equilibrium.

1. Disruption Of Genetic Equilibrium
   1. Objectives:

1. List five conditions that can cause evolution to take place.

2. Give an example of how migration can affect evolution.

3. Define genetic drift, and tell how it affects endangered species.

4. Contrast the effects of stabilizing directional, and disruptive

selection on variations in a trait over time.

* + 1. Give an example of sexual selection.

1. Formation Of Species
   1. Objectives:

1. Explain the difference between the morphological concept of

species and the biological species concept.

2. Define geographic isolation, and explain how it can lead to

speciation.

3. Name three kinds of reproduction isolation.

4. Summarize the punctuated equilibrium hypothesis, and contrast

it with the hypothesis of gradual change.

1. Chapter Seventeen: Human Evolution

1. The Study Of Human Origins

a. Objectives:

1. 1. Describe how paleoanthropologists gather evidence of human

ancestry.

2. List some traits shared by all primates.

3. Name two distinguishing characteristics of anthropoids.

4. Give examples of traits unique to humans.

2. Fossil Evidence Of Hominid Evolution

* 1. Objectives:

1. Explain how the discovery of Lucy changed hypothesis about

1. the evolution of bipedalism.
2. 2. Explain the significance of finding fossils of hominids that are
3. not ancestral to modern humans.
4. 3. List the fossil finds of 1995, and discuss their significance
5. regarding the evolution of bipedalism in hominids.
6. 3. Hypthesis Of Hominid Evolution
7. a. Objectives:
8. 1. Name Two behavioral advances made by *Homo* species.
9. 2. Describe where Neanderthals are placed on the hominid
10. phylogentic tree.
11. Ecology

A. Chapter 19: Ecology

1. Define the term *ecology* and explain why ecology is important.

2. List and describe three human caused environmental problems.

3. Identify the five different levels of organization in ecology.

4. Explain the theme of interconnectedness.

5. Identify the importance of models to ecology

6. Contrast abiotic factors with biotic factors and list tow examples of each.

7. Explain the importance of tolerance curves.

8. Describe some adaptations that allow organisms to avoid unfavorable

conditions.

9. Explain the concept of the niche.

10. Contrast the fundamental niche with the realized niche.

B. Chapter 20: Populations

1. Explain the difference between population size, density, and dispersion.

2. Describe the three main patterns of population dispersion.

3. Explain the importance of a population’s age structure.

4. Contrast the three main types of survivorship curves.

5. Describe the exponential model of population growth.

6.Compare the similarities and differences between the logistic model and the

exponential model.

7. Distinguish between density-dependent and density independent regulatory

factors.

8. List three reasons why small populations are more vulnerable to extinction.

9. Explain how the development of agriculture changed the pattern of human

population growth.

C. Chapter 21: Community Ecology

1. Distinguish predation from parasitism.

2. Evaluate the importance of mimicry as a defense mechanism.

3. Describe two ways plants defend themselves against herbivores.

4. Explain how competition can affect community structure.

5. Contrast mutualism with commensalism, and give one example of each type

of relationship.

6. Explain the difference between species richness and species diversity.

7. Explain the cause and consequences of the species area effect.

8. Distinguish between primary and secondary succession

D. Chapter 22: Ecosystems and the Biosphere

1. Contrast producers and consumers.

2. Contrast food web and food chain.

3. Explain why ecosystems usually contain only a few trophic levels.

4. Trace the water cycle.

5. Summarize the major steps in the nitrogen cycle.

6. Describe the steps in the carbon cycle.

7. Gain an understanding of the seven major biomes.

8. Summarize the aquatic ecosystems.

E. Chapter 23: Environmental Science

1. Give an example of how global systems are linked together.

2. Describe two ways that humans have modified the composition of the

atmosphere and identify the possible consequences of these changes.

3. Describe global patterns of biodiversity.