BIOLOGY HIGH SCHOOL ASSESSMENT
STUDENT RESOURCE BOOK

High School Biology

Correlated to *Biology* published by Prentice Hall, ©2006

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Prince George's County Public Schools

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Board of Education of Prince George's County, Maryland

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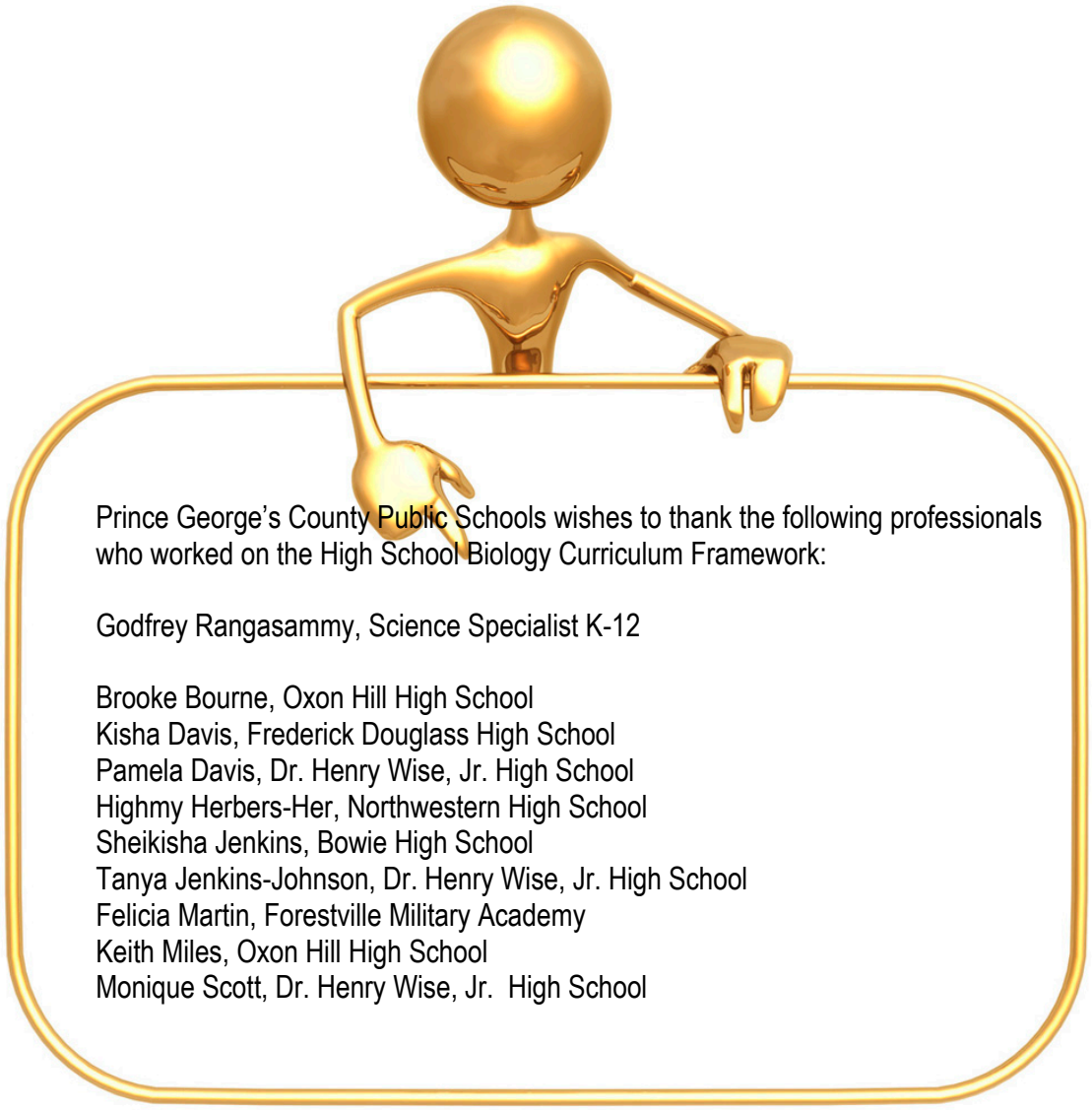

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Thank you to all teachers and students whose participation provided feedback and suggestions for the creation and revision of the Biology High School Assessment Student Resource Book.

This document was prepared to facilitate learning in the High School Biology Course using the Curriculum Framework Progress Guide with Extensions. The worksheets contained in this document were generated by Biology teachers of Prince George's County Public Schools.

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Table of Contents

Abstract

Course Title: **High School Biology**
Biology High School Assessment Student Resource Book

Summary: The Biology High School Assessment (HSA) Student Resource Booklet is a compilation of teacher generated worksheets, activities, notes, and reviews designed to aid memory and retention of biological concepts learned in class this year. The resource book will aid the development of connections between concepts taught in biology as well as help them to apply biological concepts to their everyday lives. This book is designed to serve as an ancillary to the Biology course and help students check for understanding independently, or with their teacher. Activities in the resource book are designed to scaffold and extend biological concepts covered in the High School Biology course. Passing the Maryland High School Assessment for Biology is a requirement for graduation. Thus, ownership of knowledge acquired through the Biology HSA course is critical and will be demonstrated by success on the Maryland HSA for Biology which is administered at the end of the course.

Proposed Outline: The Biology High School Assessment Student Resource Book is to be utilized as outlined in the Prince George's County Public Schools Biology Curriculum Framework Progress Guide with Extensions. The Resource Book is divided into four major sections: 1. HSA Science Goals, 2. Supplemental Student Activities, 3. Unit Test Reviews, and 4. Biology High School Assessment Review.

1. The HSA Science Goals is a checklist for students to keep track of the science goals and objectives as they are taught and to facilitate further independent study of concepts covered in class.

2. Supplemental Student Activities are teacher generated worksheets or activities that facilitate the understanding of concepts covered in class. The Biology CFPG refers to these activities and worksheets to aid student understanding and retention.

3. The Unit Reviews in this book are designed to help students prepare and review pertinent material covered in the unit. High School Biology will be covered in units. Unit lessons are in-depth study of biological topics that help students develop conceptual knowledge of biological concepts rather than memorization of unrelated facts. Units are designed to encourage imagination, creativity, and analytical thinking. The Unit reviews are an excellent way for students to prepare for upcoming Unit tests as well as the Maryland High School Assessment

4. Lastly, the Biology HSA Review provides students with an opportunity to test their knowledge of what they have learned in biology as preparation for the Biology High School Assessment.

Students are to complete the material in the Biology Resource Book as directed by their teachers. Teachers may refer to the Curriculum Framework Progress Guide with Extensions for High School Biology for suggested implementation. Additional activities and reviews can be used for re-teaching, remediation, or review at the teacher's discretion.

Note to Teacher: This Biology High School Assessment Student Resource Book was created to correlate with the Prince George's County Public Schools Curriculum Framework Progress Guide with Extensions for Biology. The supplemental student activities and unit reviews are a vital component in this course and are referred to throughout the CFPG. Assigning students the activities and reviews in this book will facilitate their preparation for Unit Tests and the Biology High School Assessment.

Note to Student: Successful passing of the Biology High School Assessment is a requirement for graduation. This resource book presents you with the opportunity to test your knowledge of what you are learning in your biology class. This year you will be given assignments, projects and assessments (unit tests and/or quizzes) as you learn key concepts to prepare you for the Biology HSA. Reading the suggested material and completing the assignments as instructed by your teacher will help you prepare for these assessments and the Biology HSA. The HSA Science Goals is your own checklist to help you keep track of what you are learning and to facilitate further independent study of biology concepts covered in class.

HSA Science Goals Student Checklist

CHECK IT OFF!
Use this checklist to keep track of the science goals and objectives as they are taught and to facilitate further independent study of concepts covered in class.

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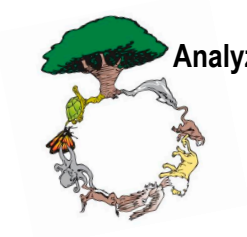
Introduction to Biology and the Process of Science

Demonstrate the ability to use scientific skills & processes and major biological concepts

- Scientific Method
  - ❑ Identify and Pose meaningful, answerable scientific questions and suggest investigative approaches to provide answers to questions
  - ❑ Formulate, Confirm, Modify, and Reject a working hypothesis
  - ❑ Determine and Identify independent and dependent variables, and proper controls
  - ❑ Explain the importance of sample size and repeat trials
  - ❑ Pinpoint appropriate instruments and materials to conduct an investigation
- Data Analysis
  - ❑ Make Predictions, Decisions, and Draw Conclusions
  - ❑ Recognize and Critique Arguments Based on Biased, Faulty, Misleading Data, or on Incomplete Use of Numbers
  - ❑ Organize data appropriately using tables, graphs, and webs (axes labeled with appropriate quantities, appropriate units on axes, axes labeled with appropriate intervals, independent and dependent variables on correct axes, appropriate title)
  - ❑ Read a technical selection and interpret it appropriately
- Laboratory Safety Procedures
- Mathematical Processes
  - ☐ Determine relationships between quantities and develop mathematical models to describe relationships
  - ☐ Create and/or Interpret graphics (i.e. scale drawings, photographs, digital images, field of view, etc.)
  - ☐ Utilize ratio and proportion in appropriate situations to solve problems
  - ☐ Express and/or compare small and large quantities using scientific notation and relative order of magnitude

Circle of Life – Interdependence in Nature



Analyze relationships between biotic diversity and abiotic factors in environments and the resulting influence on ecosystems.

- ❑ Abiotic/Biotic Factors: space, soil, water, air, temperature, food, light, and organisms
- ❑ Relationships (i.e. predator-prey, parasite-host, mutualism, commensalism, and competition)

Analyze how relationships among different organisms contribute to stability of an ecosystem

- ❑ Diversity
- ❑ Succession
- ❑ Trophic Level (i.e. producer; consumer; herbivore; carnivore; omnivore; scavenger; decomposer)
- ❑ Niche (role of organism within ecosystem)
- ❑ Pyramid (i.e. energy, biomass)

Illustrate how all organisms are part of and depend on two major global food webs that are positively or negatively influenced by human activity and technology

- ❑ Oceanic and Terrestrial Food Webs

Compare the transfer and use of matter and energy in photosynthetic and non-photosynthetic organisms.

- ➢ Biogeochemical Cycles
  - ☐ Water cycle (movement of water between living systems and the environment)
  - ☐ Carbon cycle (movement of carbon between living systems and the environment, cyclic relationship between photosynthesis and respiration)
  - ☐ Nitrogen cycle (roles of bacteria; human impact)

Investigate how natural & man-made changes in environment affect individual organisms & populations

- ❑ Population Increase, Food Depletion, Urbanization, Habitat Destruction, Pollution, Natural Disasters, Disease

Foundations of Life - Biochemistry

Describe the unique characteristics of chemical compounds and macromolecules used by living systems

- ❑ Water (inorganic molecule, polarity, density, solvent properties)
- ❑ Carbohydrates (organic molecule; monosaccharides are building blocks, energy source & dietary fiber, structural component of cells; cell wall; cellulose)
- ❑ Lipids (organic molecule; component of cell membrane, stored energy supply)
- ❑ Proteins (organic molecule; amino acids are building blocks, structural & functional role, enzymes)
- ❑ Nucleic Acids (organic molecule; nucleotides are building blocks – sugar, phosphate and nitrogen bases; DNA – double helix, RNA – single strand; DNA replication; DNA role in storage of genetic information, ATP (energy carrier molecule)
- ❑ Minerals (inorganic substance, essential for cellular processes)
- ❑ Vitamins (organic molecule, role in human body; C – wound healing, K – blood clotting, D – bone growth)

Biology High School Assessment
May 21, 2009

HSA Science Goals - Qtr 2

The Basic Unit of Life – The Cell

Explain the processes and functions of related structures found in unicellular and multicellular organisms

- ❑ Distinguish between plant & animal cells (prokaryotes and eukaryotes)
- ❑ Transportation of materials (role of cellular membranes; vascular tissues in plants & animals; circulatory systems)
- ❑ Waste disposal (role of cellular membrane; excretory and circulatory systems)
- ❑ Movement (cellular - cilia, flagella & pseudopodia; interaction between skeletal & muscular systems)
- ❑ Feedback mechanisms for maintaining cellular and organismal homeostasis (water balance, pH, temperature, role of endocrine system)
- ❑ Control of Structures (cellular organelles & human systems) and Related Functions (role of nucleus, sensory organs & nervous system)
- ❑ Capture & release of energy (chloroplasts, mitochondria)
- ❑ Protein synthesis (ribosomes)

Discuss factors involved in the regulation of chemical activity as part of a homeostatic mechanism

- ❑ Osmosis (water flow across membranes; role in living systems)
- ❑ Temperature (effect upon enzyme activity; metabolic rate; rate of diffusion & states of matter)
- ❑ pH (pH scale: relative values for acids & bases, effect on living systems: cellular; organismal)
- ❑ Enzyme regulation (effect of temperature, pH & enzyme/substrate concentration on enzyme activity)

Explain how changes in a cell's environmental conditions may cause changes in the metabolic activity of the cell or organism

- ☐ Metabolic Activity (cellular & organismal) – effect of changes in pH, temperature, light, water, oxygen, carbon dioxide, radiation (role in cancer or mutations), toxic substances (natural, synthetic)

Biology High School Assessment
May 21, 2009

HSA Science Goals - Qtr 2

Powering Up for Life - Bioenergetics

Compare the transfer and use of matter and energy in photosynthesis and non-photosynthetic organisms

- ❑ Carbon Cycle (movement of carbon between living systems and the environment.; relationship between photosynthesis and respiration)
- ❑ Photosynthesis (energy conversion; light; chemical; basic molecules involved)
- ❑ Cellular Respiration (distinctions between aerobic & anaerobic; energy released; use of oxygen; basic molecules involved in aerobic respiration)
- ❑ Chemosynthesis (from inorganic compounds)
- ❑ ATP (energy carrier molecule)

Life is a Cycle - Reproduction

Explain processes and the function of related structures found in unicellular and multicellular organisms

- ❑ Nucleic acids (organic molecule; nucleotides are building blocks - sugar, phosphate, and nitrogen bases; DNA is a double helix, DNA replication; DNA role in storage of genetic information)
- ❑ Asexual Reproduction (binary fission, budding, vegetative, mitosis: role in growth and repair, chromosome number remains the same)
- ❑ Sexual Reproduction (angiosperms, mammals)

Biology High School Assessment
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All in the Family – Introduction to Heredity

Demonstrate Sorting & Recombination of Genes Has an Affect on Variation in Offspring

- ❑ Meiosis (formation of gametes, chromosome number reduction, crossing over, new gene combinations)
- ❑ Fertilization (genetic recombination of gametes to form zygote in sexual reproduction)

Illustrate & Explain How Expressed Traits are Passed from Parent to Offspring

- ❑ Dominant & Recessive Traits
- ❑ Phenotypes (expression of inherited characteristic)
- ❑ Genotypes (heterozygous and homozygous pairs of alleles)

Interpret How DNA Alteration Effects Can Be Beneficial or Harmful

- ❑ Radiation (role in cancer or mutations)
- ❑ Toxic substances (natural, synthetic)
- ❑ Chromosome Number (abnormalities)

Family Tree - Heredity

Illustrate & Explain How Expressed Traits are Passed from Parent to Offspring

- ❑ Dominant and Recessive Traits
- ❑ Phenotypes (expression of inherited characteristic)
- ❑ Genotypes (heterozygous and homozygous pairs of alleles)
- ❑ Punnett Square (Predict/Interpret Results of Monohybrid Cross only, Translate genotypes into phenotypes)
- ❑ Sex-linked Traits (X-linked only; Recessive phenotypes more often expressed in the male)
- ❑ Pedigree (Interpret patterns of inheritance within a family)

Express Yourself – Gene Expression

Explain How a Genetic Trait is Determined by the Code in a DNA Molecule

- ❑ Nucleic acids (organic molecule; nucleotides are building blocks - sugar, phosphate, and nitrogen bases; DNA is a double helix, RNA is a single strand; DNA role in storage of genetic information)
- ❑ Definition of a Gene (Segment of DNA that codes for a protein or RNA)
- ❑ Sequence of Nitrogen Bases in Protein Formation
- ❑ Protein Synthesis (Role of DNA, mRNA, tRNA, rRNA)
- ❑ Proteins Determine Traits

Interpret How DNA Alteration Effects Can Be Beneficial or Harmful

- ❑ Mutations
- ❑ Genetic Engineering (Gene splicing, recombinant DNA, cloning)

Biology High School Assessment
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HSA Science Goals - Qtr 3

HSA Science Goals - Qtr 4

The Tree of Life – Order and Diversity of Life

Explain the mechanism of evolutionary change.

- ❑ Natural Selections (definition; Effects of environmental pressure)
- ❑ Adaptations (Effects on Survival)
- ❑ Variation (Effects on Survival & Reproductive Success)

Estimate relatedness among organisms or species

- ❑ Classification (recognize relationships among organisms; distinguish between prokaryotes & eukaryotes)
- ❑ Anatomical similarities (evolutionary relationships; homologous structures)
- ❑ Similarities of DNA base and/or amino acid sequence (gel electrophoresis)

Bodyworks – Human Body Systems

Demonstrate that multicellular organisms function as a result of their complex body systems

- ❑ Transportation of materials (Circulatory System)
- ❑ Waste Disposal (Excretory & Circulatory Systems)
- ❑ Movement (Skeletal & Muscular Systems)
- ❑ Feedback Mechanism (Endocrine System - Maintaining Cellular & Organismal Homeostasis - water balance, pH & temperature balance)
- ❑ Structure/Function Control (Role of Sensor Organs and Nervous Systems)

Biological Issues (*not tested*)

Analyze the consequences and/or trade-offs between technological changes and their affect on the individual, society and the environment

- ❑ Bioethics
- ❑ Genetic Engineering
- ❑ Investigate what can be done for Endangered Species
- ❑ Explore how our food supply is affected

Investigate a biological issue and defend a position on some of the following points:

- ❑ Animal rights, Drug and alcohol abuse, Viral disease (AIDS), Newly emerging diseases, Stem cell research, Bioethics, Biodiversity, Population growth, Global sustainability, Origin of life

Biology High School Assessment
May 21, 2009

Supplemental Student Activities

YOU CAN DO IT!

Complete the worksheets and activities in this section as directed by your teacher to help with your understanding of what was taught in class.

BIO - LIT BINGO

(A collection of six summaries of biology news from current sources)

OBJECTIVE: Students will choose a science article related to the topic that we are currently studying in class. Once the article is chosen, you are to read, summarize, and critique the article. The rubric on the following page will grade you on the criteria explained below. The goal of the assignment is to expose you to additional sources of scientific information available outside the classroom and see applications for biological concepts taught in class.

DIRECTIONS:

1. Scan sources regularly: Internet, newspaper, magazines, and/or science magazines. All sources must be current (within the last 2 years) and be a minimum of 300 words.
2. Select sources and topics to complete 6 lines "Bingo" (any vertical, horizontal, or diagonal) and 1 free space.
3. Use Feature/Full length Articles only (No abstracts or article summaries).
4. You are required to write:
    a. at least a **2 page** review of the article
    b. Must be **double spaced**
    c. **12pt** font size
    d. **Times New Roman** font
5. You are to staple the Article BEHIND each individual summary and place in your pocket folder. Include this sheet and your SIGNED "plagiarism" sheet.

ARTICLE SUMMARY FORMAT: Included in your Article Summary should be the following:

1. **Name, date, class and period**
2. **Bibliography**
3. **Paragraph #1-Introduction**
    a. What is the title of the article (should be in quotes or italics)?
    b. Who is the author?
    c. What source or publication did the article come from?
    d. What is the date of the article?
    e. Write one to two sentences about what the article is about
4. **Paragraph #2-Summary (Abstract) of Article**
    a. Give a summary of the article; what is the article about?
    b. If necessary, you can write more than one paragraph summarizing the article
5. **Paragraph #3- What did you think of the article (critique)**
    a. Do you agree or disagree with the author(s)?
    b. Did it support or change your opinion of the topic; if not, why or if so, how?
    c. Did the writer demonstrate that he/she did sufficient research?
    d. What would you have added to enhance the article?
6. **Paragraph #4-Conclusion**
    What are your reasons for choosing your particular article and how does it relate to what we are studying in science?

You can locate appropriate science articles in the newspaper, magazines, science journals, or on the internet. It is not necessary for you to cut out the article from the paper; however, a **bibliography is required**. (Please refer to the following link for assistance with writing a bibliography: www.citationmachine.net)

Article Summary Rubric

CATEGORY	4	3	2	1
Requirements	All of the written requirements (2+ pages, bibliography, typed, double spaced, 12pt, Times New Roman font, and turned in on time) were met.	Almost all (about 90%) the written requirements were met.	Most (about 75%) of the written requirements were met, but several were not.	Many requirements were not met.
Spelling, Grammar and Punctuation	There are no spelling, grammar or punctuation errors in the summary. RUN SPELL CHECK BEFORE PRINTING!!	There is one spelling, grammar or punctuation error in the summary.	There are 2-3 spelling, grammar, and punctuation errors in the summary.	The summary has more than 3 spelling, grammar, and punctuation errors.
Summary of Article	The summary covers all of the main points of the article	The summary covers most but not all of the main points of the article	The summary covers some of the main points of the article	The article is not summarized at all
Critique	All four questions under critique are answered clearly and completely.	Three questions under critique are answered clearly and completely.	Two questions under critique are answered clearly and completely.	One or none of the questions under critique are answered.
Paragraph construction	All paragraphs include introductory sentence, explanations or details, and concluding sentence.	Most paragraphs include introductory sentence, explanations or details, and concluding sentence.	Paragraphs included related information, but were typically not constructed well.	Paragraphing structure was not clear, and sentences were not typically related within the paragraphs.

DUE DATES: The due date for the first article summary is listed; other dates will be determined by your teacher. **There are no make up days allowed. It is your responsibility to make sure the project is submitted on or before the due date.**

1ST SEMESTER

1st article summary due: **September 8 (B Day) and 9 (A Day), 2008**
2nd article summary due:
3rd article summary due:
4th article summary due:
5th article summary due:
6th article summary due:

2ND SEMESTER

1st article summary due:
2nd article summary due:
3rd article summary due:
4th article summary due:
5th article summary due:
6th article summary due:

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Name _____ Date _____ Pd _____

1ST Semester Bio-Lit Bingo

Source\Topic	1 Ecology	2 Going Green	3 Workplace Careers Education	4 Microbiology/ Cells	5 Health	6 Cancer	7 DNA
A Newspaper							
B Weekly News Magazine							
C Science Magazine							
D Television Radio/Lecture							
E Business Magazine							
F Field Trips/ Other							
G Repeat							

Remember: This is "Bio-Lit Bingo." All articles MUST pertain to biology. You are encouraged to check an article with your teacher in advance.

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Name _____ Date _____ Pd _____

2ND Semester Bio-Lit Bingo

Source\Topic	1 Biodiversity	2 Evolution	3 Workplace Careers Education	4 Health	5 Genetic Engineering	6 Bioethical Issues	7 Genetic Diseases & Disorders
A Newspaper							
B Weekly News Magazine							
C Science Magazine							
D Television Radio/Lecture							
E Business Magazine							
F Field Trips/ Other							
G Repeat							

Remember: This is "Bio-Lit Bingo." All articles MUST pertain to biology. You are encouraged to check an article with your teacher in advance.

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Bio-Lit Topic Explanations:

Biodiversity – articles dealing with the variation of life forms within a given ecosystem, biome of the entire Earth

Bioethical Issues – articles investigating a bioethical issue (i.e. animal rights, stem cell research, urbanization, origin of life, mandatory DNA testing/sequencing, etc.)

Cancer – articles containing news/information relating to the various types of cancer (i.e. lung cancer, leukemia, cervical cancer, etc.)

Ecology - the interactions between LIVING THINGS in nature and/or between a living thing and its environment. Articles dealing ONLY with climate or geology (not living) are UNACCEPTABLE.

Evolution - changes in LIVING THINGS through a long period of time. Articles dealing with evolution of stars or the universe (not living) are UNACCEPTABLE.

Health - viruses, bacteria of other very small LIVING THINGS or articles dealing with health, medications, or related research.

Genetics/DNA - heredity, inherited disease, birth defects or any article involving genes, chromosomes, and biotechnology.

Microbiology/Cells – articles relating to microorganisms (too small to be seen with the naked eye), such as fungi, protists, bacteria, and viruses (although not considered living)

Workplace/Careers/Education - article must relate one of these topics to BIOLOGY or HEALTH.

SOURCE EXAMPLES: (There are sources other than those listed. If in doubt, ask before using.)
Newspaper: Washington Post, Washington Times, Rockville Gazette, Wall Street Journal, etc.

Weekly News Magazine: Time, Newsweek, U.S. News & World Report, etc.

Science Magazine: Discover, Popular science, Science News, Scientific American, professional journals

TV/Radio/Lecture: Television nightly news, NOVA, Science Frontiers, Discovery/Learning Channel, talk radio, lectures at hospitals, NIH, Student Academy of Science lectures held at Wooten, etc.

Business Magazine: Business Week, Forbes, etc.

Field trips: places to visit such as the zoo, Botanical Gardens, Arboretum, Aquarium, hospital tours, Museums (Natural History AFIP/Walter Reed, Maryland Science Museum). ***Requirements for proof of visit……..see your teacher before you go.***

Other: any general distribution magazine such as Good Housekeeping, Redbook, Field and Stream, etc.

Repeats: This row is used to make a vertical bingo pattern by using one of the sources already used (such as two articles from a newspaper). The Repeats row cannot be used for a horizontal bingo.

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Please read, sign, and keep in student resource book.

Cheating and Plagiarism Know the Facts!

Cheating and/or plagiarizing are serious offenses. Over the last few years, there has been an increase in the number of students getting expelled from universities as a result of either cheating or plagiarizing. Therefore, all students need to understand what constitutes cheating and plagiarizing. The following behaviors are inappropriate and will result in disciplinary action ranging from no credit on the assignment in question to suspension.

1. Copying another student's work whether the work is a small homework assignment, an essay, a computer document or program, a lab report, a map, a quiz, a test, etc.

2. Giving your work to another student and allowing them to copy it.

3. Telling another student what was on the test/quiz you just took in order to give them assistance in taking the test/quiz at a later time.

4. Passing on information stored in your graphing calculator about a test /quiz you have taken to a student who will take the test/quiz at a later time.

5. Being intentionally absent on the day of a test/quiz in order to find out what was on it before taking it or on a project due date.

6. Using cheat sheets or storing information in your graphing calculator that is not permitted during a test/quiz.

7. Using the words and/or interpretations of another person (i.e. from a book, an article, a website, etc.) without properly citing the source and giving credit to the original author. (Note: Selected word substitution in a copied sentence is still plagiarism.)

8. Taking a quiz/test/exam for another student or completing another student's work for them.

9. Turning in any work that is not your own.

By signing below, I indicate that I have read and understand all of the situations above. Furthermore, I agree not to cheat or plagiarize the work of another.

Print Name: _____

Signature: _____

Date: _____

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***Please read, sign, and attach this sheet to your bio-lit folder.**

Cheating and Plagiarism Know the Facts!

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Print Name: _____

Signature: _____

Date: _____

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Name _____ Date _____ Period _____

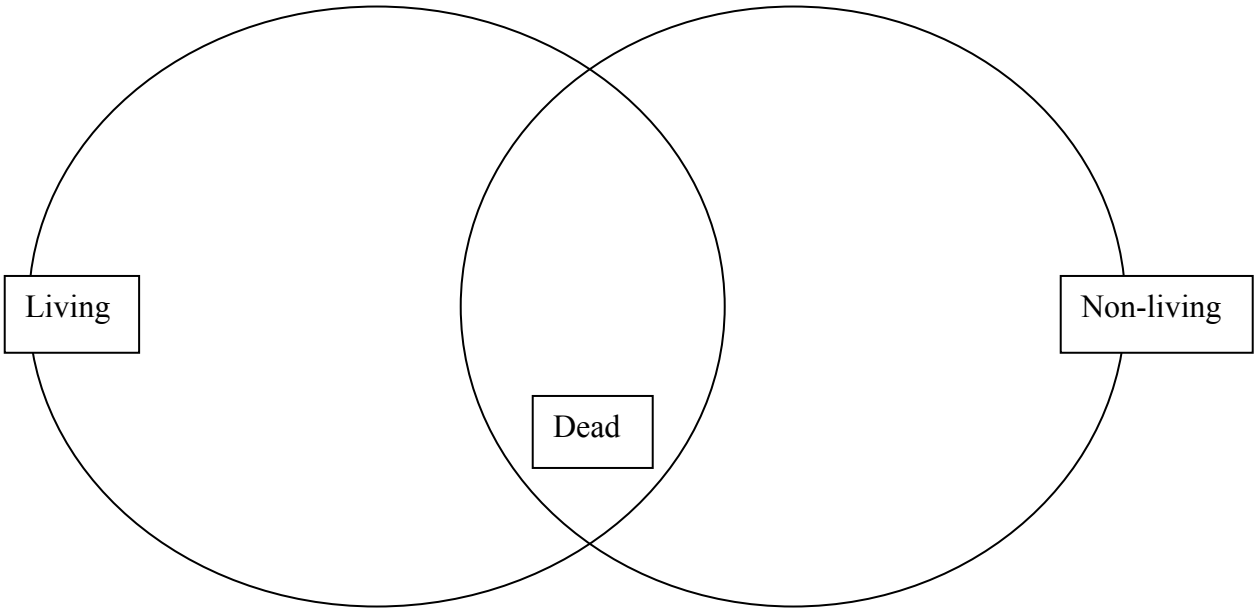
To Live or Not to Live? That is the Question!

Directions: Place an X in the boxes that show characteristics that are true for that item

Items for Observation	Made of cells	Change over time	Maintains Homeostasis	Respond to the environment	Reproduce	Obtain and use energy	Grow and develop	Universal Genetic Code

How can you tell the difference between something that is dead and something that is non-living?

Place the items listed in the chart in the correct section of the Venn Diagram.



Rafael's Setup - Brief Constructed Response (BCR)

Rafael was given an assignment to determine how the appearance of frog blood cells change when they are placed in distilled water. He is using an incorrect setup to perform his investigation. His laboratory setup is shown in the figure below.

Critique Rafael's setup shown in the above figure. In your response, be sure to include
• Any unsafe laboratory equipment and procedures shown in the figure
• A description of the materials and safe setup for the correct investigation
• An explanation of why it is important to follow the correct procedures in the laboratory
• Any safety precautions you have used during an investigation in biology; provide specific details and the reasons for taking the precautions (HSA 2004)

Name _____ Date _____ Period _____

Science Skills and Processes

1. Why is it important that all laboratory investigations are performed safely?

2. Many people add fertilizers to house or garden plants. Make a hypothesis about whether you think these fertilizers really help plants grow. Next, design an experiment to test your hypothesis. Include in your plan what variable you will test and what variables you will control.

Scientific Notation

3. Convert the following numbers to scientific notation
   a. 5,213 = _____
   b. 73,200 = _____
   c. 23.21 = _____
   d. 4,713,000,000 = _____
   e. 0.02 = _____
   f. 0.000314 = _____

4. Convert the following numbers to standard form (i.e. 1000)
   a. 2.331×10^{5} = _____
   b. 9.51×10^{22} = _____
   c. 5×10^{-3} = _____
   d. 7.6278×10^{-5} = _____
   e. 0.00042×10^{-3} = _____
   f. 42.15×10^{-4} = _____

5. Earth is approximately 93,000,000 miles from the sun. In scientific notation, how far is the Earth from the sun?

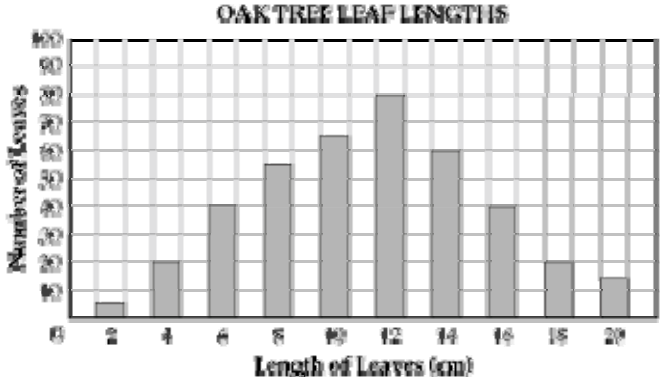
6. Light travels at a speed of 1.86×10^5 miles per second. Converting from scientific notation, how many miles per second does light travel?

7. The Boeing Corporation sells their 777 Boeing commercial jet for a cost of $200 to $259 million dollars.
   a. Write $200 to $259 million dollars in standard form.
   b. Write $200 to $259 million dollars in scientific notation.

Name _____ Date _____ Period _____

Mathematical Models in Science

1. Students collected 400 oak leaves for a research project. The graph below shows the lengths of the leaves they collected.
    a. According to the graph, what proportion of the leaves have a length of 12 centimeters?
       A. 1/10 B. 1/5 C. 3/10 D. 2/5
    b. What proportion of the leaves have a length of 18 centimeters? ____



2. The table below shows the number of species of different types of simple land plants.
    a. According to the table, approximately what proportion of all simple plant species are bryophytes?
       A. 1/3 B. 1/2 C. 2/3 D. 3/4
    b. Approximately what proportion of all simple plant species are ferns? _____

NUMBER OF SIMPLE PLANT SPECIES

Simple Plants	Number of Species
Bryophytes	20,000
Club mosses, spike mosses, and horsetails	1,000
Ferns	12,000
Total	33,000

3. In a species of fly, red eyes are dominant to brown eyes. Students crossed male and female flies that had red eyes and recorded the eye color of their offspring. Their data are shown below. Using the data in the table, what is the approximate ratio or red eyed offspring to brown eyed offspring?
   A. 1:1 B. 2:1 C. 3:1 D. 4:1

FLY OFFSPRING

Eye Color	Number of Offspring
Red	77
Brown	27

Name _____ Date _____ Period _____

Scientific Method Madness

Battle of the Beats

Lil' Wayne and Jay-Z decide to produce an album. Their friend, Twista, tells them that if they drink a special juice called "Just Blaze," it will make them rap as fast as Twista. Twista can record 400 wpm (words per minute). Jay-z drinks the juice and raps at 300 wpm. Lil' Wayne does not drink the juice and records at 23 wpm. In this experiment identify:

Problem:

Materials:

Control group:

Dependent variable:

Independent variable:

Conclusion:

How can this experiment be improved?

Hang Time

Lebron James and Carmello Anthony want to jump higher to win the dunk contest. Nike produces a commercial stating that their new shoe will increase hang time by 50%. Lebron wears the shoes and finds that his hang time increases from 3.2 seconds to 3.6 seconds. Carmello does not wear the new shoe and his hang time remains at 3.5 seconds. In this case identify:

Problem:

Materials:

Control group:

Dependent variable:

Independent variable:

Conclusion:

How can this experiment be improved?

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Name _____ Date _____ Period _____

Ecology, Part I

1. Complete the table about factors affecting living organisms.

Factor	Abiotic or biotic	How it affects living things
Space		
Soil		
Water		
Light		
Temperature		
Food		

2. Complete the table about relationships.

Relationship	Definition	Example
Parasite-host		
Mutualism		
Predator-prey		
Commensalism		
Competition		

3. What is the original source of energy for life?

4. What common characteristics do all producers have?

5. What common characteristics do all consumers have?

6. Predict which organism type would be present in the largest quantities in an ecosystem (i.e. carnivore, herbivore, producer) by drawing a food pyramid? Explain why.

7. A team of scientists conducted a study of a wetland. Using samples collected from the wetland, the scientists estimated the total biomass at each trophic level. Their data are shown below.

Explain the relationship between trophic levels and biomass. In your response, be sure to include the roles of the organisms found at the different trophic levels how each trophic level obtains energy why the available energy changes at each level why the amount of mass differs at each of the trophic levels. Write your answer in the answer below. (HSA 2004)

8. Draw a food chain for the following organisms.
   shark, phytoplankton, bacteria, killer whale, medium sized fish

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Ecology, Part II

1. Each player on the following sporting teams has a different niche. Determine at least four possible niches (roles) for the team players.

	Track	Baseball	Football	Swimming	Basketball
Niche					

2. How does the niche of each player affect the overall performance of the team?

3. Complete the table about the contributions of the following species and the effects on the ecosystem in their absence.

	Species' Contribution(s) to the Ecosystem	Effect(s) on Ecosystem with Lost of Species
Oak tree		
Snake		
Spider		
Human		

4. How does the lack of biodiversity affect an ecosystem?

5. In general, how do humans affect biodiversity?

Name _____ Date _____ Period _____

Biodiversity: Is it Worth It?

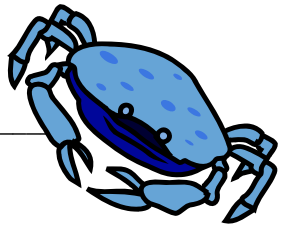
Does anyone truly know how many species of organisms exist on this Earth? The truth is NO. Scientists estimate anywhere from 1.4 million to 200 million (What a range?). What comes to mind when asked, "What is biodiversity?" Most people immediately think of plants and animals. In actuality, Earth encompasses a much broader spectrum of life.

You are a Biologist/Ecologist working for the United States Environmental Protection Agency and have been directed to spend $4 million toward the conservation of species and their habitats. It may seem $4 million is an abundant amount, however, consider how $9.7 million was spent for conservation of the endangered northern spotted owl in South America. Your task is to decide which species will benefit from these funds. In order from the highest to lowest amount, list the species in the chart provided.

You must decide how the money should be spent. For example, how would you spend money on: 1. Buying native habitat and turning it into a preserve? 2. Collection of organisms from the wild and put in a zoo or botanic garden for captive breeding? 3. Collection of fungal specimens from all around the world to be used in cancer research? 4. Collection of local species for biodiversity garden projects? Other ideas? In the table below, write a justification for each expense. Why would you spend money on that particular species?

Species	Amount of $ to be spent	How will the money be spent?	Why did you spend money on this species?
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Name _____ Date _____ Period _____



Food Chain/Food Web Activity

1. Read the article: "Helping to Save the Crab" (*Baltimore Sun, 11 May 2008*)
   http://www.baltimoresun.com/news/opinion/ideas/bal-id.profile11may11,0,2288307.story

2. Create a food web of the Chesapeake Bay depicting a minimum of 15 organisms.
   a. Be sure to highlight the energy transfer process involving the blue crab. (There should be at least one food chain for the blue crab.)
   b. Identify producers, autotrophs, consumers, heterotrophs, herbivores, carnivores, omnivores, detritivores, and decomposers.
   c. Identify primary, secondary, and tertiary consumers.

3. Identify at least one of each of the following:
   a. Predator/prey relationship
   b. Parasitic relationship
   c. Mutualistic relationship
   d. Commensal relationship
   e. Provide examples in the Bay of competition.

4. The following websites can be used as resources, or if you prefer, you can locate your own.
   http://www.chesapeakebay.net/ecoint6a.htm
   http://www.pwrc.usgs.gov/products/factsheets/fact8.pdf
   http://www.mdsg.umd.edu/issues/chesapeake/food_web/
   http://www.baylink.org/fieldtrips/primer.html
   http://www.fisheries.vims.edu/multispecies/femap/foodweb.htm

5. Reflect on what you have learned about ecology and the blue crab to answer the following questions:
   a. What is the common and scientific name of the blue crab?
   b. Describe the specific habitat and niche of the blue crab.
   c. What does the blue crab eat?
   d. Is the blue crab an omnivore, herbivore, or carnivore?
   e. What animals may eat the blue crab to survive?
   f. Describe the status of the blue crab (e.g., abundant, endangered, or threatened).
   g. What other interesting facts did you find out about the blue crab?
   h. Create a food chain including the blue crab (using words and arrows only).
   i. What would happen to the Chesapeake Bay if the amount of blue crab were to increase in the ecosystem? Explain your answer.
   j. What do you predict would happen in the Bay if blue crabs were eliminated from the environment? Explain your answer.

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Name _____ Date _____ Period _____

The Snake Migration

Visit the website http://www.iht.com/articles/ap/2008/03/11/america/LA-GEN-Brazil-Snake-Invasion.php to learn more about the migration of the snake in Brazil and answer the questions that follow.

1. What is deforestation?

2. What problem is deforestation creating in the Amazon?

3. Explain what affects deforestation has on the availability of space and resources and number of competing organisms.

Restoring Beauty

On May 18, 1980 after 123 years of silence, Mt. St. Helens in Washington erupted dispersing its thick ashes throughout the ecosystem. It is believed 57 people perished as a result of the eruption. In addition, thousands of other organisms were killed. It was the most economically destructive eruption in United States' history, drastically hitting the logging industry. Visit the website http://www.olywa.net/radu/valerie/mshafter.html to learn more about the devastating event and answer the questions that follow.

1. What was the first organism to reappear after the eruption of Mt. St. Helens? _____
   What type of succession is this event an example of?_____

2. Describe three events that led to the returning of plants and animals to the area surrounding Mt. St. Helens?
   a. _____
   b. _____
   c. _____

3. Complete the following table about succession.

Stage	**Definition**	**What happens**
Primary		
Secondary		
Pioneer stage		
Climax community		

Name _____Date_____Period_____

Scientists Explore an Aspect of Fish Migration (HSA, 2003)

Read the following passage taken from the 2003 HSA and answer the questions that follow.

Toxic pollutants from agriculture and industry have been found worldwide, even in areas that are far from pollution sources. Until now, scientists have blamed air currents for spreading toxins far from their sources. However, a recent study indicates that fish can transport toxins over long distances.

Scientists developed this hypothesis when toxins were mysteriously found in a remote lake in Sweden. A team of scientists from Lund University hypothesized that salmon accumulated and stored toxins in their fatty tissues when they were in the Baltic Sea. The salmon migrated upstream, spawned, and then died in the lake, releasing toxins as their bodies decomposed.

To test this hypothesis, the scientists traveled to Alaska, where they carried out an experiment in two neighboring lakes, Lower Fish Lake and Round Tangle Lake. Lower Fish Lake is open to migrating salmon, while Round Tangle Lake is closed to migrating salmon because of numerous waterfalls and rapids. A small fish, the arctic grayling, lives in both lakes. Fish eggs are a large part of its diet. When the scientists examined the arctic grayling from both lakes, the arctic grayling in Lower Fish Lake had more than twice the concentration of toxins in their bodies as the arctic grayling in Round Tangle Lake. Since both lakes are exposed to similar levels of air pollution, the difference in toxin levels found in the arctic grayling must be due to other factors.

In a related experiment, scientists caught salmon throughout their migration and tested their fatty tissues for toxins. Even though the fatty tissue deposits were gradually used up, toxin levels remained about the same throughout the 400-kilometer journey up the Copper River from the Gulf of Alaska to Lower Fish Lake. Instead of metabolizing the toxins, the salmon stored them in other body tissues that also contain fat, and in their eggs.

Both of these studies support the hypothesis that migrating salmon can transport pollutants to new areas.

1. In addition to eating fish eggs, the artic grayling also eats insects and small fish. What is the ecological role of the artic grayling? *(www.mdk12.org)*

A. herbivore B. decomposer C. omnivore D. carnivore

2. What community interaction(s) had an effect on the fish populations in the lakes?

3. Fill in the blanks with the following terms:

habitats	pH	toxins
oxygen	pollution	urbanization

Cells exist within a narrow range of conditions. Some conditions that affect cells are the _____, or acidity, the environment, the amount of water and _____, or air, available. Changes in environment will affect the cell and may cause death to the cell or organism. Some events that affect the cell and organism are the release of poisons, called _____; _____ (contamination of the environment); destruction of areas where the organisms live, called _____; and _____, the change of areas of land into cities.

Name: _____ Period: _____ Date:_____

Making the Connection-Designer Trees: A Way to Counteract the Greenhouse Effect

(Biotechnology Manual, pp. 152-4. Copyright by Pearson Education, Inc., publishing as Pearson Prentice Hall, Upper Saddle River, New Jersey 07458. Prentice Hall)

Earth's climate has been relatively stable for the last several thousand years. However, there is a new threat to Earth's climate: air pollution. Global air pollution has steadily increased in recent decades. The ecological, economic, and societal costs of air pollution are increasing daily.

Greenhouse Effect

The release of carbon dioxide, or CO_2, is associated with increasing air pollution. The burning of fossil fuels and wood and the cutting down of forests have released much carbon dioxide into the air. Since the start of industrial times there has been a 25 percent increase in the amount of atmospheric carbon dioxide. During the same period of time, global temperatures have increased by 0.5°C. Scientists think that the temperature increase is caused by the release of more carbon dioxide into the air. Because carbon dioxide molecules in the air help to trap heat, they act like the glass roof of a greenhouse. Consequently, the heat trapping action of carbon dioxide in the atmosphere has been called the *greenhouse effect.* Current computer models of the global atmosphere and climate give conflicting information about the world's future climate. Nevertheless, in the next 100 years, the amount of atmospheric carbon dioxide will probably double. Although atmospheric carbon dioxide levels have changed in the past, they have never doubled in just 100 years! Concerned people think it is important to find techniques and propose policies to reduce air pollution.

Storing Carbon

The cultivation of more woody plants is one possible way to reduce atmospheric carbon dioxide. Plants need carbon dioxide for photosynthesis. During photosynthesis, plants change carbon dioxide into sugar, which the plants use for energy. Woody plants convert much of their sugar into wood. Consequently, woody plants can also store carbon for many years in their woody stems and roots. Because they can store carbon, woody plants can be considered a kind of carbon bank. The longer a woody plant lives, the longer it can store atmospheric carbon. So, long-lived trees are excellent for storing carbon. The faster trees grow and the more forests that are planted, the greater the effect trees could have on slowing the increase of atmospheric carbon dioxide. But, because forests are being cut down rapidly, more carbon dioxide is being released into the atmosphere, and the amount of potential carbon storage is being reduced.

Speeding up the Process

Besides growing more trees, another possible way for humans to reduce the amount of carbon dioxide in the atmosphere is by enabling plants to use more carbon dioxide. Normally there is enough carbon dioxide in the air so that the rate of photosynthesis is not slowed. Usually during photosynthesis, other steps than the ones of the Calvin cycle limit the rate at which plants can use carbon dioxide. In theory, by finding a way to speed up the slowest steps, the rate of carbon dioxide uptake should be increased. Making the sugar-transfer enzymes of a plant work more effectively would be one way to speed up the process of using sugars. As a result, plants would move sugars faster and produce more cellulose. Consequently more carbon would be stored.

Enhancing Sugar Transport

One of the most important enzymes involved in moving sugars in plants is called *sucrose phosphate synthetase.* This enzyme catalyzes the reaction between fructose-6-phosphate and UDP glucose. UDP glucose, or uridine diphosphate glucose, is an activated form of glucose. When the enzyme links fructose and glucose together, they form sucrose-6-phosphate.Sucrose is the sugar that is usually transported in the sap of woody plants. In theory, plants that have more-active sucrose-forming enzymes should grow faster than plants with less-active enzymes. Actually, researchers have found that certain plants with more-active sucrose phosphate synthetase enzymes do grow faster. Consequently researchers can screen plants for more-active sucrose phosphate synthetase enzymes by studying the seedlings that grow fastest. Researchers have to consider a second factor when selecting plants to counteract the greenhouse effect. The chosen plants should be able to grow faster when the carbon dioxide concentration in the air is higher than normal. So after screening plants for more active sucrose phosphate synthetase enzymes, researchers also need to screen the plants for the ability to grow fast in the presence of higher levels of carbon dioxide. After researchers have identified plants with more-active sucrose phosphate synthetase enzymes, there are still more steps in the process of genetic engineering. Scientists must locate and remove the gene for the sucrose phosphate synthetase enzyme from the faster-growing plants. Then the genetic engineers must duplicate the gene many times and insert copies of the gene into seedling plants so that the plants will grow faster. Through this process, eventually it may be possible to create trees that grow faster and remove more carbon dioxide from the air.

REVIEW *In the space provided, answer the following questions*.

1. Why are some people concerned about the increase in the amount of carbon dioxide in the air?

2. How might trees be used to reduce the amount of carbon dioxide in the atmosphere?

3. a. What does the enzyme sucrose phosphate synthetase do? **b.** Why is this enzyme important to plants?

a.

b.

4. What might be done to make trees more effective in storing carbon?

5. List some steps in the process of genetically engineering trees with the enzyme sucrose phosphate synthetase.

Name: _____ Period: _____ Date:_____

Biochemistry

1. Draw and label the parts of an atom.

2. Define the following:

Word	Definition
Atom	
Compound	
Molecule	
Covalent Bond	
Ionic Bond	
Hydrolysis reaction	
Dehydration synthesis (Condensation reaction)	

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Name: _____ Period: _____ Date:_____

Making Golden Models

Wow! You have the Midas touch! Okay. Maybe you are not making gold today, but you are making very essential compounds that help to sustain many life forms. Your job is to use the model kit and prepare compounds such as carbon dioxide, glucose, oxygen and water. Your teacher will be able to tell you which pieces of the kit represent carbon, hydrogen, and oxygen. As you prepare the compounds, take a look at how many bonds carbon, hydrogen, and oxygen each make. Carbon dioxide, glucose, oxygen, and water are not gold, but why do you think they are golden to some organisms? You better get started. Some organism might need these compounds pretty soon!

Compound	Structural Formula	How is the compound used in the human body?	Organic or Inorganic? Justify your answer.	Type of Bond (polar, non-polar or ionic)? Explain.
Carbon Dioxide CO_2				
Glucose $C_6H_{12}O_6$				
Oxygen O_2				
Water H_2O				

Please answer the following questions on water:

4. Why is water polar?

5. Why is water so important to living things?

6. Fill in the chart:

Macromolecule	Structure	Building blocks	Function within the cell	Examples of
Carbohydrate				
A) monosaccharide				
B) disaccharide				
C) polysaccharide				
Lipid				
Protein				
Nucleic Acids				

8. Identify the reactants and products in the following chemical reactions:

a. $C_6H_{12}0_6 + O_2 \rightarrow CO_2 + H_20$

b. $CO_2 + H_20 \rightarrow . C_6H_{12}0_6 + O_2$

Name _____ Date _____ Period _____

Making the Connection-Lactose Intolerance

1. What is lactose?

2. Explain why you would classify lactose as a carbohydrate?

3. Recall that this is a group of organic molecules that is classified by its number of rings. How many rings does a molecule of lactose have? Based on the number of rings, what is its appropriate chemical name?

4. Which foods do you believe contain lactose? Explain.

5. How is lactose broken down?

6. If you are or know someone that is lactose intolerant, describe what causes you or the person to be affected by this disorder.

7. What are the symptoms of lactose intolerance?

8. Whom does lactose intolerance mainly affect?

9. Explain why you believe these specific groups of people are mainly affected by this disorder. Justify your answer.

10. What do you think can be done to manage lactose intolerance? Explain.

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Name _____ Date _____ Period _____

Making the Connection-Macromolecules and Nutrition

Now that you are an expert on Carbohydrates, Lipids, Proteins, and Nucleic Acids, create a brochure using one of the major macromolecules that discusses some of the problems that can be caused by these macromolecules. Your brochure should look very similar to one that you would find in a doctor's office. Being the expert that you are, provide detailed information so that readers will be well informed of:

- The macromolecules and their building blocks
- Foods in which they can be found
- Causes, symptoms, possible treatments of the problems associated with the macromolecule
- The human body system the problem mainly affects

Multicultural Connection #1

A. Based on the Africa: Challenges in the 21st Century video, explain how the African government plays a role in famine. Using your newly learned knowledge, how are the African citizens affected by lack of nutrition? What disorders may develop? What can be done to rectify famine in this area of the world? Justify your answer.

B. On a separate sheet of paper, write or type a letter to the United Nations or the newly elected president expressing your concern for the people of Africa. Explain the biological consequences of the lack of nutrition (i.e. lack of carbohydrates, proteins, lipids and 5 vitamins/minerals). Share your recommendations and any changes you think will make a difference in their lives.

C. Bring in an envelope and stamp to mail your letter to the United Nations or the President of the United States.

Multicultural Connection #2

Let's take a trip. Get in your seats and buckle up and prepare for takeoff. Are you tired? We just spent 20 hours on a plane to Japan. We are here to enjoy the food and the culture. It's a little chilly, so put on your jacket. It's fall. Look at the koyo (red leaves). Are you excited? Great! Let's get ready for Bunka-no hi (Culture Day).

Research the culture of Japan (i.e. food, holidays, family structure), the weather, and seasons to write a one page paper. Give details of the Japanese culture. Describe how it is different from your culture. Explain the significance of the Cherry Blossom Festival in Washington, DC. In addition, research how tree leaves lose their color and gain koyo. Go ahead, get started and enjoy your journey!

Name _____ Date _____ Period _____

Cells and Cell Chemistry

1. Compare a bacterial cell and a human body cell. Include in your response:
   - How they are similar and different in structure
   - How they are classified (2001)

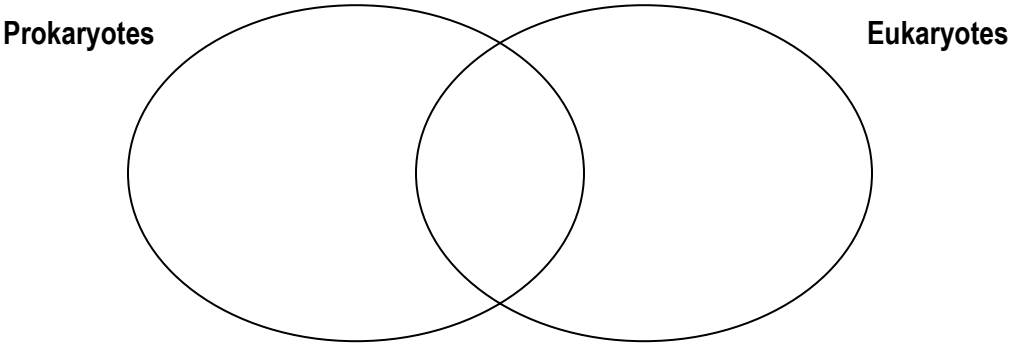
2. Complete the following:

Organelle	Function	Where found (animal, plant, and/or, prokaryote)
Plasma membrane		
Ribosome		
Vacuole		
Cell wall		
Centriole		

Chloroplast		
Cytoplasm		
Endoplasmic reticulum		
Golgi Apparatus		
Lysosome		
Microfilament/microtubule		
Mitochondria		
Nucleolus		
Nucleus		

2. The cell theory states:
   - ✓
   - ✓
   - ✓

3. Fill in the following Venn diagram with what you know about prokaryotes and eukaryotes.



4. Why is the cell membrane selectively permeable?

5. Discuss the conditions needed to cause water to diffuse into a cell.

6. Discuss the conditions necessary to cause water to diffuse out of a cell.

7. Describe what would happen to a red blood cell in each of the following situations:
   a. It is placed in a solution with a high concentration of salt.

   b. It is placed in distilled water without any solution.

8. What are some methods organisms have developed for removing excess water?

9. What is homeostasis? How is osmosis related to homeostasis?

10. Osmosis is the movement of _____ from _____ concentration to _____ concentration.

11. Diffusion is the movement of _____ from _____ concentration to _____ concentration.

12. When a cell is placed in a hypertonic solution, it will _____ because _____.

13. Active transport uses _____, passive transport uses no _____, and facilitated diffusion is a form of _____ transport.

14. _____ → Tissues → _____ →Organ Systems

15. Fill in the blanks with the following terms:

ameoboid	flagella	skeletal
ciliate	movement	

The movement of organisms is dependent upon the relationship between its muscle and its _____system. The muscles are required to pull the bones in order for movement to occur. Protozoa are classified according to their method of locomotion, or _____. One type of movement is through the twirling or lashing of the _____, which are long, hair-like structures on the surface of a cell. Another type of movement is _____, which is a creeping caused by pseudopods. The third type of movement is _____, which is the synchronized beating of short hair-like projections.

Name _____ Date _____ Period _____

Photosynthesis and Respiration

1. Write the photosynthesis equation below:

2. Write the cellular respiration equation below:

3. What organelle carries out photosynthesis? _____

4. What organelle carries out cellular respiration? _____

5. **Fill in the chart below**

Type of Respiration	**What cells it occurs within**	**Conditions in which it occurs**	**Most energy is produced**
Aerobic respiration			
Anaerobic respiration			

6. The CO_2 originates in the _____
   a. it is placed in the atmosphere by _____
   b. the process that produces CO_2 is called _____

7. The CO_2 is used by _____
   a. they take CO_2 + sunlight and produce _____+_____ in their
   b. _____ (organelle)
   c. this process is called: _____

8. The _____cycle in the process of photosynthesis.

9. The _____cycle is in the process of respiration.

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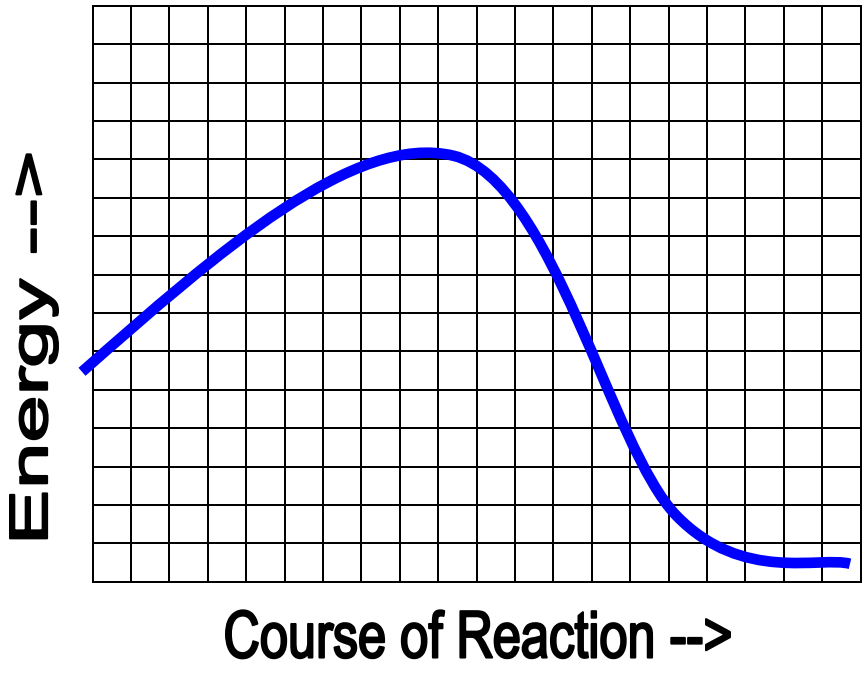
Name _____ Date _____ Period _____

Enzymes

1. What is an enzyme? _____
2. What group of macromolecules are enzymes in? _____
3. What is the job of an enzyme? _____
4. List 2 ways to increase an enzymes activity.
5. What are enzymes? What is their role in a cell?
6. An acid is a substance with a pH of _____, a base is a substance with a pH of _____, and a neutral solution has a pH of _____.
7. One example of an acid is _____, a base is _____, and a neutral solution is _____.
8. What two things can cause enzymes to malfunction? _____ and _____.
9. In the space provided, draw a graph that represents the effect of enzymes on a reaction that occurs in the body. Identify the reactants, products, and activation energy.



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Name _____ Date _____ Period _____

Cell Division and Genetics

1. The DNA must replicate before mitosis in order to _____

_____.

2. The DNA shuffles and is cut in half during _____. This is important

because _____.

3. The cell will complete mitosis when making _____.

4. The cell will complete meiosis when making _____.

5. List four differences between mitosis and meiosis?
   1.
   2.
   3.
   4.

6. Summarize how sexual reproduction, which includes meiosis and fertilization, affects genetic variation within an offspring.

7. Draw a picture of each phase of mitosis for a cell with four chromosomes in the next page. The following parts need to be labeled where appropriate: centrioles, chromosomes, spindles, nuclear envelope, cytoplasm, cell membrane, and centromere.

8. Mitosis phases

Phase	What happens in the phase
Interphase	
Prophase	
Metaphase	
Anaphase	
Telophase	

9. Draw and label the phases of meiosis on the next page.

MITOSIS	MEIOSIS

10. What are the three components of a nucleotide?

11. Draw a picture` of the structure of DNA that (at least) includes the terms: base, 1 sugar, phosphate, nucleotide, and helix.

12. Describe DNA fingerprinting using the following terms: electrophoresis, agarose gel, DNA bands, banding pattern, lane, and DNA fragment.

13. What do the bands in the gel pattern represent? What causes some bands to move further than other?

14. Fill in the following chart as you compare/contrast RNA/ DNA.

Characteristic	DNA	RNA
Sugar present		
Number of strands		
Location		
Job		

Mutations

15. Mutations and crossovers create different genes and gene sequences. Fill in the chart below about mutations.

Type of Mutation	Definition	Example
Deletion		
Point		
Insertion		

16. Protein Synthesis Definitions:

Word	Definition
Codon	
Nucleotide	
Replication	
Anti-codon	
Clone	
mRNA	
tRNA	

17. What is transcription? _____

18. What is translation? _____

19. What is a chain of amino acids called? _____

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Name _____ Date _____ Period _____

Meiosis Model

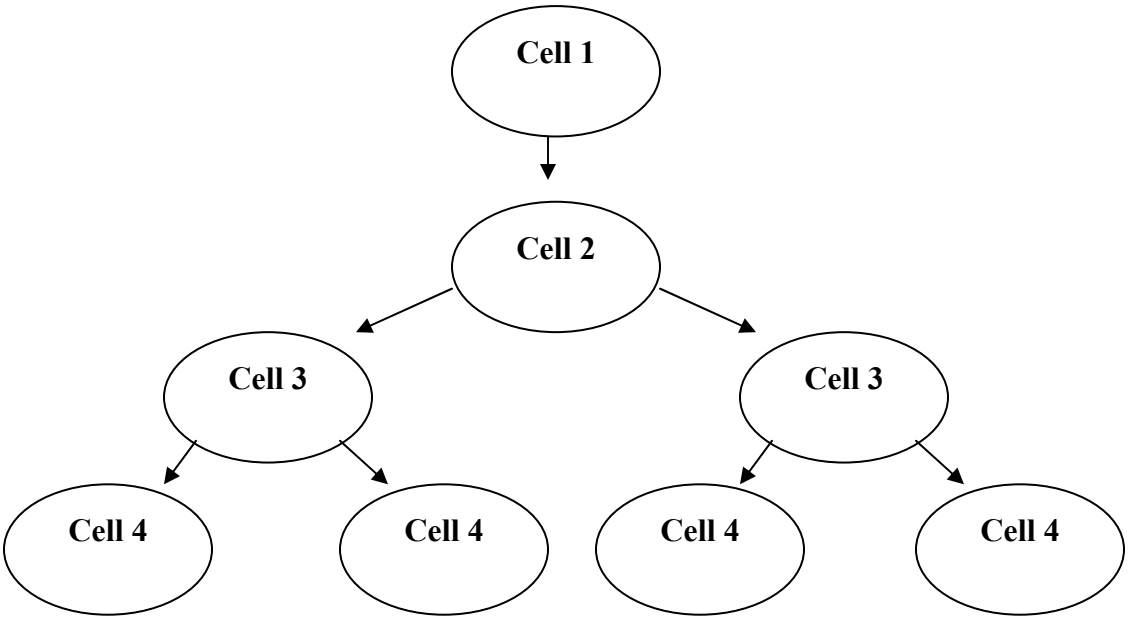
Introduction:

Sexual reproduction requires two parents and involves two processes: ***meiosis*** and ***fertilization***. Meiosis is the process that produces ***gametes***, or sex cells. The gametes produced are ***haploid***, which means the cells have one copy of each kind of chromosome. For example, if the organism's chromosome number is eight, all of the body cells will contain 8 chromosomes; however its sex cells will contain 4 chromosomes. Through fertilization, a ***diploid*** cell called a ***zygote*** is produced from the union of a haploid sperm cell (male gamete) and a haploid egg cell (female gamete). Both meiosis and fertilization are important contributors to ***genetic variation*** within an offspring.

Meiosis involves two divisions. The first division, Meiosis I, involves pairing the ***homologous chromosomes*** and then separating the homologues into separate cells (which reduces the chromosome number by half). Because any cell division is preceded by ***DNA replication***, the second division of meiosis (Meiosis II) involves the separation of the individual duplicated chromosomes (sister chromatids).

Procedure:

1. Copy the diagram below onto your poster paper. Each circle represents a cell.



2. This organism's chromosome number is 4 (2n = 4). This means each body cell contains two different homologous pairs. All of the genetic information is found on a total of two chromosomes (chromosome 1 and chromosome 2). However, each body cell contains two copies of each chromosome, one copy from mom and the other copy from dad. Choose two similar colors of pipe cleaners for chromosome 1 (for example mom chromosome 1 = pink and dad chromosome 1 = red). Choose two similar colors of pipe cleaners for chromosome 2 (for example mom chromosome 2 = lavender and dad chromosome 1 = purple).

3. **Cell 1** is the diploid body cell before meiosis begins. Glue the correct number and types of pipe cleaners into **Cell 1** to show the two pairs of homologous chromosomes.

4. Before meiosis I begins, the chromosomes replicate. Obtain more pipe cleaners to represent ***DNA replication***. Glue the correct number and types of pipe cleaners into **Cell 2** to show the replicated chromosomes. This cell represents the cell during prophase I. The two homologous chromosomes should line up next to each other to form a ***tetrad***. ***Crossing-over*** may occur at this point in the cell cycle.

5. Illustrate at least one crossing-over event in **Cell 2**. Be sure to account for the "new" chromosomes produced as the result of crossing-over throughout the rest of your model.

6. **Cells 3** are the two cells produced at the end of meiosis I. Use pipe cleaners to show the correct number and types of chromosomes present in each cell.

7. **Cells 4** are the gametes produced after meiosis II. Unlike meiosis I, there is no replication of chromosomes before the cell divides. There are many different combinations of chromosomes that could occur during telophase II of meiosis II. Use your pipe cleaners to show how the chromosomes in **Cells 3** are assorted into **Cells 4**.

Analyze and Conclude:

1. Draw and color the homologous pair for chromosome 1 and chromosome 2.

	MOM	**DAD**
CHROMOSOME 1		
CHROMOSOME 2		

2. State whether the chromosome number in each cell is diploid, haploid, or other.

Cell1: _____ Cell 2: _____

Cells 3: _____ Cells 4: _____

3. How many cell divisions occur during meiosis? _____

4. Draw and color a crossing-over event in your tetrad and the resulting chromosome.

CROSSING –OVER IN TETRAD	CHROMOSOMES PRODUCED

5. Explain how crossing-over increases genetic variation. _____

_____

6. How do the four gametes produced differ from each other? _____

_____

7. What are the differences between meiosis I and meiosis II? _____

_____

8. Are the arrangement of chromosomes in each gamete you produced the only possible combinations?

Why or why not? _____

_____

9. Below is a diagram of an angiosperm. Shade in the location of meiosis that produces male gametes blue and female gametes red.

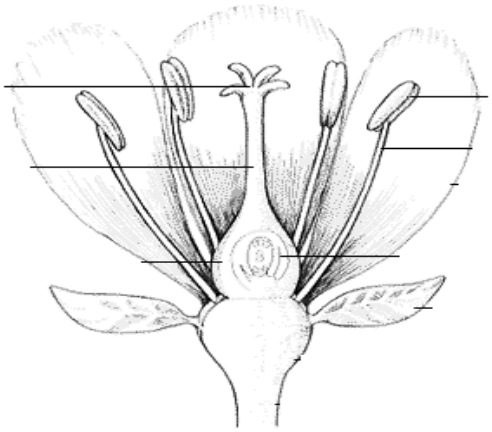


Figure 1 . *http://www.amnh.org/learn/biodiversity_counts/ident_help/Parts_Plants/parts_of_flower.htm*

10. Compare and contrast mitosis and meiosis by completing the table below.

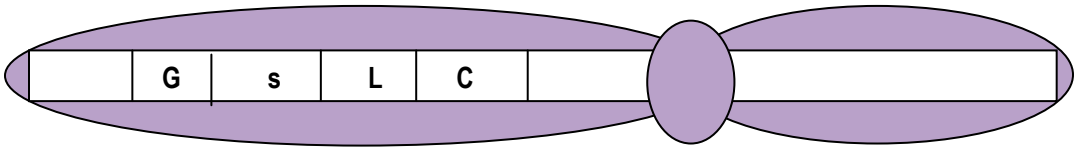
	Mitosis	**Meiosis**
Function of Cells Produced		
Number of Cell Divisions		
Exchange of Genetic Material Between Homologous Chromosomes		
Number of Cells Produced		
Genetic Make-Up of Cells Produced		

Name_____ Date_____ Pd._____

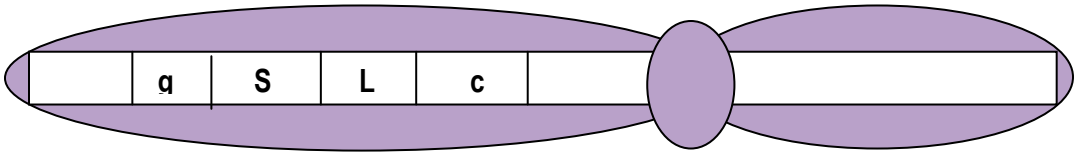
Should This Fish Be Called "Goldy?"

Imagine! A sperm cell, from a male fish, fuses with an egg cell, from a female fish. Each fish gamete carries 47 chromosomes. The zygote that results from the fusion of the gametes contains 94 chromosomes from each parent. One pair of the zygote's chromosomes are shown below.

Chromosome from the Female Fish



Chromosome from the Male Fish



Each chromosome of the homologous pair contains alleles for the same traits. But one chromosome may have a dominant allele and the other a recessive allele. Use the drawings and the table to answer the questions.

Trait	Dominant Gene	Recessive Gene
Dorsal Fin Texture	Jagged (S)	Smooth (s)
Dorsal Fin Shape	Concave (C)	Convex (c)
Scale Size	Large (L)	Small (l)
Scale Color	Gold (G)	Gray (g)

1. Will their new fish have gold colored scales? Explain.

_____

_____

_____

2. Does the female fish have gold colored scales? Explain.

_____

_____

_____

3. Does the male fish have gold colored scales? Explain.

_____

_____

_____

4. What will be the texture of the baby fish dorsal fin? Explain.

_____

_____

_____

5. Will the texture of the baby fish dorsal fin resemble that of either of its parents? Explain.

_____

_____

_____

6. Will the baby fish have large or small scales?

_____

7. a. Does the male fish have large scales?

_____

b. Does the female fish have large scales?

_____

8. a. Define the term homozygous.

_____

_____

b. For which traits is the baby fish homozygous?

_____

_____

9. a. Define the term heterozygous.

_____

_____

b. For which traits is the baby fish heterozygous?

_____

_____

10. Explain why you cannot completely describe the baby fish's parents even though you can accurately describe the baby fish.

_____

_____

_____

_____

_____

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Name _____ Date _____ Period _____

Genetics Definitions

Word	Definition
Allele	
Autosome	
Dominant	
Gene	
Genotype	
Heterozygous	
Homozygous	
Phenotype	
Recessive	
Sex-chromosome	

Complete the following Punnett squares. Give the genotype and phenotype of each.

1. Monohybrid Cross a heterozygous right handed person with a left handed person.
Right is dominant over left.

2. Cross Tt X TT T= tall t= short

3. Cross Tt X Tt

4. Sex-linked Cross a female who is a carrier for hemophilia (X^HX) with a hemophiliac male (X^HY).

5. Answer the following questions.

In *Pisum Sativum*, a pea plant, the allele for purple flower (P) is dominant over the allele for white flowers (p). A cross between two purple-flowered plants resulted in both purple-flowered and white-flowered offspring, as shown in the table below.

RESULTS OF PEA PLANT CROSS

Flower	**Number of Plants**
Purple	103
White	35

On a piece of paper, do the following:

- Draw a Punnett Square that shows the cross between the two purple-flowered parent plants described above. When writing the allele pairings, underline all lowercase letters (p).
- Fill in the genotypes of the offspring on the Punnett Square.
- Make a key to indicate which genotype produces which flower color.
- Give the ratio of flower colors that can be expected from the cross.
- Explain how the data in the table and in the Punnett square helped you determine the ratio.

6. A genetics study was conducted that crossed two red-flowered plants. The next generation was a mixture of red-flowered and white-flowered offspring. Which of these represents those of the parent generation?

A) rr and rr B) Rr and Rr C) RR and rr D) RR and RR

Name _____ Date _____ Period _____

A Simulation of DNA Mutations and Cancer Record Sheet

(Biotechnology Manual, pp. 123-8 copyright by Pearson Education, Inc., publishing as Pearson Prentice Hall, Upper Saddle River, New Jersey 07458. Prentice Hall)

Estimate #1: _____

DNA Sequence #1

AATTGCGAATCATGCAGCCTGACCGCTAAACCCGATCGCTTAAGGCCTTAACCGTCAGACTA
TTAACGGTTAGTACGTCGGACTGGCGATTTGGGCTAGGGAATTCCGGAATTGGCAGTCTGAT

DNA Sequence #2

CAGCCTGACCGCTAAACCCGATGATGCAGCCTGACCACGTCGGTACTTAACCGTCAGATGACCG
GACGGTCTGGCGATTTGGGCTACTACGTCCGACTGGTGCAGCCATGAATTGGCAGTCTTCTGGC

Estimate #2: _____

DNA Sequence from Smoker's Lung:

GAATTGGCAGTCTGATGCAGCCTGACCACGTCGGTAAGGCCTTAATTGCCAATCATGCAGATTGG
CTTAAGCGTCAGACTACGTGGGACAGGTGCAGCGATTCCCGAATTAAGGGTTAGTTCGTCTAACC

Estimate #3: _____

DNA Sequence for Slow Checker:

CAGCCTGACCGCTAAACCCGATGATGCAGCCTGACCACGTCGGTACTTAACCGTCAGATGACCGCCG
GAATTCCGGACTGCTA

GTCGGACTGGCCATTTGGGCTACTACGACGGACTGGTGCAGCCATGAATTGGCAGACTACTGGCGGC
CTTAAGGCCTGACGAT

ANALYSES AND CONCLUSIONS

1a. How many mistakes did you find? If you found the right number, you have saved the cell from cancer! But you must remain on guard for more mutations to come. If you did not find all the mutations, your cell is now cancerous.

b. For each of the mistakes, explain what was wrong.

c. Compare your estimate #1 to the actual number of mistakes. Explain any differences between the two numbers.

2a. How many mistakes did you find?

b. Compare your estimate #2 to the actual number of mistakes. Explain any differences between the two numbers.

3a. Using the information in the table, describe the relationship between age and cancer.

b. Explain what factors you think would contribute to this relationship.

c. Cigarette smoke is the number-one cause of cancer in the United States today. About 25 percent of all cancer deaths are due to cigarette smoke. Using your knowledge of cancer, explain why.

4a. How many mistakes did you find?

b. Compare your estimate #3 to the actual number of mistakes. Explain any differences between the two numbers.

c. Would this cell develop into a cancerous cell? Explain your reasoning.

Name _____ Date _____ Period _____

How is Colorblindness Transmitted?

Procedure:

1. Use the marker to label one cup "father" and the other "mother."
2. The white beads represent X chromosomes. Use the marker to mark a dot on 1 white bead to represent the X-linked allele for colorblindness. Place this bead, plus 1 unmarked white bead into the cup labeled "mother."
3. Mark a black dot on 1 more white beads. Place this bead plus 1 red bead, into the cup labeled "father." The red bead represents a Y chromosome.
4. Close your eyes and pick one bead from each cup to represent how each parent contributes a sex chromosome to a fertilized egg.
5. In your data table, record the color of each bead and the sex of the individual who would carry this pair of sex chromosomes. Also record the individual's genotype and phenotype.
6. Put the beads back into the cups they came from.
7. Repeat steps 4 through 6 for a total of 10 pairs of beads (offspring).

Data Table

Trial	Colors	Sex of Individuals	Individual Genotype	Individual Phenotype
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Analyze and Conclude

1. Identify the "mother's" genotype and phenotype.
   _____

2. Identify the "father's" genotype and phenotype.
   _____

3. How do sex chromosomes keep the numbers of males and females roughly equal?

_____

4. Share your data with classmates. Calculate the class totals for each table column.

Class Data

Total # of Colorblind Males	Total # of Colorblind Females

5. How many females are colorblind? _____

6. How many males are colorblind? _____

7. How would you explain these results?

_____

_____

8. Draw a Punnet square that illustrates these parents. Report the genotypic and phenotypic percentages and ratios.

Identify

Trait (gene):

Alleles and Symbol:

Parents (genotype and phenotype):

Female Offspring (genotypic and phenotypic percentages):

Male Offspring (genotypic and phenotypic percentages):

9. Evaluate the accuracy of your model. How accurately does it represent the transmission of colorblindness in a population?

   _____

10. Did you observe the expected phenotypic ratio in this experiment? Explain.

    _____

    _____

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Name _____ Date _____ Period _____

Modeling Protein Synthesis

A. An Overview of Protein Synthesis

Directions: Before modeling protein synthesis, let's review key points about this process, by filling in the blank.

1. Protein synthesis is_____.

2. The two steps of protein synthesis are _____ and _____.

3. The molecule that stores the instructions to make a protein is called a/an _____.

4. Proteins are very important to the cell because they _____ and _____.

5. Proteins are made up of _____ _____.

6. What makes proteins different from each other? _____

7. A section of DNA that codes for a protein is called _____.

9. During DNA replication both strands of DNA serve as a template for a new strand. However, during transcription only one _____.

B. Identifying the Key Players

Directions: Your teacher has provided your group with models of the key players involved in protein synthesis. Draw and label each model in a different box and fill in the information. Be sure to color each diagram following the key below and briefly describe the function of each molecule.

Color Code Key - messenger RNA = green, DNA = red, transfer RNA = blue, and protein = yellow

Title_____
Nucleic Acid _____

Function_____
_____

Title_____
Nucleic Acid _____

Function_____
_____

Title_____
Nucleic Acid _____

Function_____
_____

Title_____
Nucleic Acid _____

Function_____
_____

Title_____
Nucleic Acid _____

Function_____
_____

Title_____
Monomer _____

Function_____
_____

C. Transcription

Directions: Your teacher has provided your group with models of the key players involved in protein synthesis. Identify and use the gene to make an mRNA molecule with the appropriate nitrogen base sequence (follow the rules of base pairing). Record your mRNA molecule and answer the questions below.

1. The formation of mRNA is called transcription because _____

_____

2. In the new strand you used "U" instead of "T." Explain. _____

_____

3. Transcription occurs in the _____.

4. The mRNA will leave the _____ and go to the _____ to find a _____.

5. Explain why the molecule is called mRNA. _____

mRNA Nitrogen Base Sequence

D. Translation

Directions: Your teacher has provided your group with models of the key players involved in protein synthesis. Identify and use the mRNA molecule to determine the appropriate amino acid sequence (follow the rules of base pairing). Record the nitrogen base sequence of your tRNA and mRNA molecules, the amino acid sequence of your protein in the box titled Translation below. Answer the questions below.

1. Explain why the second step is called translation. _____

2. Translation occurs in the _____.

3. Explain why the molecule is called tRNA. _____

4. mRNA is a sequence of subunits that are broken into sections of _____ nucleotides. Each section codes for a particular _____ and it is called a _____.

5. A protein is a sequence of subunits called _____ _____.

6. How many codons are in your mRNA? _____ How many amino acids will it code for? _____

7. tRNA carries the proper _____ by matching up to the _____.
The matching code on the tRNA is called _____.

8. The two amino acids are linked by a _____ _____ and this process continues until you form a protein or _____.

TRANSLATION

Name _____ Date _____ Period _____

Adaptations that are Out of this World!!

Explore how natural selection might work in a fantasy environment. Pose to the class that humans are to be sent to five different planets, each with very different living conditions. Assume that each planet can support life, some better than others. First, brainstorm conditions on the five planets. Each group of students will be assigned one planet. The group's job is to speculate about what adaptations would help humans thrive in their new world. Create an illustration of what the inhabitants of the planet might look like in several million years and write up a brief profile about them. Answer these questions:

- What planetary conditions might prompt adaptation?
- What foods are available?
- What adaptations would give people an advantage on the planet?
- How might living on the planet change humans physically?

• What types of behavior changes might be advantageous?

Illustration

Profile

1. Directions: Fill in the blanks using the words provided. Each paragraph is provided with a separate list of words.

adaptations	diversity	prokaryotes
anatomical similarities	eukaryotes	

In a classification system, organisms may be grouped according to the likenesses of their body parts, or _____. They may also be classified according to the type of cells they have. For example, some cells do not have a true nucleus and are called _____; some cells are _____ and have a nucleus. Classifying organisms shows that there are a wide variety of living things and that there is much _____ among organisms. Organisms exhibit a wide variety of traits. Many of these traits are _____, which enable the organisms to survive in their surroundings.

2. List the 7 levels of organization in the system of classification starting with

Kingdom.

_____

_____

_____

_____

_____

Species

3. Complete the table below:

Characteristic ***Yes or no***	**Monera**	**Protista**	**Fungi**	**Plantae**	**Animalia**
Nucleus					
Cell Wall					
Mobility					
Nutrition					
Muticellular/ Unicellular					
Examples					

4. Define evolution

5. Does evolution occur in individuals or in population?

6. What is natural selection?

Name _____ Date _____ Period _____

Gel Electrophoresis

What is gel electrophoresis used for?

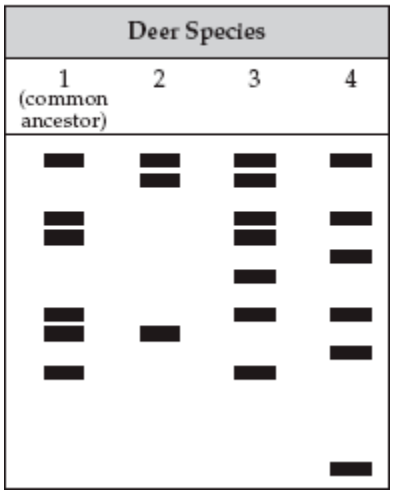
1. How would gel electrophoresis be used in a paternity test?

2. What is this gel showing?

3. What conclusions can we make from this?

4. Put the organisms in order of closeness of similarity.

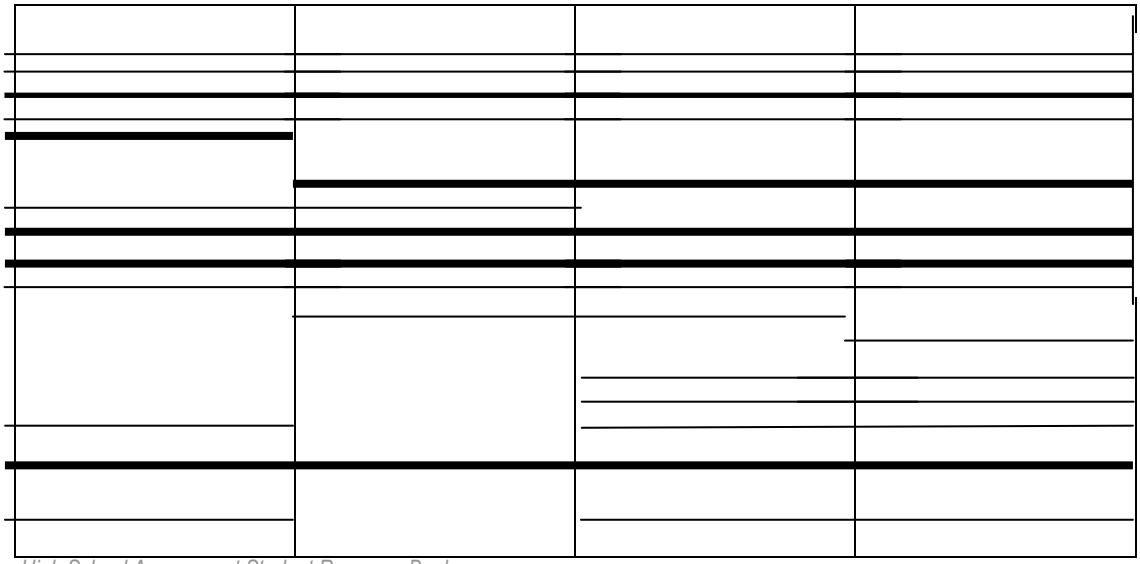
ELECTROPHORESIS GEL OF DEER SPECIES



5. Like a paternity test, does this gel mean these organisms could be related?

6. Evolution says that humans have a common ancestor with apes; do you think the gel below supports that?

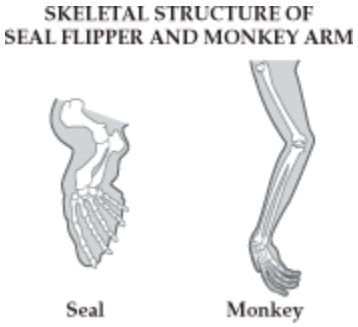
Orangutan Gorilla Chimpanzee Human



Name _____ Date _____ Period _____

Homologous Structures

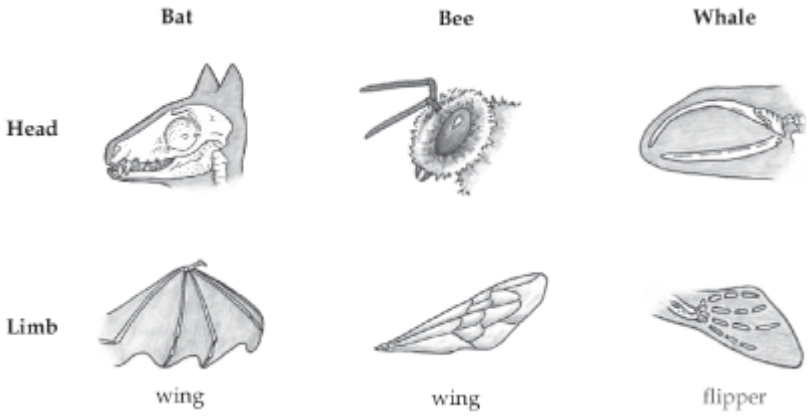
What are homologous structures?



1. What example is being shown here?

2. What do you think it means that different organisms have similar structures? (what is your explanation for what you see)

3. Which structures are homologous in this example?



Name _____ Date _____ Period _____

Adaptations

In each scenario pick the organism that has the best chance of survival. Explain your choice.

LEAF SIZE OF MAPLE TREES

Tree	Average Length (cm)	Average Width (cm)
1	16.0	8.0
2	10.0	5.0
3	18.0	10.0
4	15.0	8.0

1. Which maple tree has the greatest adaptation for growth? ____

What is the adaptation? _____

2. A B

Which fox would survive better in the desert? _____

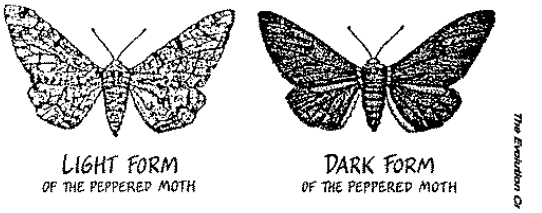
Why? _____

Which fox would survive better in the cold? _____

3. A bird eats moths that are resting on tree trunks.

a. Which moth would probably be eaten in a forest where trees have light colored bark? _____

Which has a better chance of surviving? _____



http://www.godrules.net/evolutioncruncher/images/co9p/Image343.gif

b. Which moth would probably be eaten in a forest where trees have dark colored bark? _____

Which will be more likely to survive and reproduce? _____

4. Rafflesia flowers produce the smell of rotting flesh. This smell attracts flies. When the flies land on the flowers, the pollen attaches to them. The flies then transport the pollen to other flowers. Producing a smell to attract flies is an example of_____

A. parasitism.
B. adaptation.
C. replication.
D. predation.

5. Loggerhead turtles in the Atlantic Ocean return to lay their eggs on the same beaches where they hatched. Scientists have observed that the turtles have a "compass sense." This sense allows them to use Earth's magnetic field to find their way back to the beaches where they were hatched.

Which of these terms best describes the turtle's ability to use Earth's magnetic field?

A. Diversity
B. Habitat
C. Succession
D. Adaptation

6. Which of these will most likely result in variation within a species?

A. Mutation
B. Succession
C. Diffusion
D. Competition

7. Researchers are studying slider turtles. Slider turtles hatch on the beach. The researchers discovered that larger baby turtles were more likely to survive than smaller baby turtles. They hypothesized that the larger turtles could move more quickly toward the water than the smaller turtles, reducing their exposure to predators.

The survival advantage for the larger baby turtles is a result of _____

A. natural selection.
B. gene splicing.
C. Mutualism.
D. Commensalism.

Name _____ Date _____ Period _____

Variation

1. What does variation mean?

2. Where do variations come from?

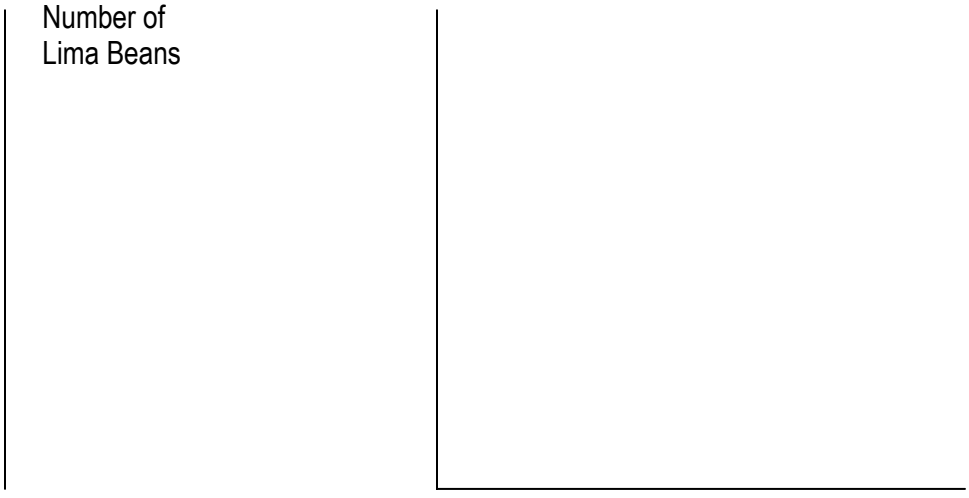
3. List 2-3 characteristics with 2-3 examples of variation for each one. (i.e.: hair color- blonde, brown, red)

1.	2.	3.
a.	a.	a.
b.	b.	b.
c.	c.	c.

4. Do you think variations are beneficial, harmful, or neutral to a population? Why?

5. Measure the length of 20 lima beans (or other large bean). Make a data chart and graph your data.

Length (cm)	Number of Lima Beans



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Name _____ Date _____ Period _____

Body Systems

1. Fill out the following chart

System	Major parts	Major functions
Circulatory		
Nervous system		
Digestive		
Excretory		
Skeletal		
Muscular		
Endocrine		

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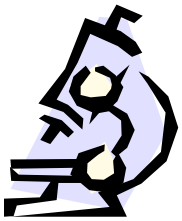
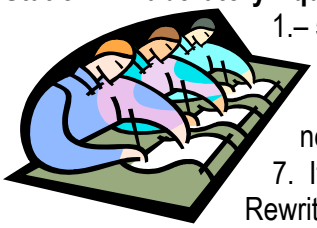


Quarter 1 – Laboratory Assessment (Units 1-3)

Instructions
Your teacher will tell you how long to spend answering the questions at each station. On a separate sheet of paper, record the number of each question and write your answer next to the appropriate number.

Station 1: Laboratory Equipment/ Making Measurements



1.– 5. Next to the appropriate number, write the name of each piece of numbered laboratory equipment.
6. An experiment requires 4 liters of water, how many milliliters of water are needed?
7. It is estimated that a red blood cell is approximately 8,000,000 micrometers. Rewrite this figure using scientific notation.

Station 2: Scientific Method

Students studied a species of fish. They wanted to find out if these fish grow faster in warmer water. The students designed an experiment to determine how different water temperatures affect the growth of the fish. They placed one fish in a tank at 26°C and another fish in a tank at 22°C. The fish were fed the same amount of food during the experiment. The mass of each fish was recorded at the beginning and at the end of the experiment. The data the students collected are shown in the table below.

Effects of Water Temperature on the Growth of Fish			
Temperature (°C)	**Starting Mass (g)**	**Final Mass (g)**	**Percent Change**
26	3.68	7.84	113%
22	6.80	9.09	34%

8. What is the hypothesis that the students were most likely investigating?
9. What is the independent (manipulated) variable in this experiment? What is the dependent (responding) variable? Name a controlled variable.
10. Does the students' data support this hypothesis? Explain?

Station 3: Macromolecules and Laboratory Safety
A student wants to know if glucose is present in an unknown liquid. She places five milliliters of the liquid in a test tube and adds five drops of Benedict solution. She transfers the test tube to a beaker of boiling water for five minutes, then removes it and observes changes in the color of the solution.
11. What type of macromolecule is the unknown liquid?
12. A brown paper bag is commonly used to test for which macromolecule? View the results from the following brown paper bag test. Is the result positive or negative for the macromolecule? Explain your reasoning.
13. What other equipment does the student need to perform this experiment safely? Use your knowledge of laboratory safety to explain why she needs this equipment.

Station 4: Food Webs and Communities

14. Arrange these plants and animals into a food web. Draw your food web on your answer sheet. Label each organism in your drawing as a producer, herbivore, or carnivore.
15. Suppose a new species is introduced into this community. Turn over the photograph marked with an X to see the new species. Predict how the presence of this new species would change the populations in this community. Turn the X-marked photograph face-side down. Mix up the other photographs and spread them out face-side up so that the station is ready for the next person.

Station 5: Polarity, Adhesion, and Solutions

Observe the level of the liquid in the narrow tube that is inside each test tube. Your teacher may have added a small amount of food coloring to some of the liquids to make them easier to see inside the narrow tubes. Write your answers to the following questions in the appropriate place on your sheet of paper.

16. Which of the three liquids is most polar? _____ Explain your answer.
17. Would food coloring that was added to the water and the alcohol dissolve in the oil as well? Explain your answer.

Station 6: pH

Select one vial from each of the racks labeled A, B, and C. Determine and record whether the contents of each vial are acidic, basic, or pH neutral. Record your answer in the appropriate place on your sheet of paper. **CAUTION:** *Always use proper safety procedures when working with chemicals.* When you are finished, place the vials in the rack marked "Used Vials."

18. Vial A -
19. Vial B -
20. Vial C -

Quarter 2 Laboratory Assessment (Units 4-6)

Your teacher will tell you how long to spend answering the questions at each station. On a separate sheet of paper, record the number of each question and write your answer next to the appropriate number.

Station 1: Cell Structures
1. – 3. Look at the microscope slide on each of the three microscopes. Do not move or touch the microscope slides. If necessary, use the coarse- and fine-adjustment knobs to bring the image into focus. Next to the appropriate number on your sheet of paper, write the name and function of the structure indicated by the pointer.

Station 2: Parts of the Microscope
4. – 7. Next to the appropriate number, write the name of each numbered part of the microscope.

Station 3: Osmosis
8. The slides on these microscopes were prepared from two onion membranes. One membrane was kept in a concentrated salt solution; the other was kept for the same amount of time in water. Describe the differences between the two slides. Identify which slide was prepared from which onion membrane, and explain how you determined the answer.

Station 4: Photosynthesis
9. and 10. Write the name of the process that occurs in this structure and list two products of this process.

Station 5: Cellular Respiration
This test tube contains a suspension of yeast cells in water.
11. How would the rate at which the yeast cells produce alcohol be affected by sealing the test tube and removing all oxygen? Explain your answer.

12. How would the rate at which the yeast cells consume sugar be affected by sealing the test tube and removing all oxygen? Explain your answer.

Station 6: Mitosis
13. and 14. Look at the microscope slide on each microscope. Do not move or touch the microscope slides. If necessary, use the coarse- and fine-adjustment knobs to bring the image into focus. The pointer indicates a cell in a specific stage of mitosis. Next to the appropriate number on your sheet of paper, write the stage of mitosis.

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Quarter 3 Laboratory Assessment (Units 7–9)

Your teacher will tell you how long to spend answering the questions at each station. On a separate sheet of paper, record the number of each question and write your answer next to the appropriate number.

Station 1: Genetic Crosses

For these peas, the roundness allele (R) is dominant over the wrinkled allele (r).
1. List all the possible genotypes for the peas in dish *A*.
2. List all the possible genotypes for the peas in dish *B*.

Now, assume that the peas in the dishes are pure-bred round and pure-bred wrinkled, respectively. Suppose the plants that produced the peas in dish *A* are crossed with the plants that produced the peas in dish *B*.

3. What are the genotypes of the F_1 plants? In what percentages do you expect them to occur?
4. What are the phenotypes of the F_1 plants? In what percentages do you expect them to occur?

Suppose two plants of the F_1 generation are crossed.

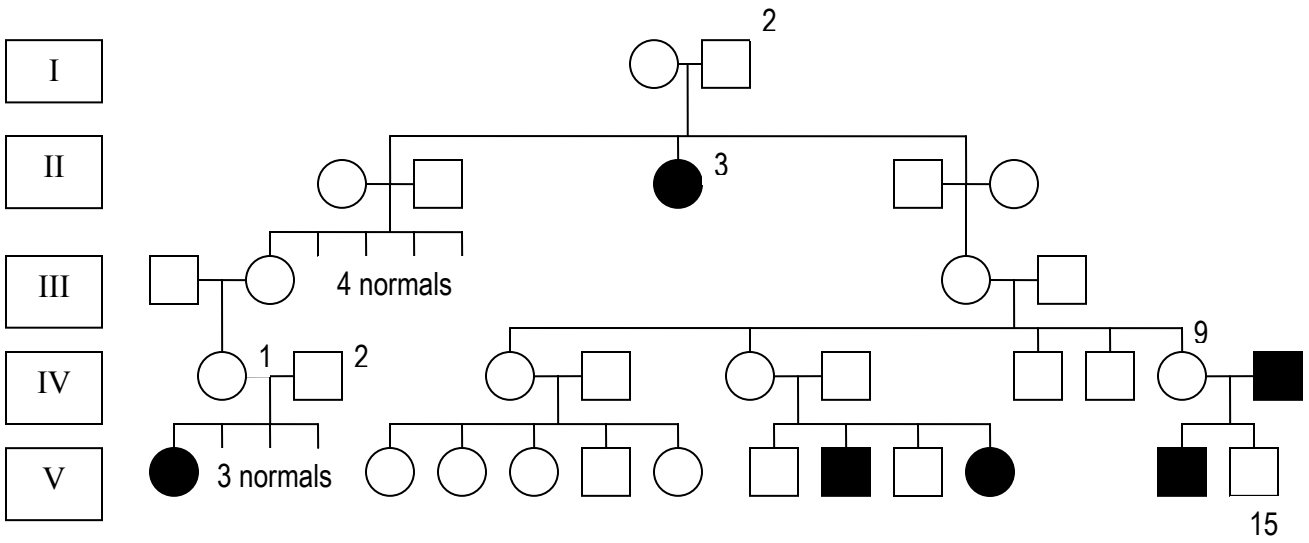
5. What will be the genotypes of the F_2 plants? In what percentages do you expect them to occur?
6. What will be the phenotypes of the F_2 plants? In what percentages do you expect them to occur?

Station 2: Sex-Linked Inheritance

In *Drosophila*, eye color is a sex-linked trait in which the allele for the red eyes (X^R) is dominant over the allele for white (X^r). The X^r allele is rare in the population that produced this specimen.
7. What color are the eyes of this specimen?
8. From your knowledge of genetics, is it more likely that this specimen is a male or a female?
9. Write the most likely genotypes of the parents that produced this specimen. Is it likely that either of its parents had white eyes?

Station 3: Pedigree

Analyze the pedigree showing the inheritance of albinism (an autosomal recessive trait). Autosomal recessive traits are single gene traits caused by a recessive gene carried on an autosome. The trait is expressed in the phenotype only when the genotype is homozygous. The following conditions occur with this type of inheritance. Determine the genotype for each of the following individuals, using ***A*** for the dominant gene and ***a*** for the recessive gene.



10. I-2 and II-3
11. IV-1 and IV-2
12. IV-9 and V-15

Station 4: Human Sex-Linked Inheritance

Colorblindness is a sex-linked recessive trait. In questions 10 to 12, X^B designates the normal allele, and X^b designates the allele for colorblindness.

13. Based on the information given, what is the genotype of the mother? Of the father?
14. Pick one paper "allele" from the "carrier mother" bag and one from the "colorblind father" bag. What is the genotype of your new individual? What is the phenotype? Return each paper "allele" to the bag it came from.
15. What is the probability that the next student at this station will select an individual of the same genotype as the one you selected?

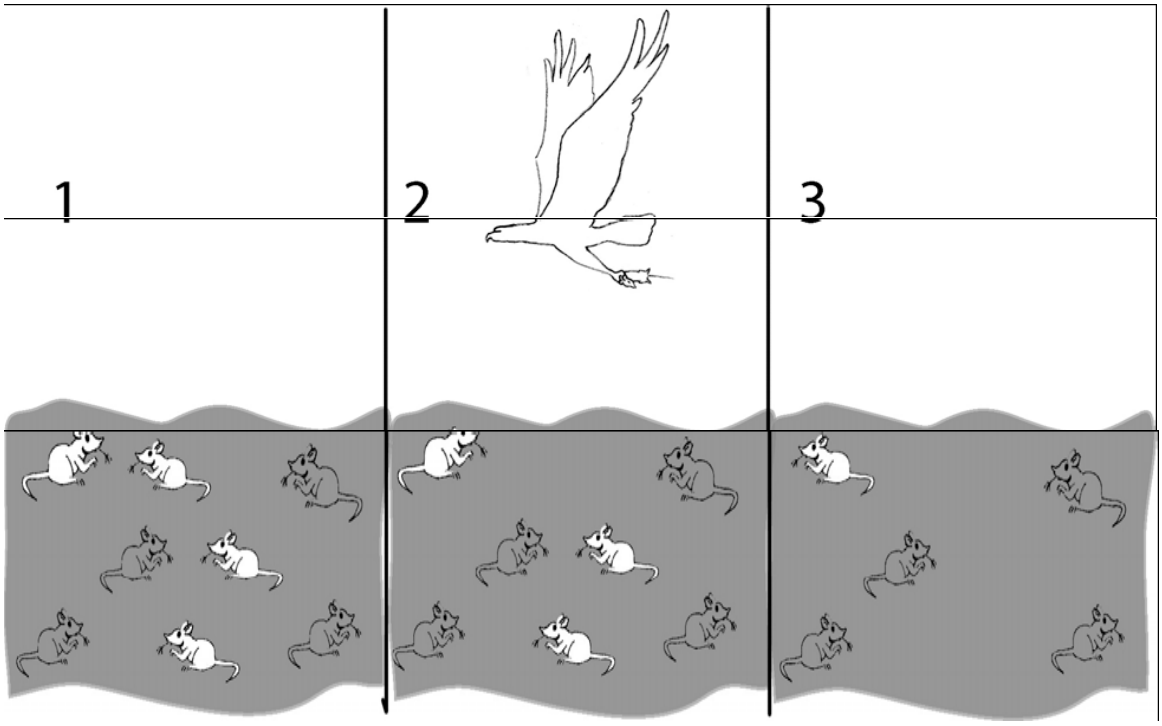
Station 5: Transcription and Translation

16. Could the nucleotide sequence on card *A* represent DNA, RNA, or both? How can you tell?
17. If the nucleotide sequence represents a segment of messenger RNA, how many amino acids does it code for? Which amino acids are they?
18. Name the type of RNA that binds directly to both a codon and an amino acid?

Quarter 4 Laboratory Assessment (Units 10-11)

Your teacher will tell you how long to spend answering the questions at each station. On a separate sheet of paper, write the number of each question and write your answer next to the appropriate number.

Station 1: Evolution



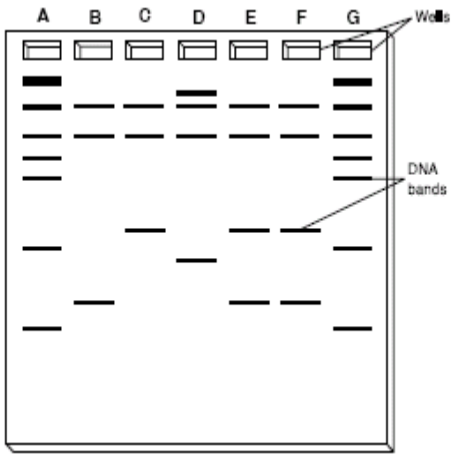
1. Describe what is happening in figures 1-3.
2. Is the population of mice different in figure 3 than in figure 1? Explain why.

Station 2: DNA Fingerprint

You are a forensic scientist who specializes in the analysis of DNA. The police have brought you four samples of evidence. The first is a blood sample from the victim of a crime. The second is a blood sample from a suspect who claims to have been elsewhere when the crime occurred.
The third sample was collected at the crime scene, and the fourth sample was taken from the suspect's shoe. You are asked to compare the DNA in these samples to determine whether there is sufficient evidence to connect the suspect with the crime scene or with the victim.

Examine the DNA fingerprint, and locate lanes A and G. Starting with the wells below letters A and G, compare the patterns of DNA bands in these two lanes. Then, examine lanes B through F. Compare their patterns of DNA bands. Recall that wells A and G contained a standard mixture of DNA. Starting at the top and moving down, the lengths of the DNA molecules in this mixture, in kilobases, are: 5.0, 4.1, 3.5, 3.1, 2.8, 1.9, and 0.7. Keep in mind that the smaller the molecules of DNA, the farther they move down through the gel. In lanes A and G, label each band with the length of the DNA molecules it contains.

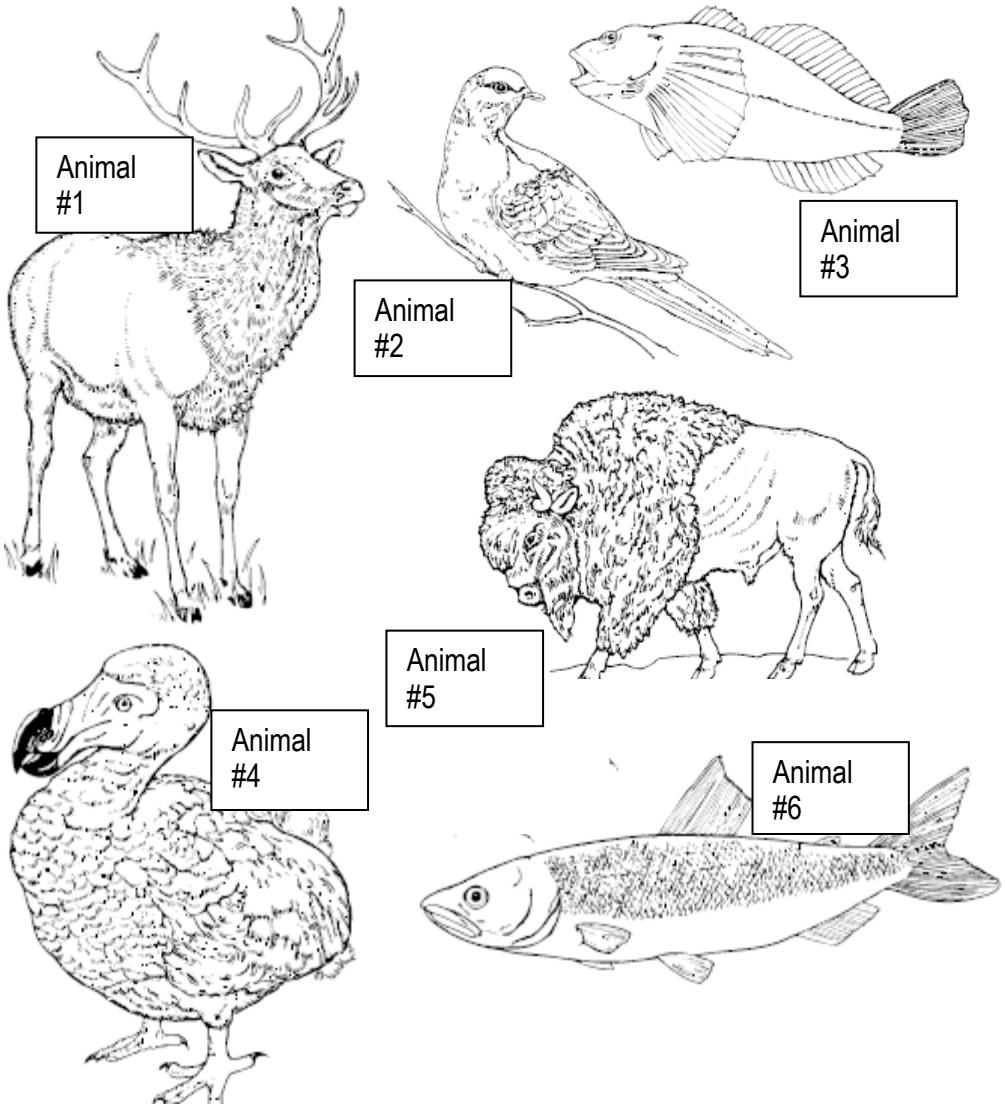
Data Table	
Lane	**Source of DNA Sample**
B	Victim of the crime
C	Suspect
D	Person unrelated to the crime
E	Evidence found at crime scene
F	Suspect's shoe



3. Using the lengths of the DNA molecules in lanes A and G as your standards, estimate the lengths of the DNA molecules in lanes B through F. Which sample(s) contained DNA molecules that were approximately 1 kilobase long? Approximately 2 kilobases long?
4. Why were the samples in lanes A and G necessary?
5. Based on your findings, was the suspect present at the crime scene? Explain your answer.
6. What process was used to prepare this DNA fingerprint?

Station 3: Classification

Vertebrates can be divided into five major groups: fishes, amphibians, reptiles, birds, and mammals. (These are not all formal taxonomic groups.) Fishes have gills. The other vertebrates mentioned have lungs. Fishes, amphibians, and reptiles are called ectothermic because they derive body heat mainly from their environment. (*Ecto-* means outside; *-therm* means heat.) Birds and mammals are called endothermic because they derive body heat mainly from metabolism. (*Endo-* means inside.) Some species in each vertebrate group have become extinct. Ten extinct animals are pictured. Study the characteristics of these animals and then use the dichotomous key to identify them.



Dichotomous Key for the Extinct Animals Shown		
1	a Is endothermic	Go to 2
	b Is ectothermic	Go to 6
2	a Has feathers	Go to 3
	b Has hair or fur	Go to 4
3	a Has narrow, straight beak	*Passenger* pigeon
	b Has wide, crooked beak	Dodo
4	a Has horns	Go to 5
	b Has no horns	*Texas* red wolf
5	a Horns may have many branches	Eastern elk
	b Horns have no branches	Oregon bison
6	a Breathes with gills	Go to 7
	b Breathes with lungs	Go to 8
7	a Has large, fan-shaped fins just behind the head	U*tah Lake* soulpin
	b Has small pectoral fins	*New Zealand* grayling
8	a Has scaly skin	Go to 9
	b Has smooth skin	*Palestinian* painted frog
9	a Has front and hind legs	*Domed* tortoise
	b Has no legs	*Round Island* boa

7. Animal 3
8. Animal 6
9. Animal 4
10. Mammals are endothermic, have hair or fur, breathe with lungs. (They also give birth to live young.) Which of the animals described in the **dichotomous key** are mammals?

Station 5: Pig/Frog Anatomy

11. – 14. Write the name of each labeled structure next to its number.

Station 6: Human Body Systems

Look at the model located at this station.

15. What is this a model of?
16. What system is this organ a part of?
17. This body system is often compared to what plant structure? Explain your answer.

First Quarter Project
Ecosystem Story Book

Point Value : 150pts

Purpose: The book that you are to write must be written for a 3rd grade reading level and must be in story form. This book is not meant to be a reference book, it should be a creative story. **This format will require you to fully understand the topics you are covering.** It will be nearly impossible to write a book at a third grade level without having a full understanding of the subject matter yourself. Also, be sure to remember that 3rd graders love pictures!

What the students will do: You are to choose one of the sixteen biomes found on our planet. Within the biome you have chosen, you must examine a particular ecosystem (Example - Biome: Tropical Rain Forest ….Ecosystem: El Yunque Rainforest, Puerto Rico). You must provide me with the Biome/Ecosystem you will be working on by _____. I expect that there will be no duplication within the class because there are quite a few different ecosystems within each individual biome. You must send me an email (_____) with your choice of biome and ecosystem. I will reply to you (via email) to confirm your message and approve your choice. Do not assume your choice is acceptable until you hear from me. There will be **no duplicates** within the class.

Sixteen Biomes Includes the Following:

Tropical Rain Forest	Temperate Broadleaf Forest	Savanna	Chaparral
Temperate Grassland	Coniferous Forest	Ocean Pelagic	Desert
Marine Benthic Zone	Coral Reefs	Wetlands	Tundra
Streams and Rivers	Estuaries	Intertidal Zones	Lakes

Directions: Within the context of your story, the following items must be included:

- A brief definition of the terms biome and ecosystem
- A geographic description of the biome/ecosystem chosen.
- Abiotic factors: definition and how they affect the ecosystem.
- Biotic factors: definition and how they affect the ecosystem.
- Limiting factors (density-dependent and density-independent): definitions and at least two specific examples of each type of limiting factor.
- Organisms found in this ecosystem:
  a. producers (4 minimum); **b.** consumers - primary, secondary, tertiary, (6 minimum, 2 each).
- Description of a food web consisting of at least fifteen different organisms (names of organisms must be included).
- Predator-prey relationships within the ecosystem (two examples) – must explain therelationship and indicate why the relationship is either beneficial or detrimental to the ecosystem.
- An energy (productivity) pyramid or biomass pyramid.
- A description of how the ecosystem has had (or could) rebuild after a natural disaster (secondary succession). Be sure to include the order in which new organisms would return to the ecosystem.
- The impact of human activity on this ecosystem, including a prediction of what may happen to this ecosystem in the future.
- In addition, the last page of your book must include a works cited page. This page must be compiled using MLA format and your references must include: **a.** minimum of five sources; **b.** one source must be a paper source other than your text book or an encyclopedia (scientific journal, scientific books).

Evaluation:

- The story must be in book format and must be handed in as a hard copy. An electronic copy will not be accepted.
- There is no minimum length for the story book. The only requirement is that all required topics are presented in the book.
- The book will be graded on its biological accuracy and on its creativity (see rubric).
- Remember the book must be written for a 3rd grade reading level.
- Please assess yourself using the rubric below and attach this rubric to your Ecology Story Book.
- Be prepared to present your work to your fellow classmates in our Gallery Walk.

First Quarter Project
Ecosystem Story Book Rubric

Student Name _____ **PD**_____

Biome_____ **Ecosystem**_____

Part I: Self/Teacher Assessment of Ecology Story Book

Element	Points Possible	Self	Teacher	Comments
Format (30pts)				
Understood by age group	5			
Creativity	15			
Neatness/Grammar/well-edited	10			
Content (90pts)				
Definition of the terms biome and ecosystem	5			
Geographic description of the biome/ecosystem	5			
Definition of abiotic/biotic factors and their affect	10			
Limiting factors (density-dependent and density-independent): definitions and examples of each	10			
Producers	4			
Consumers - primary, secondary, tertiary, etc	6			
Food Web	10			
Predator-prey relationships	5			
Energy (productivity) or Biomass pyramid	5			
Secondary Succession	10			
Impact of Human Activity	10			
Reference Page	10			
Peer Review (30pts)				
1.	10			
2.	10			
3.	10			
Total	**150**			

Part II: Presentation of Ecology Story Book

You will present your story book to the class in the form of a Gallery Walk. Your fellow classmates will have the opportunity to learn from your work and evaluate it based on the standards. This evaluation will be calculated in your final grade.

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Second Quarter Project

A Cell Is A Small City

What comes to mind when you think of going to a pizza parlor? Can you smell the aroma of cheese, pepperoni, onions, or picture the employees making pizzas? Can you hear music playing in the background as well as sounds from people laughing and talking? People come in and go out, taking boxes of pizzas-to-go. What a flurry of activity!

Cells, the basic units of life, can be compared to a pizza parlor, a factory, and even an entire city. These cells are busy building and breaking down macromolecules. They are at work releasing energy from foods, and then using that energy to make needed cell parts. Together, your cells function to make your body operate like a well-run business, factory or city.

THE TASK

You will work in a team that will consist of three or four members. Your group will work together to plan, design, and construct a 3-D "Cell"(pick from below) based on your research of the organelles and what their functions are.

School	Church	Business	Stadium
Store	Library	Hospital	Amusement Park
Daycare	Zoo	College	Home
Hotel	Mall	Park	Farm
Fire/Police Station	Sports Team	Office	White House

THE PROCESS

1. Research each cell organelle to determine its function and how it works with other cell parts to function correctly.
2. Together, give your model a name. You will also name the parts of your model that correspond to actual cell structures. Complete the table with the cell organelles required, functions and your analogies.

NOTE: SOME OF THE CELL STRUCTURES CAN REPRESENT PEOPLE AND NOT JUST BUILDINGS

3. Decide the best placements for your cell structures based on your research of the cell and its organelles.
4. Once you have decided on placements of structures in the model, you will begin the sketch. If you are using small and large buildings, make sure you show the different sizes. If people are an important part of your model, sketch them in as well. (Stick figures are fine) **SKETCH EVERYTHING INCLUDING EXTRAS SUCH AS TREES, PEOPLE, STREAMS, HOUSES, ETC...**

REQUIREMENTS AND TIMELINE:

TABLE (Due: _____)

SKETCH (Due: _____)

Use unlined paper for your sketch of your model

Use a pencil

A ruler must be used for all straight lines and a compass can be used for circles

Drawing must be CLEAN and NEAT. Sloppiness will result in a loss of points for your team

3. **FINAL 3-D PROJECT:** (Due: _____)

Tips For a Successful Project.

Keep communication between all group members OPEN!! Trade telephone numbers or e-mail addresses if possible to help each other when not in class/school.

Help each other along during each phase of the project. If there are any concerns at all, **talk to the teacher, ASAP**.

· Names of Team Members Date Due: _____

_____ _____

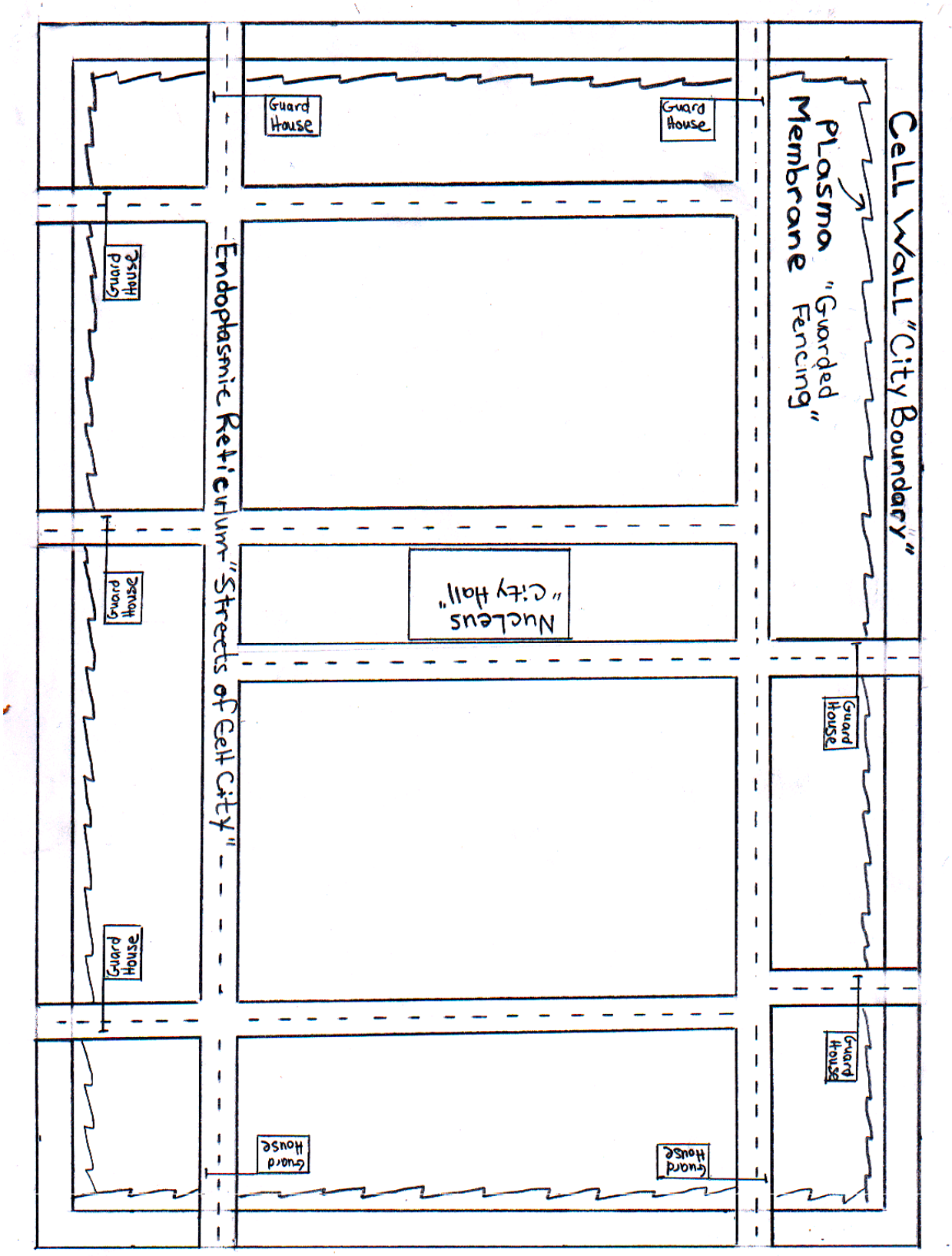
_____ _____

Analogy Table

Students are to research the function of each organelle and then decide which object (i.e. structure, person) in their cell model has a similar job.

Organelle	Function (of organelle)	Analogy (object in model)
Nucleus		
Nuclear Membrane		
Endoplasmic Reticulum		
Golgi Apparatus		
Vacuole		
Chloroplast		
Cell Membrane		
Mitochondria		
Ribosome		
Cytoskeleton		
Cytoplasm		
DNA		
Lysosome		

Example of "Rough Draft" or Sketch.



Architect/City Planner Evaluation " Blueprint of your cell _____ " (The rubric used to grade you will look like the one below)			
Organelles	**Structure Analogy (object with similar function as the organelle)(1 pt).**	**Actual functions match structures represented in model (2 pts).**	**Points Earned**
Mitochondria			
Nucleus			
Chloroplasts			
Nuclear Membrane			
DNA			
Lysosomes			
Endoplasmic Reticulum			
Cell Wall			
Cell Membrane			
Golgi Apparatus			
Cytoskeleton			
Vacuole			
Cytoplasm			
Ribosome			
		Sketch (5 pts)	
		Creativity (5 pts)	
		Neatness (5 pts)	
		Total Points (out of 57)	

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Third Quarter Project

Pedigree

To demonstrate your understanding of how to correctly draw and label a human pedigree, you are to construct a pedigree of your family tree or a famous family (You cannot do Queen Elizabeth's family or the Romanov family). Along with your pedigree, you are to submit a **written component** that contains the following information:

1. Inheritance Pattern (Autosomal dominant, autosomal recessive or sex-linked)
    a. What is the pattern of inheritance for the trait that you have followed in your family tree?
    b. What evidence led you choose the pattern of inheritance that you chose?
2. Genotype and Phenotype of individuals depicted in the pedigree
    a. Provide an explanation of the relationship between genotype and phenotype
    b. Summarize the genotypes and phenotypes of individuals in the pedigree
3. Career Connection
    a. Explain the career of genetic counseling
    b. How do genetic counselors use pedigrees in their practice?
    c. Can you think of any other careers where a pedigree would be useful?

You may choose to trace, **tongue rolling**, **widow's peak, dimpled chin, hitch hikers thumb, attached earlobes, or color blindness** through your family tree. Begin with your grandparent's generation and continue through three full generations including yourself, your siblings, and your cousins. You must have a minimum of 4 people in each generation. Therefore, there will be a MINIMUM of 12 people for the whole pedigree. Feel free to make your pedigree larger, however, keep in mind that you need to be as accurate as possible. In today's society, many families are blended with step and half siblings. These individuals can also be included in your family pedigree. Be sure to ask your teacher for assistance in making your diagram.

This project is worth **100 points** (**50 points** for the pedigree and **50 points** for the written portion). Please take your time and be as accurate as possible. Data for this assignment should be collected over the holiday vacation, so you can collect information from your relatives when you see them!!! It will be due on the Friday after you return from vacation.

Genetic Information

- Tongue rolling is an autosomal dominant trait. Tongue rollers carry a dominant gene, R. Non-tongue rollers are homozygous recessive (rr). To see if you are a tongue roller, attempt to roll your tongue into a U shape, in which the sides of your tongue are curled upwards.
- Widow's peak is an autosomal dominant trait. If you have a widow's peak, you have at least one dominant gene (W). No downward point of the hairline and you are homozygous recessive (ww).
- Dimpled Chin is an autosomal dominant trait. Individuals with chin dimples carry at least one dominant gene, D. Individuals without dimples are homozygous recessive, dd.
- Attached earlobes are an autosomal recessive trait. Attached earlobes are directly connected to the head and the genotype is homozygous recessive (ee). Free earlobes can be moved back and forth; it is a dominant trait and the genotype will include at least one E.
- Hitchhiker's thumb is an autosomal recessive trait. Individuals who can bend the top joint of one or both thumbs backwards at about a 45 degree angle have a homozygous recessive genotype, hh. Individuals who cannot bend the top joint back have at least one dominant allele, H.
- Color Blindness is a sex-linked recessive trait. To do this trait you must show members of your family a color blind chart. You can use the following website to assist you. http://www.toledo-bend.com/colorblind/Ishihara.html

Due Date: _____ NO EXCEPTIONS!!

Name_____ Date_____ Pd._____

Pedigree Analysis Rubric

	5	4	3	2	1
Support	Poster Board		Construction Paper		Notebook Paper
Content	Titles are creative and colorful: Title for Pedigree Clearly marked generation I, II, and III Actual Pictures of family members Used correct symbols and shapes for family members	Title for Pedigree Clearly marked generation I, II, and III Actual Pictures of family members Used correct symbols and shapes for family members	Title for Pedigree Clearly marked generation I, II, and III Used correct symbols and shapes for family members	Title for Pedigree Marked generation I, II, and III Used correct symbols and shapes for family members	Missing Title Missing Generations No pictures Incorrect use of symbols
Include Key	Key is typed and color coded Summary of the type of inheritance pattern observed	Key is typed Summary of the type of inheritance patter observed	Key is completed by hand but has a color code Summary of the type of inheritance patter observed	Key is completed by hand but is black/white Summary of the type of inheritance pattern is observed	Key is missing Summary of the type of inheritance pattern observed.
Number of genotypes	More than 16 genotypes present and correctly represented	13-15 genotypes present and represented correctly	12 genotypes present and correctly represented	9-11 genotypes present and correctly represented	Less than 9 genotypes present and correctly represented
Neatness	Very Neat	Neat, organized all lines made with a ruler and clearly visible from several feet away.	Missing one of the previous criteria	Missing two of the previous criteria	Missing all of the previous criteria

Comments: Total: _____ X 2= _____/50

Name_____ Date_____ Pd._____

Pedigree Analysis Rubric for Written Component

	5	4	3	2	1
Organization	Information is very organized with well-constructed paragraphs and subheadings and transitions sentences.	Information is very organized with well-constructed paragraphs.	Information is organized with well-constructed paragraphs.	Information is organized, but paragraphs are not well-constructed.	The information appears to be disorganized. 8)
Quality of Information	Information clearly relates to the main topic. It includes several supporting details and/or examples.	Information clearly relates to the main topic. It includes supporting details and/or examples.	Information clearly relates to the main topic. It provides 1-2 supporting details and/or examples.	Information clearly relates to the main topic. No details and/or examples are given.	Information has little or nothing to do with the main topic.
Mode of Inheritance	Mode of inheritance is correct and explained using supporting details in pedigree as well as student knowledge of pedigrees	Mode of inheritance is correct and explained using supporting details in pedigree	Mode of inheritance is correct and explained using supporting details not in pedigree	Mode of inheritance is correct but not explained.	Information on mode of inheritance and supporting details are incorrect.
Career Connection	No grammatical, spelling or punctuation errors.	One or two grammatical, spelling or punctuation errors.	Almost no grammatical, spelling or punctuation errors	A few grammatical spelling or punctuation errors.	Many grammatical, spelling, or punctuation errors.
Career Connection	Career connection to genetic counselor and other professions is complete and accurate	Career connection to genetic counselor is complete. Connection to other professions is attempted but not complete and accurate	Career connection to genetic counselor is complete and accurate	Career connection to genetic counselor is attempted but not complete	Career connection to genetic counselor not attempted

Comments: Total: _____ X 2= _____/50

Portfolio Assessment in Science

Fourth Quarter Project

The key to evaluating the success of a science program lies in assessment methods that help teachers and students measure progress toward instructional goals. A portfolio is a challenging assessment tool that gives students the opportunity to showcase their best efforts in a collection of their work. Throughout the school year, students will compile a working portfolio for works in progress. At specific times, such as at the end of a particular unit, students will review what they have put into their working portfolios in order to select what they want to include in a display portfolio of finished products to be turned in at the end of the school year. Their display portfolios will include required work as well as items that the students have carefully selected.

The portfolio highlights students' demonstrated skills in thinking, reasoning, and problem-solving and is student selected to encourage students to take responsibility for their own learning. Important aspects of the Science Portfolio are personal and societal relevance, growth over time, and connections among the various sciences as well as with other disciplines. An important goal of the Science Portfolio is to improve student learning through the process of student self-evaluation. The Science Portfolio will consist of two sections of entries: Learning and Living. The entries compiled in the Learning section will demonstrate what students have learned in Biology. Entries compiled in the Living section reflect student research of science and science careers in our society. Portfolios must be well organized and meet the following guidelines.

Portfolios must be typed, 12 font, Times New Roman or Arial Narrow, 1" margins (entire document), double-spaced, page numbered.

All portfolios must include the following components:

1. **Creative Portfolio Cover**: Students are to create a cover sheet that is creative and exhibit the student's own style. The cover must have the student's name, date, teacher's name, and a title *(i.e. My Portfolio, Taking Science by Storm, Science in My Eyes)*. Covers may be artistic, or very straightforward.
2. **Letter of Introduction**. The letter of introduction will give the reader a preview of the student as a person and what they may expect to see in his/her portfolio: who they are, what they have accomplished to date, and future plans.
3. **Table of Contents**: Students are to include the pieces and page numbers of the items contained in the portfolio. Each portfolio shall have two clearly visible designated segments: Learning and Living.
4. **Learning Segment -** include entries that reflect what students have learned in Biology from each category as indicated below. The Evidence of Learning; Reading, Record and Reflections; and Creative Expression entries must include a recording sheet for each separate entry. *(see descriptions and forms at the end of instructions)*
   - ☐ Evidence of Learning (6 entries)
     - Evidence of Learning Form for Each Entry
     - Six Original Assignments
   - ☐ Reading, Record and Reflections (4 entries)
     - Reading Record
     - Reading, Record and Reflections Sheet (2 reflections per sheet – 4 reflections total)
   - ☐ Creative Expression (1 entry)
   - ☐ Overarching Questions (4 entries)

5. **Living Segment** – shows evidence of the use of science in our world.
   - ☐ Daily Television Program Guide (1 Day)
   - ☐ Capturing and Banking Science (1 entry)
6. **Presentation:** Student will share their Creative Expression from the Learning Segment and the Living Segment in a 5-7 minutes presentation to the class.

The Learning segment shall include document learning in the following areas:

Evidence of Learning – Students will include authentic work that demonstrates evidence of their learning in areas reflecting the state goals. Along with each Evidence of Learning, students must include a typed cover sheet explaining why they think the work is "portfolio worthy" followed by the original assignment. Students may choose a piece for many reasons, i.e. it was particularly difficult and you are very proud of the results; it represented a completely new skill or interest for you; or it is related to your career pathway or you think it is particularly representative of your talents. Students must include six (6) assignments demonstrating what they have learned. Each quarter must be represented.

Reading, Record and Reflections – Keep a list of what you read for each unit or quarter on a separate Reading, Record and Reflection form. You must include the following information on the Reading Record: author, title, publisher, date of publication, number of pages, and if it was required reading for a class. You may record books (fiction, non-fiction, or biographies), magazine articles, and short stories. Each quarter, select one piece from your list, and, in a paragraph, explain its impact on you. In your portfolio, include the Reading, Record and Reflection form for each of the 4 required entries along with the typed paragraph and for this section *(see form at end of instructions).*

Creative Expression - The Creative Expression entry shows a depth of understanding of a scientific concept through music, art, poetry, video or other media in an original or unique way. It is important to note that an outstanding appearance or display of work is not enough. As part of a science portfolio, it is essential that the work creatively shows understanding of an important scientific concept. The thoughtful completion of the Creative Expression Self-reflection Sheet is an essential part of the evaluation of the entry. Students must complete two (2) creative expression entries (one for each semester of the year) showing an understanding of topic(s) covered during that semester. The entry will be evaluated by how well it meets or surpasses the following requirements:

- ☐ <u>Clear Expression of the Concept</u>
  - Written description that is understandable to the reader
  - Labels, written explanation, or captions that explain the concept the student is presenting
- ☐ <u>Presentation</u>
  - Understanding is communicated effectively by the format selected
  - Work that shows quality and originality
  - Photographs of objects too large to submit
  - Videos – presentation cued to desired location on the tape

Overarching Questions – Students must answer a minimum of four (4) overarching questions presented at the beginning of each unit this year. Students must select one (1) overarching question from <u>each quarter</u>. Each response should include the overarching question, along with its unit and theme and must address all aspects of the overarching question. The overarching questions for each unit are as follows:

Unit	Theme	Overarching Question
1	Introduction to Biology and the Process of Science	Explain how having a scientific attitude might help you in everyday activities like decision making or learning a new skill?
2	Circle of Life – Interdependence in Nature	What is your ecological footprint? Think about diversity of organisms, their interactions and interdependence with each other and their environment to meet their energy demands and how these interactions result in delicate web.
3	Foundations of Life – Biochemistry	Keep a log of your diet for one day. Analyze the unique characters of the food you ate (organic and inorganic molecules) and explain how you utilize them for specific life-sustaining purposes?
4	The Basic Unit of Life – The Cell	When playing outside on a hot summer day, explain what cellular processes occur to maintain homeostasis
5	Powering Up for Life – Bioenergetics	Human digestive enzymes work best at 98.6 degrees Fahrenheit. A human fever over 108 degrees Fahrenheit is deadly. Explain why, using what you've learned about cellular respiration, enzyme structure, and enzyme function.
6	Life is a Cycle – Reproduction	Incredible as it seems, every cell in your body was produced by mitosis from a small number of cells called stem cells. Recent studies suggest these cells may hold the secret to treatment, even cures for disease or injury. Use what you learned to explain how stem cells could replace damaged cells that are unable to self repair and determine why there is such great debate surrounding the use of these cells.
7	All in the Family – Introduction to Heredity	In asexual reproduction, mitosis occurs, but not meiosis. Observe the appearance and behavior of a human population and a bacteria population to determine which population has greater genetic variation. Explain why, using what you have learned about mitosis, meiosis, and inheritance.
8	Family Tree – Heredity	Choose a family and a trait, such as facial dimples, that you can trace through three generations. Find out who in the family has had the trait and who has not. Then draw a pedigree to represent the family history of the trait.
9	Express Yourself – Gene Expression	Your career ambition is to be a science reporter. You are sent by your school newspaper to interview a geneticist who works with human genetic disorders. What questions would you ask the geneticist (Minimum of 10)?
10	The Tree of Life – Order and Diversity of Life	Natural Selection is everywhere! One dramatic example of evolution in action poses a serious threat to public health. Many kinds of disease-causing bacteria are evolving resistance to antibiotics. Analyze the viewpoints to make an informed decision about the use and restriction of antibiotics
11	Bodyworks – Human Body Systems	Just say no! Research a drug to find out its short-term and long-term effects on the body and its ability to maintain homeostasis, in order to persuade someone not to take the drug.

Capturing and Banking in Science – Students will examine how science and math are embedded in our everyday lives by analyzing television programs for one day. Students are to obtain a daily television guide (i.e. TV Guide from Sunday's *Washington Post*)

- Highlight all programming that have some sort of science or mathematics focus – this includes drama series as well as news and documentaries.
- List all the program names and include a brief description of how they relate to science.
- Calculate the approximate percentage of programs shown in one day (on one or all stations) that relate to science in some way.
- Watch one of the programs and record the character names and their science-related occupations or tasks. Also list any non-scientific jobs in which some knowledge of science would help, or a job which supports a science professional. For example: hospital administrator, journalist, lawyer, builder or police officer.
- Attach the page containing the daily television programs used to complete this entry.
- Select and research a science-related occupation portrayed in the viewed programming. Report on the daily responsibilities, salary, educational requirements (i.e. 4 year college, B.S. in Biology), and name two (2) colleges and the programs offered that may lead to this career.

Cover Sheet: Evidence of Learning

Prince George's County Public Schools
Science Portfolio

Student:	**Course:**
School:	**Teacher:**
☐ **Quarter One** ☐ **Quarter Two** ☐ **Quarter Three** ☐ **Quarter Four**	
Students completing Biology in Prince George's County will be: ❖ Critical thinkers who are able to solve complex problems. ❖ Engaged, self-directed, lifelong learners. ❖ Effective listeners and communicators. ❖ Able to understand and respect diversity. ❖ Resilient, collaborative and persistent as they address challenges. ❖ Capable of efficient time management. ❖ Caring, skilled family and community members. ❖ Able to value science as an essential part of the understanding of life on Earth. ❖ Capable of making healthy life choices. ❖ Responsible, contributing citizens in a diverse changing world.	**Date of Assignment:** **Description of Assignment:** **Rationale for Inclusion:** *What was important about this assignment? What did you learn? What was the challenge? How does this assignment relate to your post-high school plans? How will you apply this learning?*

Name: _____
Teacher: _____

Prince George's County Public Schools
Science Portfolio

Reading, Record and Reflection

Record the books, short stories, or articles you read in each quarter pertaining to science. You must have a minimum of 12 readings by the end of the school year. Using the ***Reading Reflection*** document, select one (1) reading per quarter, and in a well-developed paragraph of at least seven sentences, describe your impression of the reading and explain how this book or article has influenced you.

Reading Record

Author	Title	Publisher	Pages Read	Date Read	Required	If required, what class?
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	
					☐	

Name _____
Quarter _____

Prince George's County Public Schools
Science Portfolio

Reading Reflection

Select a book or article from your Reading Record, and, in a well-developed paragraph of at least seven sentences, describe your personal impression of the reading, and explain how this book or article has influenced you.

Book Title:
Author:
Publication Date:
Reflection:

Book Title:
Author:
Publication Date:
Reflection:

Portfolio Assessment in Science Rubric

Portfolio Assessment in Science Rubric

		4	3	2	1	0	Points Earned
	Portfolio Cover (must include student's name, date, teacher's name, and title)	Cover includes all elements and is neat and creative	Cover missing one element	Cover missing two elements	Cover missing three or more elements	No Portfolio Cover	
	Letter of Introduction (expectation of portfolio, accomplishments, future plans)	Completed Letter of Introduction	Letter of Introduction missing one element	Letter of Introduction missing two elements	Letter of Introduction missing three or more elements	No Letter of Introduction	
	Table of Contents (Include entry titles and page numbering)	Table of Contents complete	Missing one entry	Missing no more than 3 entries	Missing more than 4 entries and/or page numbering	No Table of Contents	
Learning Segment	**Evidence of Learning Cover Sheet** (6 entries)	All 6 Cover Sheets completed	4 Cover Sheets completed	2 Cover Sheets completed	1 Cover Sheet completed	No Cover Sheets included	
	Evidence of Learning Original Assignments (6 entries)	All 6 Assignments Submitted	4 Assignments Submitted	3 Assignments Submitted	1 Assignment Submitted	No Assignment Submitted	
	Reading Record (At least 12 readings listed)	At least 12 readings listed	At least 9 readings listed	At least 6 readings listed	At least 3 readings listed	Less than 3 readings listed	
	Reading, Record and Reflections (4 entries)	All 4 reflections submitted	3 reflections submitted	2 reflections submitted	1 reflection submitted	No Reading, Record and Reflections	
	Creative Expression (1 entry)	Creative Expression shows a complete understanding of scientific concept(s)	Creative Expression shows a good understanding of scientific concept(s)	Creative Expression shows a limited understanding of scientific concept(s)	Creative Expression shows a minimal understanding of scientific concept(s)	No Creative Expression Entry	
	Overarching Questions (4 entries)	All Overarching Questions answered	3 Overarching Question answered	2 Overarching Questions answered	1 Overarching Question answered	No Overarching Questions Answered	

		4	3	2	1	0	Points Earned
Living Segment	**Daily Television Guide** (1 submission)	Highlighted guide submitted	Guide submitted with an abundance of appropriate highlighting	Guide submitted with partial highlighting	Guide submitted with no highlighting	No Guide submitted	
	Capturing and Banking Science (programs listed, percentages calculated, character names and occupations listed and described)	All elements present	Missing 1 element	Missing 2 elements	Missing at least 3 elements	No elements present	
	Capturing and Banking Science (career descriptions, salary, educational requirements, colleges & programs named)	All elements described	Missing 1 element	Missing 2 elements	Missing at least 3 elements	No elements present	
				Total Points Earned (Out of 48)			

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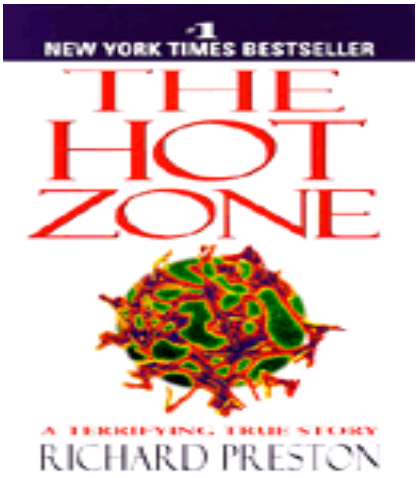
Honors Biology Second Semester Project



http://www.richardpreston.net/guide/hz/index.html

The Hot Zone is not only a great read that captures your attention from the start, but it also covers three major themes we have and will continue to study during the school year: **Process of Science, Science and Society, and Cell Biology.**

Assignment Description: Read *The Hot Zone*, by Richard Preston. Use the guided reading questions to help focus attention and reinforce comprehension throughout the reading. The reading must be complete and discussion questions must be answered as outlined in the timeframe below. An assessment will be given to test your understanding of the major scientific themes, Process of Science, Science and Society, and Cell Biology, covered in the book.

Assignment Title	Date Assigned	Date Due	Point Value
Part I Discussion Questions	3/2 (A Day) 3/3 (B Day)	4/1 (A Day) 4/2 (B Day)	100 points
Part II Discussion Questions	4/1 (A Day) 4/2 (B Day)	4/28 (A Day) 4/29 (B Day)	100 points
Part III Discussion Question	4/28 (A Day) 4/29 (B Day)	5/19 (A Day) 5/20 (B Day)	75 points
Part IV Discussion Question	5/19 (A Day) 5/20 (B Day	6/2 (A Day) 6/3 (B Day)	35 points
Hot Zone Assessment	N/A	6/4 (A Day) 6/5 (B Day)	100 points

*** Please keep in mind**: Memorization of details is not important and will not help you on the quiz. Focus on developing an understanding of the three major themes, as they relate to the book. The discussion questions will help you achieve this task.

Good luck and enjoy this thrilling, shocking, and sometimes frightening adventure!

Name _____ Date _____Period _____

HOT ZONE INNTRODUCTION: Spread of Infectious Disease

Objective:

Students will simulate the spread of a disease that requires the exchange of bodily fluids in order to understand the outbreak of disease described in the book *Hot Zone*.

Procedure:

1. Obtain a vial containing a clear liquid and a dropper. Each vial represents their body and one student is "infected" with a contagious disease. It is unknown to the class who that person is.
2. Interact with a partner and simulate the exchange of body fluids. Move around the classroom and find a partner to interact with. Both partners will fill up their droppers with liquid from their vial and place 5 drops into the vial of their partner. **It is important to remember that you must NOT dip your droppers into your partner's vial, but rather let the liquid drop in to avoid contamination.**
3. Empty any remaining liquid back into your own vial and use the dropper to gently mix it.
4. Repeat the process with another partner and then return to their seat.
5. Guess how many students got infected through the past two interactions.
6. Test your vial now for the presence of the disease by placing 1-2 drops of the indicator (phenolphthalein) into your vial. If you are infected your liquid will turn bright pink.
7. Infected students should raise their hand when the teacher asks. Count and record the number of infections.
8. Do another round of interactions, again beginning with only one student being infected. Use a new set of vials for this. In this round, you will interact with three different students.
9. Again estimate the number of infections, test your vial and then count the actual number of infections again.
10. Graph the number of infections with increasing number of interactions and estimate the number of infections after four and five interactions.

Analyze and Conclude

1. Record the names or the vial number of the students that you interacted. Create a tree of infections. Use the tree to figure out who infected you and whom you subsequently infected.
2. Use your graph to infer how an individual's behavior can affect the likelihood of infection.

Unit Reviews

SHOW ME THE KNOWLEDGE!

The unit tests are an excellent way for you to showcase your knowledge. Use the Unit Reviews to prepare for upcoming Unit tests as well as the Maryland High School Assessment

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Name _____Date _____ Period _____

Unit 1 Review: What is Life?

Laboratory Tools and Procedures

Directions: Answer True or False for each of the questions below.

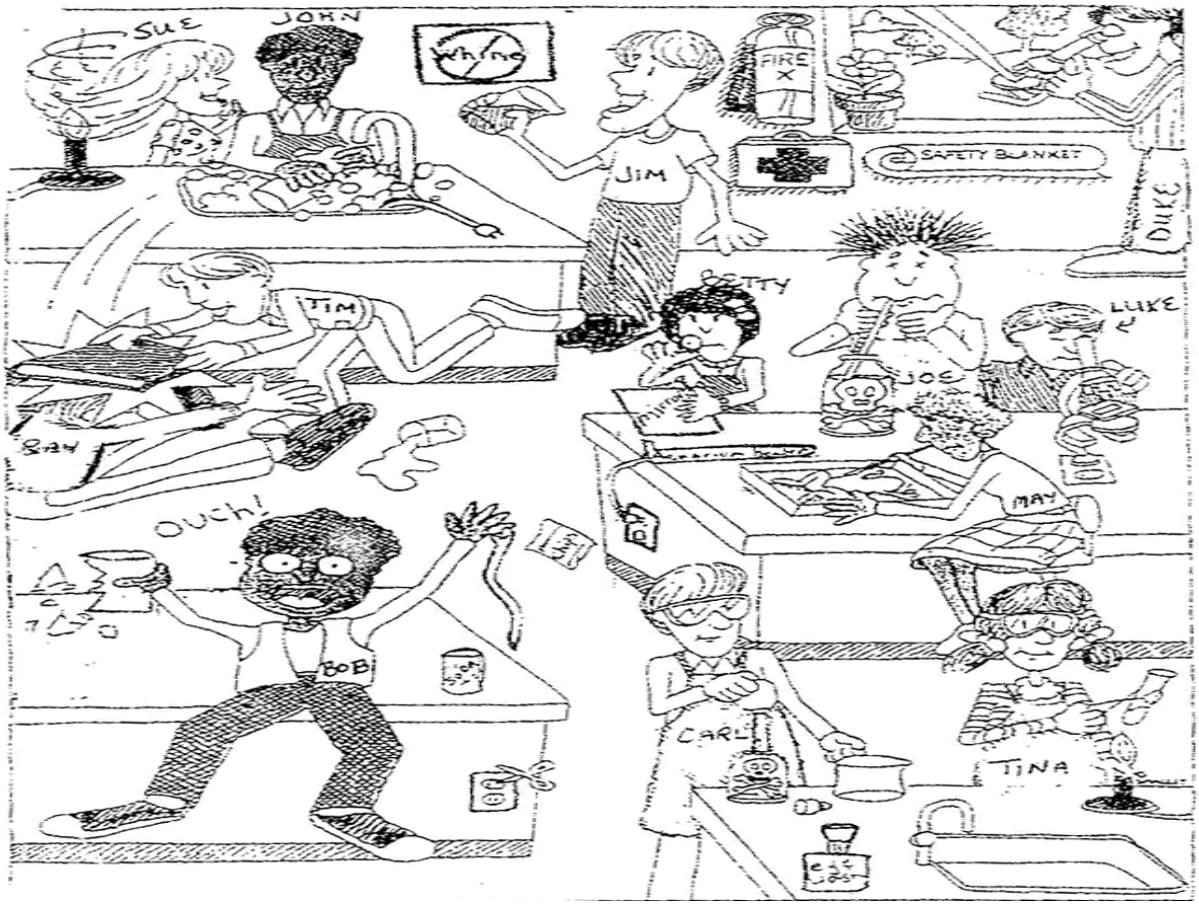
_____ 1. Students should only wear goggles in the lab when they are working with chemicals.

_____ 2. Test Tubes are used to measure volume.

_____ 3. Before beginning a lab students should identify the location of all safety equipment.

_____ 4. You should use a dissecting microscope to look at the structures inside of a cell.

Directions: View the picture below and answer the questions:



5. Identify three pieces of safety equipment that can be found in the picture.

a.

b.

c.

6. Identify four things Tina is doing properly while conducting her laboratory experiment.

a.

b.

c.

d.

7. Identify the piece of laboratory equipment that Luke is using. _____

8. Identify the laboratory equipment that May is using to dissect her frog._____

9. Identify the corresponding SI Unit for the following measurement by completing the table below:

Measurement	SI Unit (Metric)
Mass	
Volume	
Temperature	
Length	

10. Convert the following number into scientific notation 123,000,000,000._____

11. Convert the following number from scientific notation 6×10^{-3}. _____

12. Which is ***bigger*** a millimeter **OR** a micrometer? _____

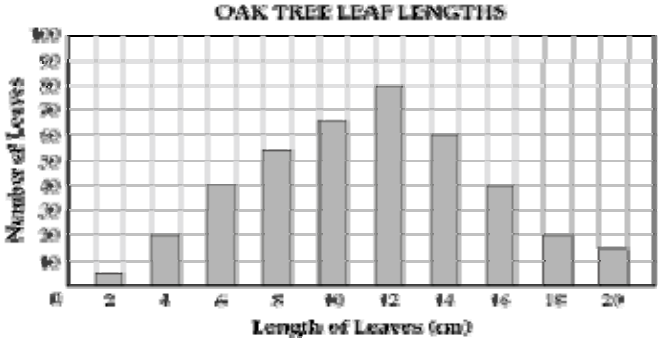
Scientific Method

Directions: Circle the **BEST** answer for the questions below:

13. A student wants to perform an investigation to determine the heart rate of a rabbit. The teacher tells her the heart rate should be about 100 beats per minute. How could this information affect the investigation?

    A. It could introduce bias.
    B. It could remove experimental error.
    C. It could increase the accuracy of the data.
    D. It could reduce the number or measurements needed.

14. Students collected 400 oak leaves for a research project. The graph below shows the length of the leaves collected.



According to the graph, what proportion of the leaves have a length of 12 centimeters?

    A. 1/10
    B. 3/10
    C. 1/5
    D. 2/5

15. Recently a new laundry detergent was presented to the market. Its manufacturer boasts "it cleans better than any other laundry detergent around!" Using the space below, design an experiment to test the cleaning effectiveness of the new detergent. Be certain to include the following terms: **Problem (Purpose), Hypothesis, Materials, Control, Independent Variable, Dependent Variable, Data/Analysis, Conclusion, Experimental Design, and Procedure.**

Use the space below to complete the BCR

Characteristics of Life

Directions: Complete the chart below.

16. List the eight characteristics of living things and give one example for each characteristic.

Characteristic	Example
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	

Directions: Circle the ***BEST*** answer for the questions below.

17. The ability of the human body to regulate the level of blood glucose is an example of

    A. osmosis.
    B. homeostasis.
    C. binary fission.
    D. aerobic respiration.

18. Mammals, birds, modern reptiles, and theropod dinosaurs are vertebrates. The table below shows some of the differences and similarities among these groups of vertebrates.

CHARACTERISTICS OF VERTEBRATE GROUPS

	Mammals	Birds	Modern Reptiles	Theropod Dinosaurs
Number of ear bones	3	1	1	1
Legs directly under body	yes	yes	no	yes
Produce milk	yes	no	no	no
Constant body temperature	yes	yes	no	yes
Live birth	yes	no	some	no
Skin covering	hair	feathers/scales	scales	feathers/scales

Birds, mammals, and theropod dinosaurs can maintain a constant body temperature. The ability to maintain a constant body temperature is an example of

    A. respiration.
    B. homeostasis.
    C. a reptilian trait.
    D. an acquired trait.

List the eight levels of organization in order from **LARGEST** to **SMALLEST**.

a. _____ b. _____ c ._____ d. _____

d. _____ e. _____ f. _____ g. _____

17. Match the branch of biology with its correct field.

_____	1.	Zoology	A.	the study of plants
_____	2.	Microbiology	B.	ancient life
_____	3.	Botany	C.	the study of animals
_____	4.	Paleontology	D.	the study of life and living organisms
_____	5.	Biology	E.	the study of microscope living organisms

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Name _____Date _____ Period _____

Unit 2 Review: The Circle of Life

Interrelationships and Interdependencies Among Organisms and their Affect on the Ecosystem

Directions: Please choose the **BEST** answer for the questions below:

Algae → Minnow → Trout → Human

_____ 1. In this food chain, what is the trophic level for the minnow?
- A. Carnivore
- B. Herbivore
- C. Decomposer
- D. Omnivore

_____ 2. Identify the producer in the food chain.
- A. Trout
- B. Minnow
- C. Human
- D. Algae

_____ 3. Identify what would happen if the trout were removed from the food chain.
- A. The human population would decrease.
- B. The algae population would decrease because the minnow population would increase.
- C. The minnow population would increase.
- D. All of the above.

_____ 4. What is the primary energy source for the food chain?
- A. The sun
- B. The fossil fuel
- C. Carbohydrates
- D. Photosynthesis

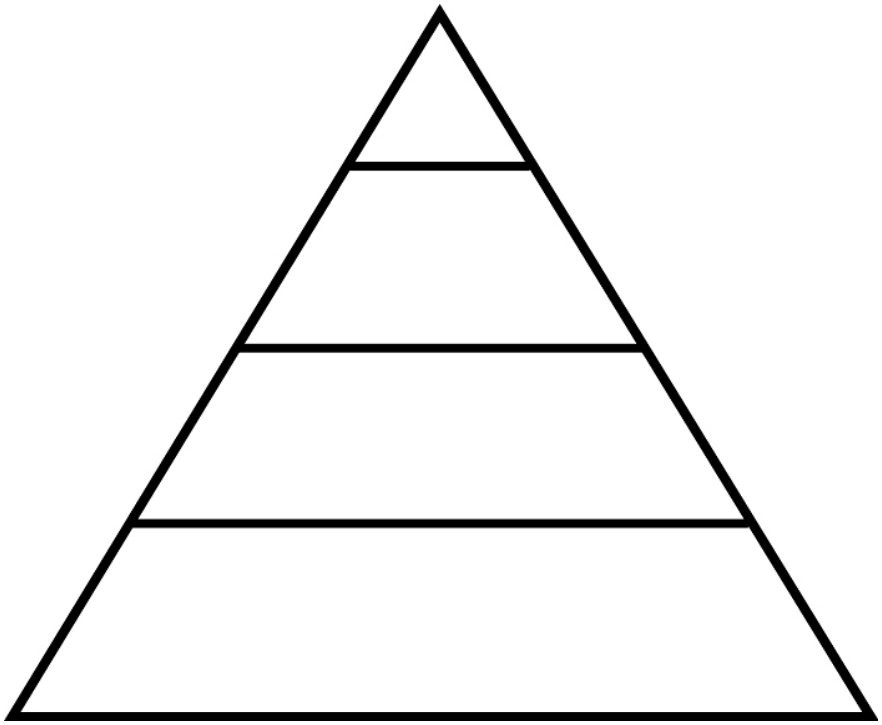
5. Construct a food web below using the organisms:
wolf, snake, hawk, Blue Jay (small bird), tree (Leaves), caterpillar, and mouse

6.

Part I: Place the terms in their appropriate places on the Energy Pyramid below:

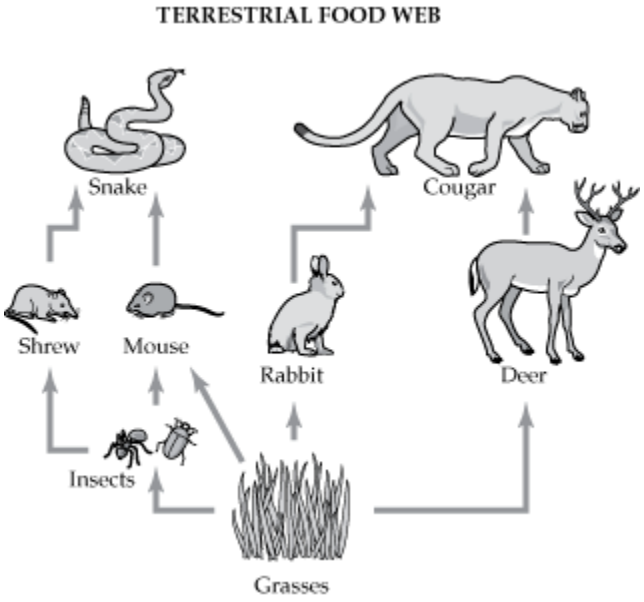
Primary Consumer, Herbivore, Producer, Secondary Consumer, Carnivore, Omnivore, and Tertiary Consumer

Part II: Use arrows to show the direction energy flows in an ecosystem.



7. Describe the role of decomposers and scavengers in the cycling of nutrients throughout an ecosystem.

Use the relationships in the food web below to answer the following question.



8. According to the food web, which of these supply energy for all the other organisms?

A. Snakes
B. Insects
C. Grasses
D. Cougars

9. According to the food web above which **BEST** describes the role of mouse?

A. Herbivore
B. Carnivore
C. Omnivore
D. Scavenger

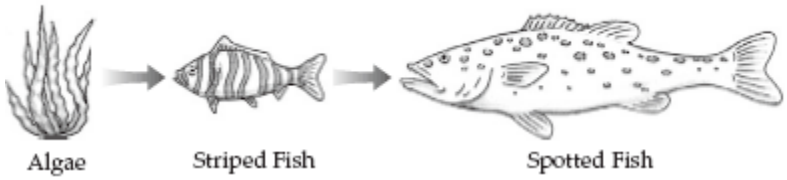
Elements of an Ecosystem and Factors that Influence It

10. Complete the chart below

	Definition	**Example (s)**
Abiotic		
Biotic		

11. A summer camp was built near a lake in the mountains. The campers used the lake for swimming, fishing, and boating. The relationships between three organisms found in the lake are shown below.

LAKE FOOD CHAIN



Striped fish are affected by biotic and abiotic factors in their environment. Which of these factors is biotic? (Circle the Answer)

A. Water Temperature
B. Mineral Nutrients
C. Freshwater Algae
D. Inorganic Sediments

12. Label the interactions below with the appropriate relationship type:

Mutualism, Parasitism, Predator-Prey, Commensalism, and Competition

_____ a. A red fox eats a flying squirrel in the forest.

_____ b. Water runs off of an agricultural farmland dumping nitrogen into a nearby river causing algae to overgrow and block the sunlight from underwater plants.

_____ c. Bacteria live inside of the intestines of cows eating undigested food particles and assist the cows with being able to breakdown grass (cellulose).

_____ d. Pinworms live inside of a dog eating all of the nutrients ingested by the dog.

_____ e. A woodpecker raises its young in the abandoned nest of a blue jay.

13. A team of scientists are studying biotic and abiotic factors that affect the stability of a deep sea ecosystem. The scientist discovered a species of fish that eat other fish and decaying matter. Which of these does not describe the newly discovered fish? (Circle the **BEST** answer)

A. Consumer
B. Scavenger
C. Predator
D. Producer

Natural and Human-Made Changes in the Environment & their Affect on the Ecosystem

14. Scientist estimate that 200 non-native species have been introduced into the Chesapeake Bay. Which of these statements is not true about non-native species?

A. They often form mutualistic relationships with non native plants.
B. They often deplete the food sources of native plants.
C. They are often aggressive at acquiring and maintaining territory.
D. They can prey on native organisms causing them to go extinct.

15. A scientist wanted to find out if low numbers of fish found in a nearby lake were related to acid rain. During his three-year study, he analyzed rainwater and lake water samples. By gathering samples of fish, he estimated the number of fish in the lake. Each year he found that both the rainwater and lake water became more acidic, and the number of fish decreased.
His data suggested that acid rain may be responsible for the decrease in the number of fish found in the lake.
What most likely led to the rainwater's increasing acidity?

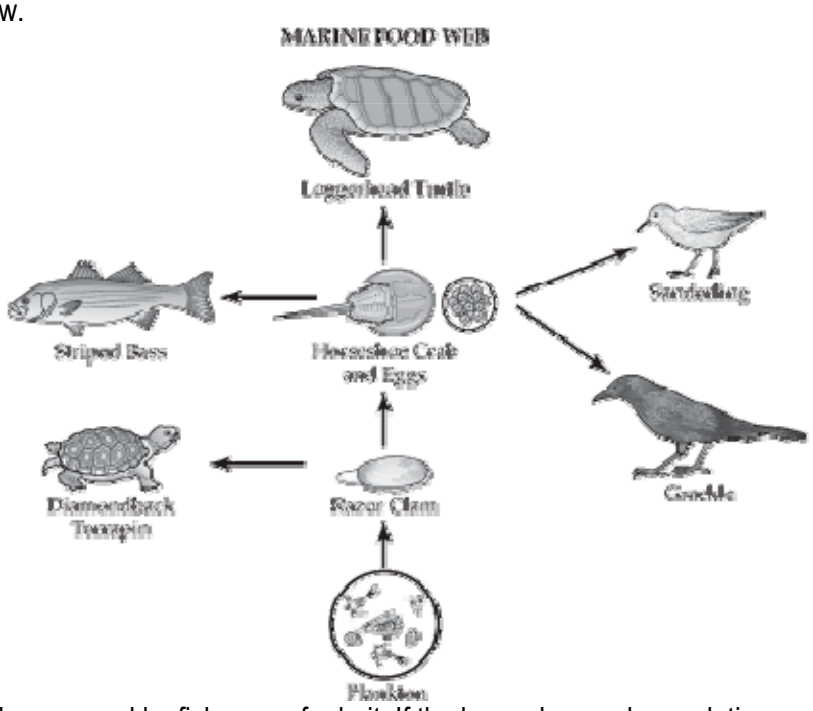
A. Ultraviolet Radiation
B. Burning Fossil Fuels
C. Sedimentation
D. Global Warming

16. The populations of wolves and other large predators have decreased throughout the United States. This disruption of the natural food web will most likely lead to

A. a decrease in prey animals.
B. an increase in producers.
C. an overpopulation of prey animals.
D. an overpopulation of scavengers.

Two Major Global Food Webs and the Impact of Human Activity

A marine environment provides a habitat for a variety of plants and animals. A small part of a marine food web is shown below.



17. Horseshoe crabs are used by fisherman for bait. If the horseshoe crab population was reduced by over fishing, which of these groups of organisms would most likely decrease in number?

    A. Plankton, razor clams and loggerhead turtles
    B. Sanderlings, loggerhead turtles and striped bass
    C. Grackles, plankton, diamondback turtles
    D. Striped bass, razor clams, sanderlings

18. Rain forests are often cleared to provide land for farming. Which of these outcomes is the most immediate effect of this practice on the global environment?

    A. An increase in acid rain
    B. Depletion of the ozone layer
    C. Decreased production of food
    D. An increase in atmospheric carbon dioxide levels

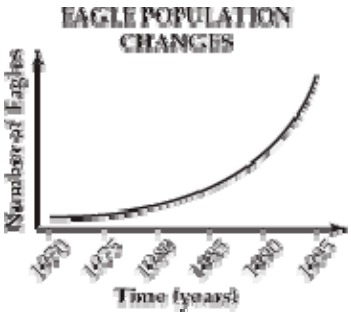
19. An ecosystem contains organisms interacting with each other and their physical environment. Which of these is the best indicator of a healthy ecosystem?

    A. There are few decomposers.
    B. There are many different species.
    C. There are few herbivores.
    D. There is a large population of only one species.

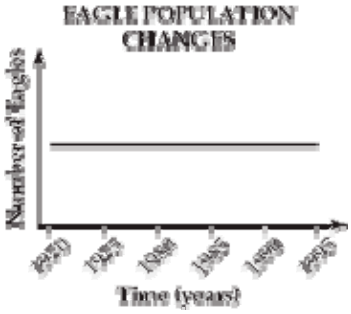
20. The pesticide DDT was used to kill mosquitoes for many years. DDT entered bodies of water, moved up the food chain, and built up in the tissues of fish. When female bald eagles ate these fish, they produced eggs with very thin shells. The eggs broke when the eagles sat on their nests. The U.S. government banned the use of DDT in 1972. Which of these graphs most likely shows how the ban of DDT affected the bald eagle population?

A.

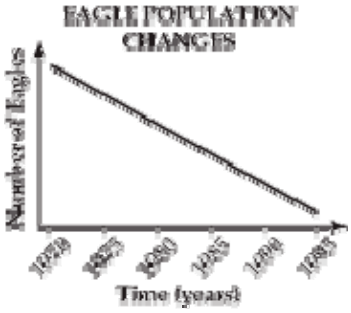
B.



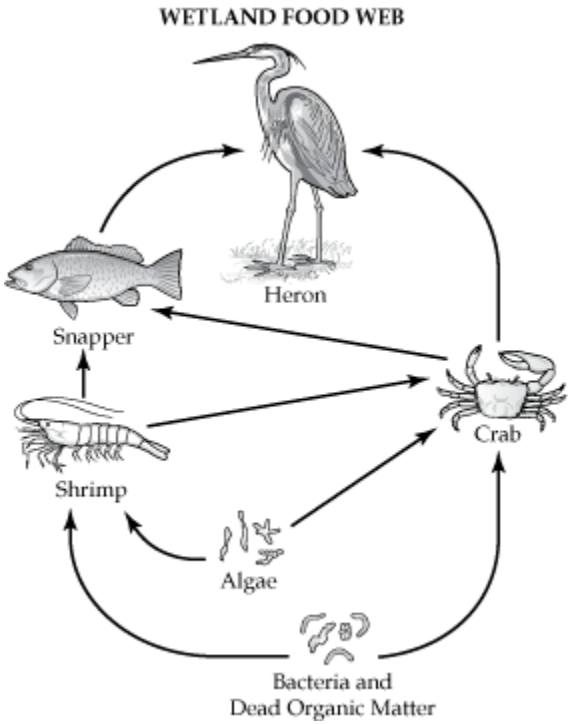
C.



D.



21. Some of the relationships among organisms living in a wetland are shown in the figure below.



Describe the flow of energy in the wetland food web. In your response, be sure to

- name the biotic and abiotic factors affecting the heron
- identify the trophic levels of the different organisms in the wetland food web
- describe how the energy is transferred between the organisms in the wetland food web
- explain how the other organisms in the wetland ecosystem would be affected by the sudden disappearance of the heron population

Name _____Date _____ Period _____

Unit 3 Review: Foundations of Life (Biochemistry)

What Matters Most?

1. Define atom.

2. Draw and label the structure of an atom in the space below.

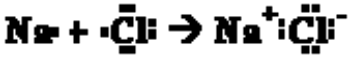
3. Complete the chart below

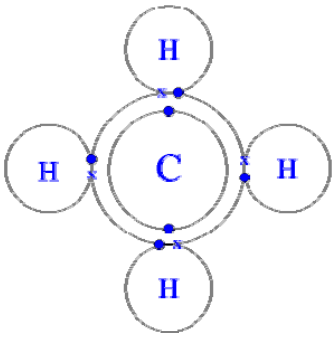
Part of Atom	Charge/ Symbol	Location in Atom
Proton		
Neutron		
Electron		

4. Complete the chart below

	Definition	Example
Element		
Molecule		
Compound		
Ion		

5. Identify the type of bonding being shown below as either Ionic or Covalent.





_____ _____

Water Works

6. Complete the chart below

	Definition	Example (s)
Inorganic Compound		
Organic Compound		

7. Write the chemical formula for water in the space below. Give the charges for hydrogen and oxygen.

8. Complete the chart below

	Definition
Solute	
Solvent	

9. Identify how water's "polarity" gives it the ability to be considered the "universal solvent".

10. Compare/Contrast the terms adhesion and cohesion.

11. Define capillary action and identify how it is used to assist plants with distributing water from the roots to the leaves.

12. When the cells of most organisms freeze, they burst. Which property of water causes this to occur? (Circle the correct answer)

A. Water is a universal solvent.
B. Water changes temperature rapidly.
C. Water is less dense as a solid than as a liquid.
D. Water is a nonpolar molecule.

13. A bacteria E. Coli grows best in mildly basic soil. Choose the soil sample that would be best for E. Coli

A. 7
B. 9
C. 13
D. 2

14. Water has a pH of 7 and is considered neutral. Red blood cells have a pH of 6.8. Explain why red blood cells have a pH which is very similar to water.

15. Identify the strongest acid among the pH readings below

A. 13
B. 8
C. 5
D. 1

Macromolecules Utilized by Organisms

16. Identify the four classes of macromolecules used by living organisms.

a.

b.

c.

d.

17. Complete the chart below

Macromolecule	Elements	Building Blocks	Job in Living Organisms	Example
1. Carbohydrate				**1. Sugar** **2. Starch**
2.		**1. Glycerol** **2. Fatty Acid**		**1.** **2.** **3. Waxes**
3.	**C, H, O, N**		**1. Builds living tissue ex. Bone, blood, skin, hair, muscle** **2.**	
4. Nucleic Acid				

18. What molecules control the reaction rate of photosynthesis?

A. Sugars
B. Enzymes
C. Fatty Acids
D. Nucleic Acids

19. A dog gets many nutrients from its food including amino acids. Which of these can be built directly using the amino acids?

A. Proteins
B. Carbohydrates
C. Lipids
D. Minerals

20. The cell wall of a plant helps the plant cell maintain its shape. What is the main structural component of the cell wall of a plant?

A. Lipid
B. Cellulose
C. Amino Acids
D. Nucleic Acids

21. What are the building blocks of Nucleic Acids?

A. Monosaccharides
B. Glycerol and Fatty Acids
C. Amino Acids
D. Nucleotides

One A Day Keeps the Doctor Away

22. Identify the vitamin that allows the blood to clot

A. Vitamin E
B. Vitamin K
C. Vitamin D
D. Vitamin A

23. Which mineral is needed for strong bones and teeth?

A. Calcium
B. Iron
C. Sulfur
D. Iodine

24. Which vitamin can be found in citrus fruits?

A. Vitamin A
B. Vitamin B
C. Vitamin C
D. Vitamin D

25. Lipids are considered the most varied of the molecules which are present in all organisms.

- What makes lipids unique from the other macromolecules?
- Explain how their interactions with water give them unique uses in plants and animals.
- Explain the two types of fatty acids and how they are differentiated.

.

Name _____Date _____ Period _____

Unit 4 Review: The Basic Unit of Life

The Cell as the Basic Unit of Structure and Function

1. Describe the three parts of the cell theory.
   a)

   b)

   c)

2. Which tool would you use to view the cell and its components?
   A. Dissecting Microscope
   B. Petri Dish
   C. Scalpel
   D. Compound Microscope

3. Complete the chart below

Type of Cell	Contains a Nucleus? Yes or No	Contains Organelles? Yes or No	Contains DNA? Yes or No If so, where is it found?	Contains a Cell Membrane and Cytoplasm? Yes or No	Examples
Prokaryote					
Eukaryote					

4. Which cellular structure is present in both eukaryotic and prokaryotic cells?
   A. Nuclear Membrane
   B. Mitochondrion
   C. Cell Membrane
   D. Chloroplast

Processes and Structures that Organisms Use to Sustain Life

5. Kiesha observes a cell under the microscope. She identifies it as a green plant cell and not a human cheek cell because of the presence of a

A. Nucleus
B. Cell Membrane
C. Mitochondrion
D. Cell Wall

6. Researchers have discovered a toxin that stops cell from synthesizing proteins. Cells exposed to this toxin cannot carry out many of their normal processes. Which of these cell organelles are most directly affected by this toxin?

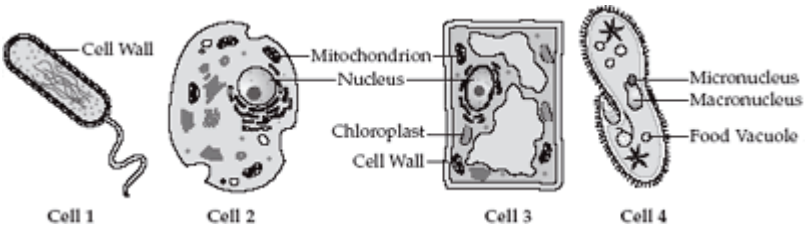
A. Ribosomes
B. Chloroplast
C. Mitochondria
D. Vacuole

7. Which parts of the single-celled algae are responsible for capturing energy?

A. Nuclei
B. Chloroplasts
C. Mitochondria
D. Cytoplasm

Use cell pictures below to answer questions 8 and 9.

8. A student observed different types of cells under a microscope. Four of the cells he observed are shown below.



Cell 4 has many hair-like structures that it uses for movement. What are these structures called?

A. Cilia
B. Flagella
C. Vacuole
D. Psueodpodia

9. Which cell above would represent a prokaryotic cell?

A. Cell 1
B. Cell 2
C. Cell 3
D. Cell 4

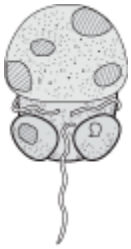
10. Which cell structure contains molecules that direct cell activities?

A. Ribosome
B. Nucleus
C. Chloroplast
D. Mitochondrion

11. Which cell structure controls which substances exit and enter the cell?

A. Cell Wall
B. Nucleus
C. Cell Membrane
D. Vacuole

A drawing of a mobile form of the single-celled green algae is shown below.



12. Which of these structures help this algae move?

A.. Flagella
B. Cilia
C. Psuedopodia
D. Vacuoles

13. Most organisms need oxygen for their cells to function normally. In mammals, two organ systems work together to move oxygen throughout the body. Which of these organelles use oxygen to release energy?

A. Nuclei
B. Chloroplasts
C. Mitochondria
D. Ribosomes

Processes and Structures Organisms Use to Regulate the Movement of Materials In/Out of the Cell

14. Compare/Contrast Osmosis and Diffusion.

15. Complete the chart below

	Definition	Direction Water Movement	Effect On the Cell
Hypertonic			
Hypotonic			
Isotonic			

16. Which of the following is **NOT** an example of active transport?

1. Facilitated Diffusion
2. Osmosis
3. Diffusion

A. 1 only
B. 2 only
C. 2 and 3 only
D. 1, 2 and 3

17. Which statement best describes the expected results when a typical cell is placed in fresh water?

A. Active transport of water into the cell would begin
B. There would be a net movement of water out of the cell
C. There would be a net movement of water into the cell
D. No change in the cell's water content would occur

18. What would happen to an animal cell with an internal salt concentration of 0.8% if it were placed in a salt solution with a concentration of 20%?

A. The cell would swell and burst because the 20% salt solution is hypotonic with respect to the cell, causing a net movement of water into the cell.
B. The cell would swell and burst because the 20% salt solution is hypertonic with respect to the cell, causing a net movement of water out of the cell.
C. The cell would lose water and shrivel because the 20% salt solution is hypertonic with respect to the cell, causing a net movement of water out of the cell.
D. The cell would lose water and shrivel because the 20% salt solution is hypotonic with respect to the cell, causing a net movement of water into the cell.

19. A student designed an experiment to see if plants grow better when watered with a sugar solution. He divided the plants into six groups, measured the initial height of each plant, and calculated the average height for each group. Once a week for two months, he watered the plants in each group using a different sugar solution for each plant group. At the end of two months, he measured the final height of each plant and calculated the average height for each group. The student's data are shown in the table below.

EFFECT OF SUGAR SOLUTION ON THE HEIGHT OF PLANTS

Plant Group	Percent Sugar Solution	Average Initial Height (centimeters)	Average Final Height (centimeters)
A	0	2	30
B	10	2	28
C	20	3	15
D	30	2	10
E	40	3	(died)
F	50	3	(died)

Which of these statements explains why the plants in Groups E and F died?

A. The higher sugar content caused too much water to move out of the root cells.
B. The higher sugar content caused too much water to move into the root cells.
C. The higher sugar content prevented the plant from capturing energy.
D. The higher sugar content clogged the pores in the cell membrane.

20. A student is setting up an experiment using a type of bag that is permeable to water, but not to sugar. She will fill and weigh three bags and place each bag into a different beaker. The diagram below shows the contents of the bags and the beakers at the start of the experiment.

INITIAL CONTENTS OF BEAKERS AND TUBES

Predict whether after 15 minutes each bag will weigh less, the same, or more than it did at the beginning of the experiment. Provide reasons for each of your predictions.

Use the space below to complete the BCR

Name _____Date _____ Period _____

Unit 5 Review: Powering Up for Life

The Capture of Light Energy within Chloroplast during Photosynthesis

1. Complete the chart below

	Where Does It Occur In the Cell?	Occurs In Animal Cell, Plant Cell or Both	Reactants	Products	Equation	How Many ATP Are Made?
Photosynthesis						
Respiration						

2. Write the equation for photosynthesis using words only ,no symbols.

3. Write the equation for respiration using words only, no symbols.

Reading selection should be used for questions 4 and 5

Scientists have recently discovered a new species that lives attached to the side of a tree. An organism from this new species

- Is multicellular
- Has cell walls
- Has vascular tissues
- Makes its own food
- Has structures that absorb moisture from the air

4. The scientists put the organism in a sealed glass container and placed it in the sunlight for several hours. Which of these increased inside the container?

A. Water
B. Nitrogen Gas
C. Oxygen Gas
D. Carbon Dioxide Gas

5. Which of these is not true about cell in the new organism?

A. They contain nuclei.
B. They use vacuoles for storage.
C. They contain mitochondria.
D. They use pseudopodia to move.

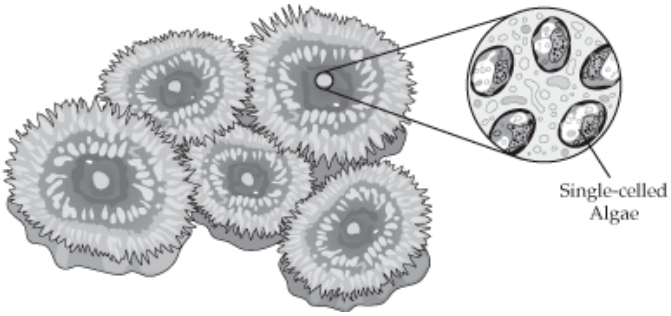
6. What raw materials are needed for cellular respiration?

A. Glucose and Carbon Dioxide
B. Glucose and Oxygen
C. Carbon Dioxide and Oxygen
D. Carbon Dioxide and Water

7. In a typical plant, all of the following factors are required for photosynthesis EXCEPT

A. Chlorophyll
B. Light
C. Oxygen
D. Carbon Dioxide

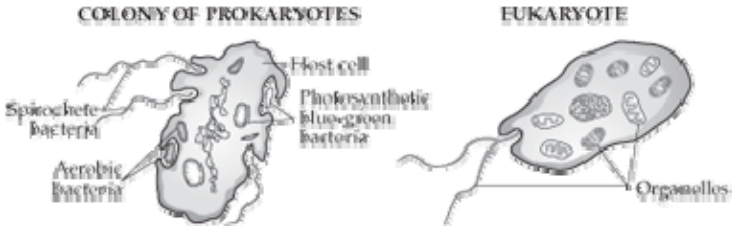
8. During a trip to the beach, Allen finds a colony of sea anemones on a rock. These sea anemones are green and get their color from tiny single-celled algae that live in their tissues. The algae produce food for the anemones while the anemones provide a place for the algae to live.



Which parts of the single-celled algae are responsible for capturing energy?

A. Nuclei
B. Chloroplasts
C. Mitochondria
D. Cytoplasm

9. The diagram below shows a colony of prokaryotes and a single-celled eukaryote. The eukaryote contains organelles that resemble the three types of bacteria found in the colony of prokaryotes. More than a billion years ago, bacteria like these may have joined other prokaryotes to form colonies of cells. Researchers think that these once free-living prokaryotes became the organelles of modern-day eukaryotes.



In the eukaryote, which of these organelles are used to make sugars?

A. Flagella
B. Ribosomes
C. Mitochondria
D. Chloroplasts

Alternative Metabolic Pathways

10. Some types of bacteria live deep in the ocean where sunlight cannot reach. These bacteria use the energy stored in inorganic molecules to make sugars. Which of these processes do the bacteria use to produce sugars?

A. Photosynthesis
B. Chemosynthesis
C. Aerobic Respiration
D. Nitrogen Fixation

11. Complete the chart below

Type of Respiration	Oxygen Present? Yes or No	Where Does It Take Place In The Cell?	Equation	How Many ATP Are Made?
Anaerobic			**1. Alcoholic-** **2. Lactic Acid-**	
Aerobic				

Enzyme Structure and Function and its Importance to Cells

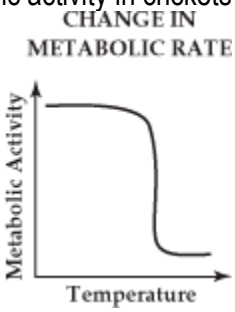
12. Define Enzyme.

13. What macromolecule group do enzymes belong to?

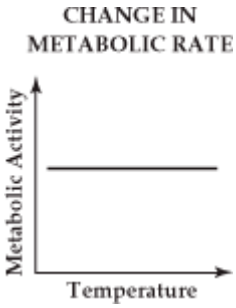
14. Explain how enzymes and substrate work together like a "lock and key?"

15. In crickets, the rate of chirping is related to the temperature of the air. The rate of chirping can be used to describe their metabolic activity. Which of these graphs <u>most likely</u> shows how temperature affects metabolic activity in crickets?

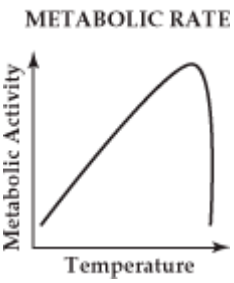
A.



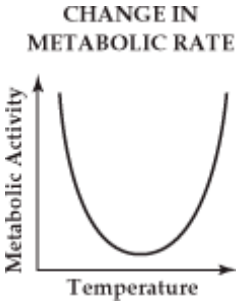
B.



C.



D.

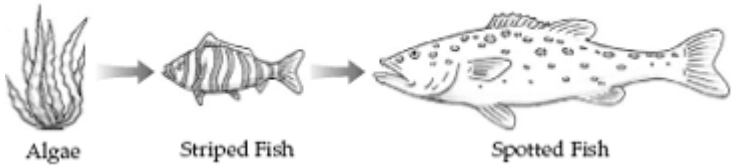


16. In the fall, the leaves of many plants change color. Which of the following abiotic factors is <u>primarily</u> responsible for causing this change?

A. Increased pH
B. Increased water
C. Decreased acidity
D. Decreased light

17. A summer camp was built near a lake in the mountains. The campers used the lake for swimming, fishing, and boating. The relationships between three organisms found in the lake are shown below.

LAKE FOOD CHAIN



Which of these fish cell structures would be <u>most directly</u> affected by a change in the oxygen level of the lake?

A. Mitochondrion
B. Chloroplast
C. Golgi Apparatus
D. Endoplasmic Reticulum

18. The breathing rate of a goldfish can be measured by the number of times the goldfish opens its mouth. In an experiment, students placed a goldfish in a container of water at 26°C and counted the number of times the fish opened its mouth. They gradually lowered the water temperature and counted the number of times the fish opened its mouth at 20°C, 14°C, 8°C, and 2°C. The results are shown in the table below.

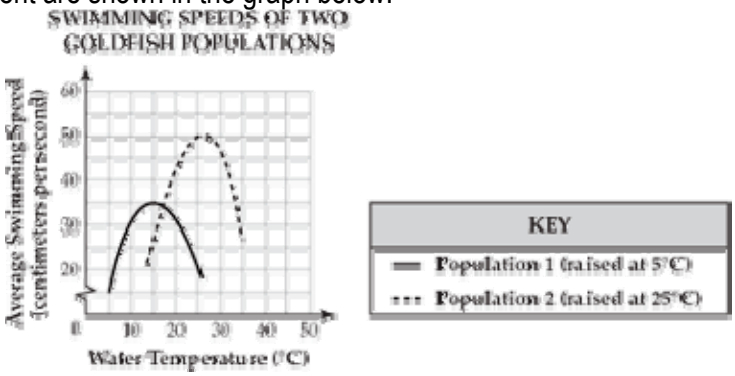
BREATHING RATES OF GOLDFISH

	Water Temperature				
Trial	26°C	20°C	14°C	8°C	2°C
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Which of these descriptions <u>best</u> explains the decrease in the breathing rate of the goldfish?

A. The demand for oxygen increased.
B. The metabolic activity decreased.
C. The demand for carbon dioxide decreased.
D. The fish's activity level increased.

19. Scientists wanted to study the effect of water temperature on the swimming speed of goldfish. They set up an experiment in which they raised populations of goldfish in two different aquariums. Population 1 was raised at 5°C. Population 2 was raised at 25°C. All other variables were constant in both aquariums. The results of this experiment are shown in the graph below.



If the temperature of the water increases from 5°C to 10°C, the goldfish in Population 1 would <u>most likely</u>

A. Produce less carbon dioxide
B. Eat less food
C. Use more oxygen
D. Excrete more salt

20. A student is studying the relationship between a leafy plant and a species of beetle. He divided 20 plants into two groups. He planted each group in a separate planter box. He then released 50 beetles into one of the planter boxes. The beetles fed on the leaves and left a white substance around the plant, changing the pH of the soil. He recorded the average height of the plants at the end of three months. His data are shown below.

PLANT DATA

Group	Average Height (cm)
1 (Grown with beetles)	12
2 (No beetles)	36

- How did the substance probably affect the growth of the plants in Group 1?
- Describe how changes in pH may affect the metabolic rates of cells.
- Describe how other environmental factors could affect growth in plants.

Use the space below to complete the BCR

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Name _____Date _____ Period _____

Unit 6 Review: Life is a Cycle

DNA Structure

1. What is the full name of DNA?_____

2. What class of macromolecules does DNA belong to? _____

3. Describe the structure of DNA? _____

4. What is the name of the sugar found in DNA? _____

5. Name the four nitrogen bases found in DNA:
   a)

   b)

   c)

   d)

6. What type of bond holds the DNA nitrogen bases together? _____

7. In DNA,
   Adenine (A) always bonds with _____ (T)

   Cytosine (c) always bonds with _____(G)

8. Name the three parts of a DNA nucleotide
   a)

   b)

   c)

9. The building blocks of DNA are _____.

10. Find compliment strand of DNA for the DNA strand below:

Original Strand: A-C-T-A-G-T-A-C-G-G-A-T-T-A

Compliment Strand: T-

Mitosis – Part 1

11. Define mitosis.

12. Where does mitosis take place in the cell? _____

13. List the steps of the cell cycle in order.

a) _____ b) _____ c) _____

d) _____ e) _____

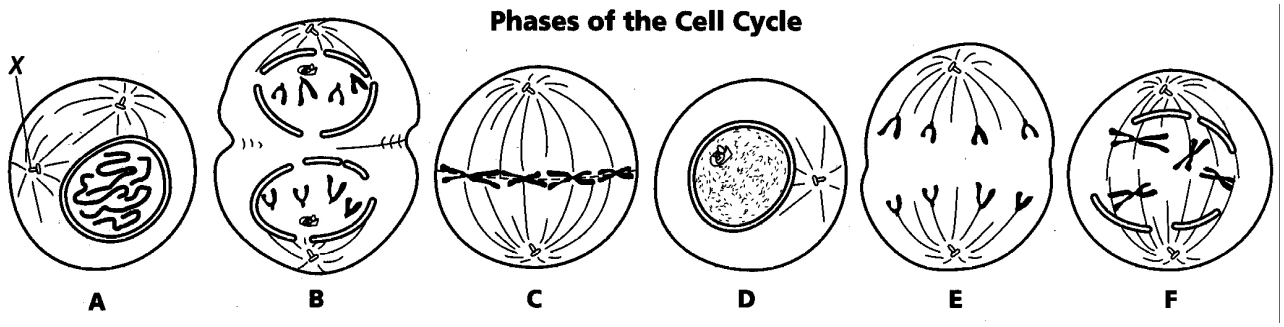
14. Describe what happens during Interphase:

G_1

S

G_2

15. Identify each stage of the cell cycle.



A. _____ B. _____ C. _____ D. _____

E. _____ F. _____

Mitosis Part II
Directions: Match the description with the appropriate stage of the cell cycle

A. Interphase **B. Prophase** **C. Metaphase** **D. Anaphase** **E. Telophase**

_____ 1. The sister chromatids begin to move apart.

_____ 2. The nucleolus begins to dissappear.

_____ 3. A nuclear membrane begins to reappear.

_____ 4. The cytoplasm begins to divide.

_____ 5. The chromosomes disappear.

_____ 6. The nuclear membrane begins to disappear.

_____ 7. The cell begins to pinch off and the cleavage furrow forms.

_____ 8. The chromosomes begin to migrate toward the poles of the cell.

_____ 9. Chromatids line up along the equator.

_____ 10. The spindle fibers begin to form.

_____ 11. Chromosomes disappear.

_____ 12. Cytokinesis is complete.

_____ 13. The cell plate forms.

_____ 14. Chromosomes are replicated.

_____ 15. DNA is replicated.

_____ 16. The longest phase of the cell cycle.

17. Which of these represents the number of chromosomes in cells before and after the process of mitosis?

A. n → n
B. n → 2n
C. 2n → n
D. 2n → 2n

Mutations and Cancer

18. Define cancer.

19. Which of these describes a mutation that can be inherited?

A. Random breakage of a liver cell's DNA
B. Abnormal lung cells produced by toxins in smoke
C. A nitrogen base substitution in a sex cell
D. Ultraviolet radiation damage to skin cells

20. An Olympic gold medalist in cross country skiing has a gene which causes him to produce 50% more hemoglobin than the average person. Which most likely caused this trait?

A. A special diet designed for the skier
B. The climate where the skier lives
C. The training routine performed by the skier
D. A gene mutation carried by the skier

21. Which of these results when one nitrogen base replaces another in a segment of genetic material?

A. An enzyme substrate
B. A mutation
C. A feedback loop
D. An adaptation

Asexual Reproduction

22. Complete the chart below

Form of Asexual Reproduction	Definition	Example
Binary Fission		
Vegetative Reproduction		
Budding		
Cloning		
Mitosis		

Frog

24.

Streptococcus is a type of bacteria that causes strep throat in humans. A frog is a multicellular organism that lives in aquatic environments. Identify how *Streptococcus* replicates itself.

A. Budding
B. Meiosis
C. Binary Fission
D. Fertilization

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Name _____Date _____ Period _____

Unit 7 Review: All in the Family

Meiosis- Part A

1. Define Meiosis

2. Meiosis occurs in what kind of cells? _____

3. List the stages of meiosis in order.

a) _____ b) _____ c) _____

d) _____ e) _____ f) _____

g) _____ h) _____ i) _____

4. Identify the stage of meiosis that is being described below

_____ Crossing over can occur.

_____ Cytoplasm has divided and two daughter cells are formed.

_____ Chromatids separate.

_____ Homologs line up at the equator.

_____ Spindle fibers push homologous chromosomes to opposite sides of the cell.

_____ Chromosomes line up at the equator not in homologous pairs.

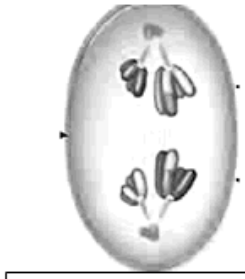
_____ DNA replication occurs.

_____ Four daughter cells are formed.

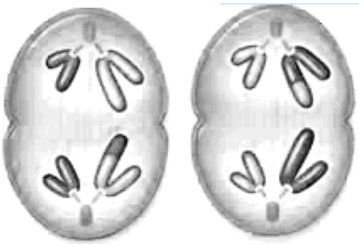
_____ Homologous chromosomes pair and form tetrad.

Meiosis Part B

Label the pictures below with the appropriate stage of meiosis.



1.



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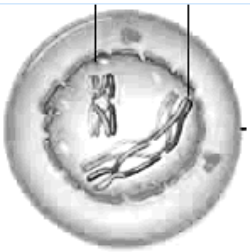

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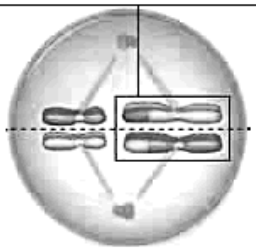

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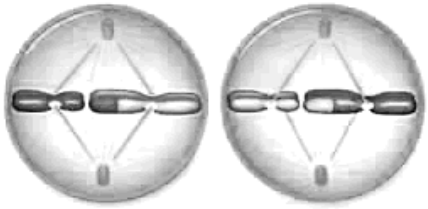
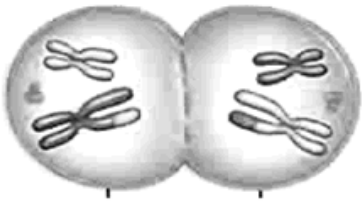


5.



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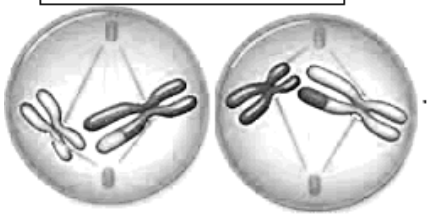


7.

8.

9. Complete the table below

	Occurs in Which Type of Cells?	Number of Divisions.	How Many Daughter Cells Are Made?	Daughter Cells Genetically Identical or Different from Parent Cell?	Chromosome Number (Same or Half of Parent	Reason for Occurrence in Body.
Mitosis						
Meiosis						

10. Which of these represents the number of chromosomes in cells before and after the process of meiosis?
    A. n → n
    B. n → 2n
    C. 2n → n
    D. 2n → 2n

11. The largest flower in the world, called a rafflesia, is three feet wide and weighs up to 36 pounds. The rafflesia has no roots, stems, or leaves. It lives on and takes nourishment from a vine called tetrastigma. The rafflesia harms the vine.

    The seeds of the rafflesia are dispersed in an unusual way. Plantain squirrels and tree shrews eat parts of the rafflesia plant. Scientists observe that when the animals chew the rafflesia, seeds get caught in their teeth. The animals will then chew on tetrastigma vines, leaving the seeds where they can germinate.

    Specialized cells in the rafflesia flowers undergo a process that produces gametes. What is this process called?
    A. Binary Fission
    B. Fertilization
    C. Meiosis
    D. Enzyme Regulation

12. A grasshopper has 180 chromosomes in its wing cells. How many chromosomes can be found in its gametes?
    A. 20
    B. 80
    C. 90
    D. 360

13. The gamete cells of a fly are
    A. Diploid
    B. Round
    C. Enzymes
    D. Haploid

Structure of Homologous Chromosomes

14. Genes are
    A. Segments of DNA that code for proteins.
    B. Segments of proteins that code for DNA.
    C. Sections of endoplasmic reticulum.
    D. Made by the mitochondrion.

15. Define allele.

16. Compare/Contrast phenotype and genotype

17. For each genotype below, indicate whether it is heterozygous (He) or homozygous (Ho).

_____	AA	_____	ii	_____	Pp	_____	TT
_____	CC	_____	Ll	_____	Bb	_____	SS
_____	EE	_____	Ww	_____	rr	_____	DD

18. For each genotype given below determine the phenotype.

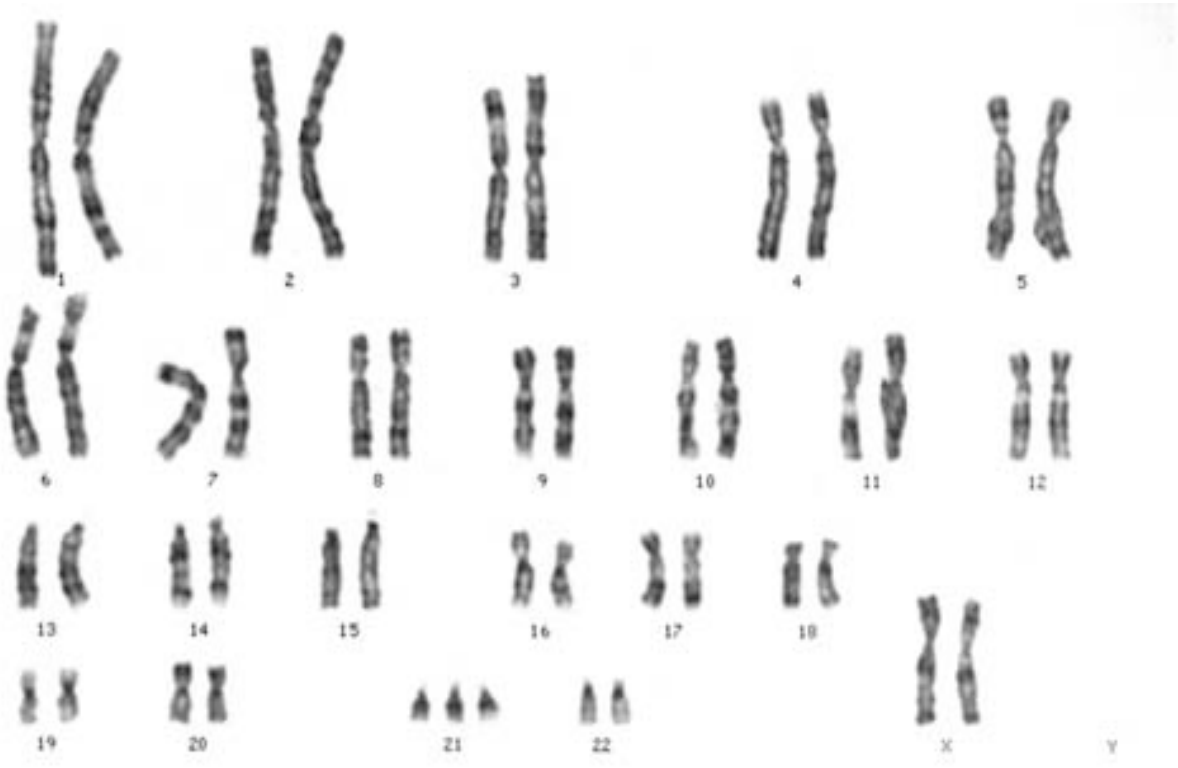
Tall is dominant to short		Round is dominant to wrinkled		Purple is dominant to white	
TT	_____	RR	_____	PP	_____
Tt	_____	Rr	_____	Pp	_____
tt	_____	rr	_____	pp	_____

19. Which of these combinations results in the expression of a recessive trait?

A. Two dominant alleles.
B. A dominant sex linked allele and a Y chromosome
C. Two recessive alleles
D. A dominant allele and a recessive allele

Human Chromosomes

20. Use the karyotype below to answer the questions below



a) How many chromosomes can be found in a normal human karyotype? _____

b) How many chromosomes are present in the karyotype picture above? _____

c) On which chromosome pair do you find an "extra" chromosome? _____

d) What is the sex of the person in this karyotype? _____

e) What genetic disorder is displayed in the karyotype? _____

21. Which of the following combinations of sex chromosomes represents a female?

A. XY
B. XXY
C. XXXY
D. XX

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Name _____Date _____ Period _____

Unit 8 Review: Family Tree

Mendelian Genetics

1. Determine the phenotype for the given genotype. Also indicate if the genotype is homozygous or heterozygous.

Wavy hair is dominant to straight hair

WW Wavy, Homozygous

Ww _____

ww _____

Brown eyes are dominant to blue eyes

BB _____

Bb _____

bb _____

Spotted fur is dominant to non-spotted fur

SS _____

Ss _____

ss _____

Hairy toes are dominant to hairless toes

HH _____

Hh _____

hh _____

2. Determine the possible genotypes for given phenotypes

Bent little fingers are dominant to straight little fingers

Bent little finger _____

Bent little finger _____

Straight little finger _____

Dimples are dominant to not having dimples

Dimples_____

Dimples_____

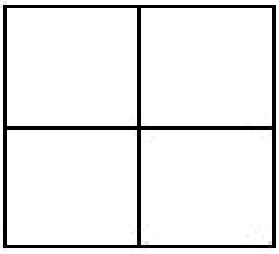
No dimples _____

Punnett Squares

1. Complete the following crosses and answer the questions.

Tall is dominant to short

TT x tt



a) What percentage offspring have the following genotypes?

_____ TT

_____ Tt

_____ tt

b) What percentage of offspring has the following phenotypes?

_____ Tall

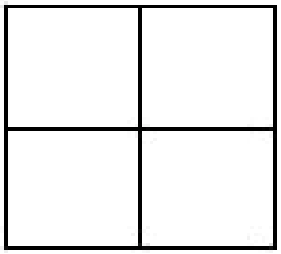
_____ Short

c) What is the ratio of tall to short?

_____

Cross

Tt x Tt



a) What percentage offspring have the following genotypes?

_____ TT

_____ Tt

_____ tt

b) What percentage of offspring has the following phenotypes?

_____ Tall

_____ Short

c) What is the ratio of tall to short?

2. Organisms that have two identical alleles for a particular trait are said to be
   A. Hybrid
   B. Homozygous
   C. Heterozygous
   D. Dominant

3. In horses, the allele for straight hair (B) is dominant to the allele for curly hair (b). Which of these sets of parents can produce offspring with curly hair?
   A. A heterozygous male with straight hair and a homozygous female with straight hair
   B. A homozygous male with curly hair and a homozygous female with straight hair
   C. A heterozygous male with straight hair and a heterozygous female with straight hair
   D. A homozygous male with straight hair and a homozygous female with straight hair

4. When two heterozygous tall pea plants are crossed, the expected genotype ratio of the offspring is
   A. All heterozygous tall
   B. ½ tall, ½ short
   C. 3Tt: 1tt
   D. 1TT: 2Tt: 1tt

5. The presence or absence of freckles is determined by one gene. The allele for freckles (F) is dominant and the allele for the absence of freckles (f) is recessive. A couple has several children. All of the children have freckles because their parents' genotypes could only produce children with freckles. Which of these are most likely the genotypes of the two parents?
   A. Ff and ff
   B FF and ff
   C. Ff and Ff
   D. ff and ff

6. In humans, the allele for dimples (D) is dominant. The allele for not having dimples (d) is recessive. A woman (DD) and a man (Dd) have four children. Which of these is the predicted ratio of the children with dimples to the children without dimples?

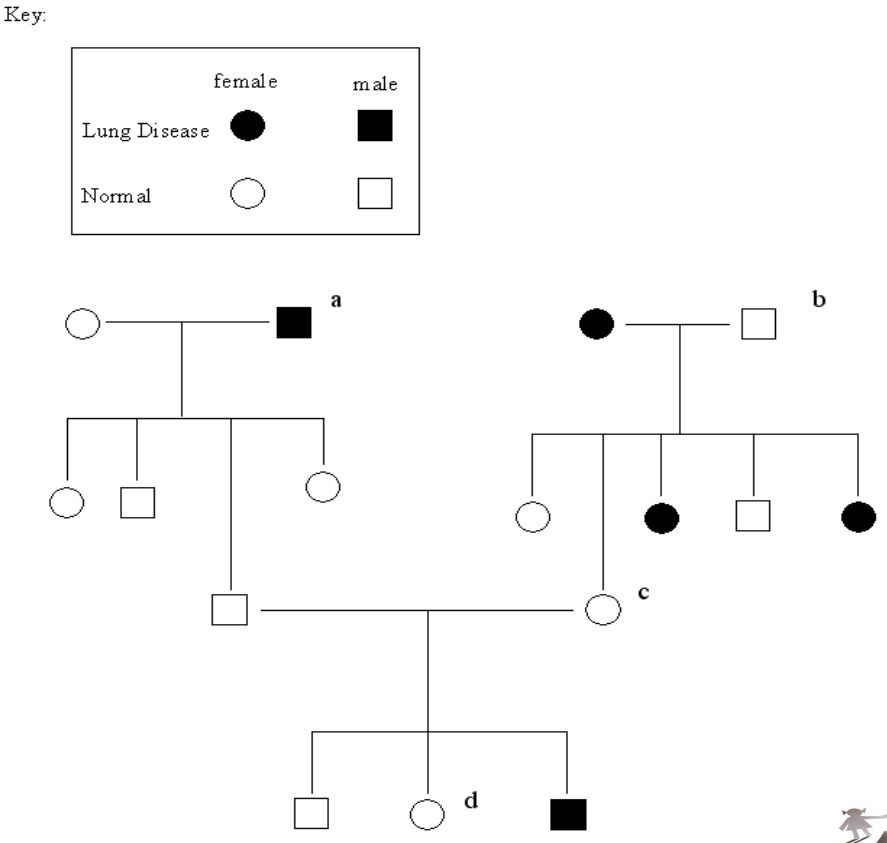
A. 1:0
B. 1:1
C. 1:3
D. 3:1

7. The allele for attached earlobes (e) is recessive to the allele for unattached earlobes (E). A woman with the genotype (Ee) and a man with the genotype (ee) have a child. What is the probability that the child is heterozygous for unattached earlobes?

A. 0%
B. 25%
C. 50%
D. 100%

<u>Pedigree</u>

8. Below is a pedigree for an inherited lung disease. **Provide the genotypes of each of the individuals marked with lower case letters.**



a. _____

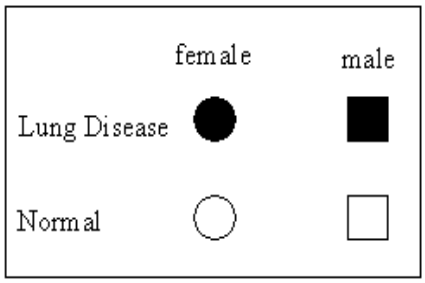
b. _____

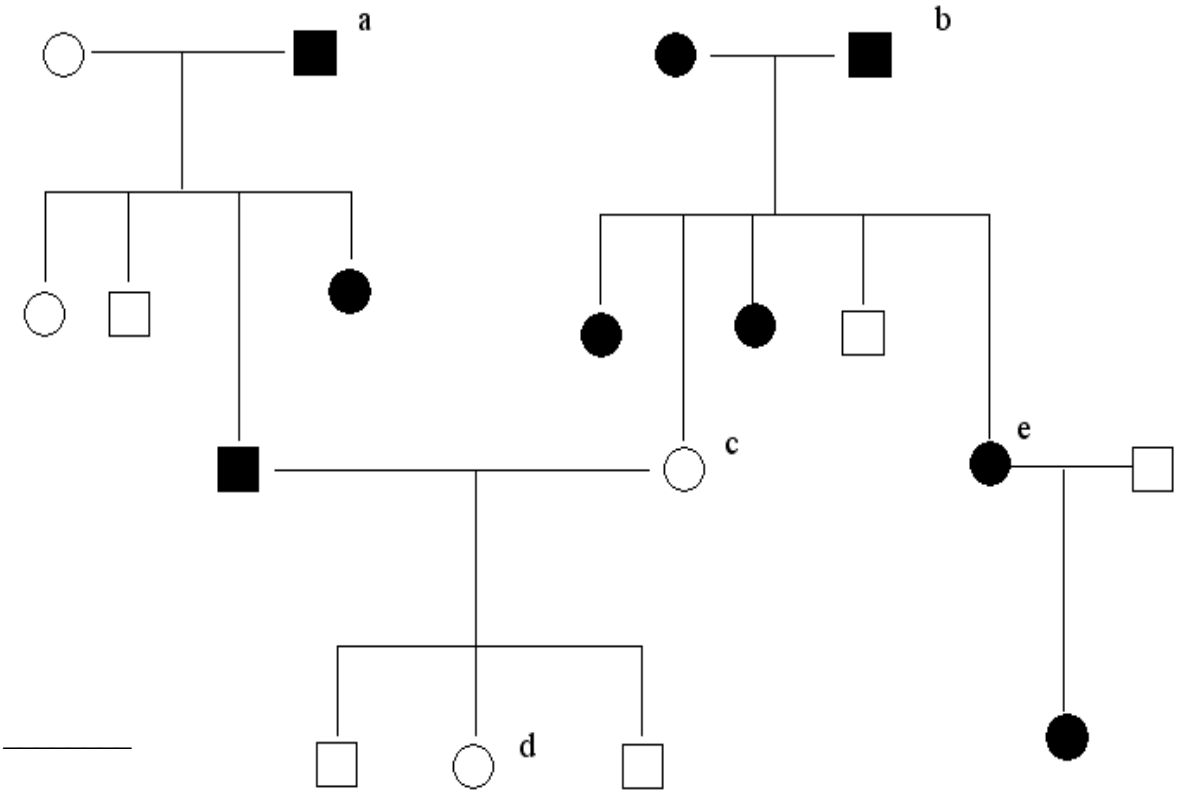
c. _____

d. _____

9. Below is a pedigree for an inherited brain disease. **Provide the genotypes of each of the individuals marked with lower case letters.**

Key:





a. _____

b. _____

c. _____

d. _____

e. _____

10. Galactosemia is an inherited disorder in humans. A person with the disorder cannot digest the sugars in milk. The allele for normal digestion (G) is dominant; the allele for galactosemia (g) is recessive.

A female who is heterozygous for the galactosemia trait and a male who has galactosemia have a child.

Describe how this disorder could have been passed on in the family. In your response, be sure to…

- identify the genotype of the father.
- complete a Punnett square to show the possible genotypes and phenotypes of the child.
- describe the probability that the child will inherit galactosemia.
- describe all the possible genotypes and phenotypes of the father's parents. Explain your answer

Name _____Date _____ Period _____

Unit 9 Review: Express Yourself

Protein Synthesis/ RNA Structure

1. What is the full name of RNA? _____

2. What class of macromolecules does RNA belong to? _____

3. Describe the structure of RNA? _____

4. What is the name of the sugar found in RNA? _____

5. Name the four nitrogen bases found in RNA:
   a)

   b)

   c)

   d)

6. What type of bond hold the RNA nitrogen bases together? _____

7. In RNA
   Adenine (A) always bonds with _____ (U)

   Cytosine (c) always bonds with _____(G)

8. Name the three parts of a RNA nucleotide
   a)

   b)

   c)

9. Name three types of RNA and describe their role in protein synthesis.

a)

b)

c)

10. Complete the chart below

Nucleic Acid	**Where Is It Found In The Cell?**	**Type of Sugar**	**Structure (Double Helix/ Single Strand)**	**Types of Nitrogen Bases (A, T, C, G, U)**	**Different Types? If So Name Them**
DNA					
RNA					

11. Place the terms below in proper order to make a protein

mRNA Protein tRNA DNA Ribosome Protein rRNA

Amino Acid

DNA → _____ → _____ → _____ → _____ →

_____ → _____ → _____

12. Hemoglobin is an important protein in red blood cells. The DNA code for hemoglobin contains the following segment:

TGC-GGA-CTC-CTC

Which of these is the messenger RNA code for this segment of DNA?

A. ACG – CCT – GAA – GAA
B. TCC – GGT – CTC – CTC
C. ACG – CCU – GAG – GAG
D. UGC – GCA - CUC – CUC

13. During cell replication, an error may result in a base pair substitution. Which of these terms describes the changes in the base pair sequence?

A. Cloning
B. Meiosis
C. Mutation
D. Translation

14. Which type of RNA is responsible for performing transcription?

A. tRNA
B. mRNA
C. rRNA
D. bRNA

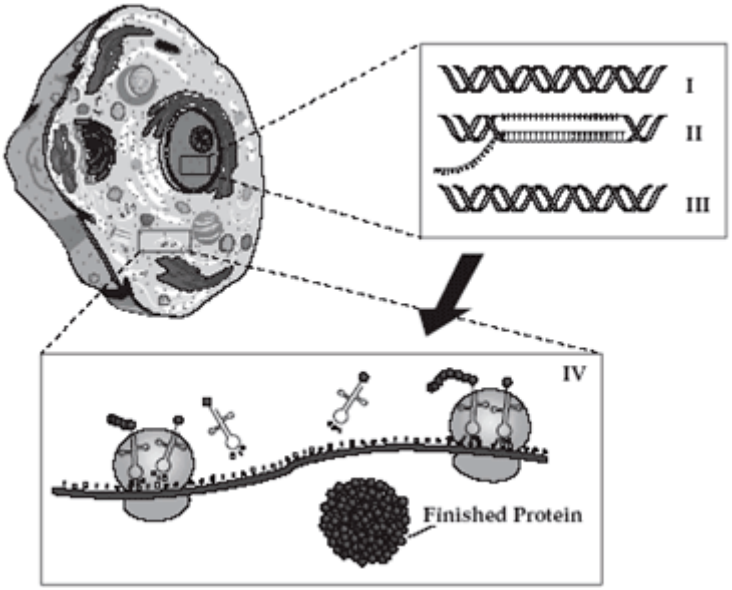
15. How many nitrogen bases make up one codon?

A. 2
B. 1
C. 9
D. 3

16. Where does translation take place in the cell?

A. Ribosome
B. Nucleus
C. Golgi Apparatus
D. Nucleolus

The diagram below shows the key steps for making proteins. Use the diagram to answer questions 14 and 15.



17. Which step involves ribosomes?
    A. I
    B. II
    C. III
    D. IV

18. Which step involves transfer RNA?
    A. I
    B. II
    C. III
    D. IV

Genetic Engineering

19. Define cloning.

20. A scientist cloned a goat. Which of these is a true statement about the cloned goat?
    A. It has new genes and traits.
    B. It lacks the genes for reproduction.
    C. It has genes that are identical to the original goat.
    D. It looks the same as the original goat but has different genes.

21. What is gel electrophoresis?

22. What is gene splicing?

23. What is gene therapy? How might it assist in curing genetic disorders?

24. Genetic engineering involves all of the following EXCEPT
    A. Reading a DNA sequence.
    B. Editing a DNA sequence.
    C. Reinserting DNA into living organisms.
    D. Analyzing an organism's phenotype.

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Name _____Date _____ Period _____

Unit 10 Review: The Tree of Life

The Theory of Evolution

1. Give three evidences of evolution

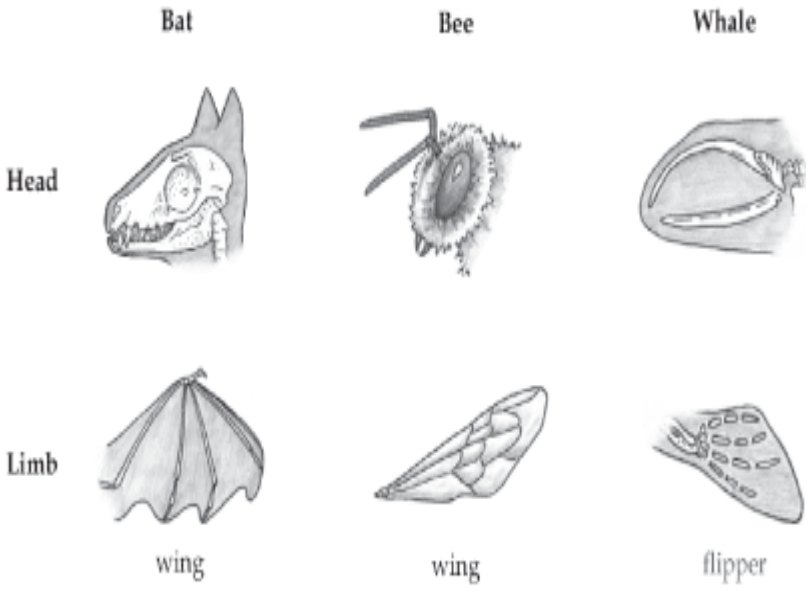
a)

b)

d)

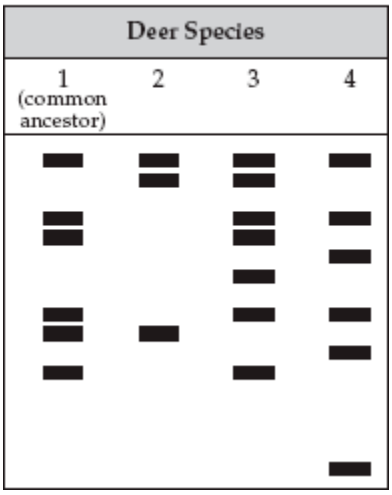
2. What are homologous structures?

3. Circle the structures that are homologous in the pictures below?



Use the gel electrophoresis diagram below to answer the questions

ELECTROPHORESIS GEL
OF DEER SPECIES



4. According to the diagram which deer species is most closely related to the common ancestor?
   - A. Species 1
   - B. Species 2
   - C. Species 3
   - D. Species 4

5. Which species is least related to the common species?
   - A. Species 1
   - B. Species 2
   - C. Species 3
   - D. Species 4

6. Explain why the other two species have different amino acids from the common ancestor.

7. Evolution says that humans have a common ancestor with apes. Do you think the gel below supports that? Support your answer.

Orangutan	Gorilla	Chimpanzee	Human

Fox A
Fennec Fox

Fox B

8. Which fox would survive better in the desert? Explain why your answer.

9. Which fox would survive better in the cold? Explain why your answer.

10. A researcher recently discovered a species of bacteria. DNA sequences were obtained from it and from several other species of bacteria. The DNA sequences came from the same part of the bacterial chromosome of each species.

	DNA Sequence		
Unknown Species	ACT	GCA	GCC
Species I	ACA	GCG	CCG
Species II	ACT	GCT	GGC
Species III	ACA	GCC	GGG
Species IV	ACT	GCA	GCG

According to the data above, the unknown bacteria are <u>most closely</u> related to which species?

A. Species I
B. Species II
C. Species III
D. Species IV

11. Rafflesia flowers produce the smell of rotting flesh. This smell attracts flies. When the flies land on the flowers, the pollen attaches to them. The flies then transport the pollen to other flowers. Producing a smell to attract flies is an example of

A. Replication
B. Adaptation
C. Predation
D. Parasitism

12. Loggerhead turtles in the Atlantic Ocean return to lay their eggs on the same beaches where they hatched. Scientists have observed that the turtles have a “compass sense.” This sense allows them to use Earth's magnetic field to find their way back to the beaches where they were hatched.

Which of these terms <u>best</u> describes the turtle's ability to use Earth's magnetic field?

E. Diversity
F. Habitat
G. Succession
H. Adaptation

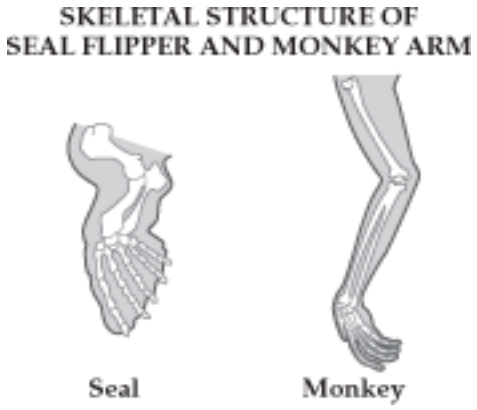
13. Researchers are studying slider turtles. Slider turtles hatch on the beach. The researchers discovered that larger baby turtles were more likely to survive than smaller baby turtles. They hypothesized that the larger turtles could move more quickly toward the water than the smaller turtles, reducing their exposure to predators. The survival advantage for the larger baby turtles is a result of

A. natural selection.
B. gene splicing.
C. mutualism.
D. commensalism.

14. Scientists have found many similarities in the proteins of turtles and sharks. These similarities suggest that turtles and sharks have_____

A. stopped evolving.
B. a common ancestor.
C. all the same DNA sequences.
D. the same number of chromosomes.

15. The figure below shows the skeletal structure of a seal's flipper and a monkey's arm.



The skeletal structures of the flipper and the arm are similar, even though they have different functions. Seals use their flippers for swimming, while monkeys use their arms primarily for grasping and lifting.

Which of these explains why the skeletal structures of the seal's flipper and the monkey's arm are similar?

A. Seals and monkeys have common ancestors
B. Seals and monkeys have identical DNA sequences
C. All of the same genetic mutations occurred in seals and monkeys
D. All of the same vitamins are used in bone formation for seals and monkeys

17. Mammals, birds, modern reptiles, and theropod dinosaurs are vertebrates. The table below shows some of the differences and similarities among these groups of vertebrates.

CHARACTERISTICS OF VERTEBRATE GROUPS

	Mammals	Birds	Modern Reptiles	Theropod Dinosaurs
Number of ear bones	3	1	1	1
Legs directly under body	yes	yes	no	yes
Produce milk	yes	no	no	no
Constant body temperature	yes	yes	no	yes
Live birth	yes	no	some	no
Skin covering	hair	feathers/scales	scales	feathers/scales

According to the table, which of these vertebrates are <u>most closely</u> related?

A. Mammals and modern reptiles
B. Theropod and modern reptiles
C. Mammals and theropod dinosaurs
D. Birds and theropod dinosaurs

18. Which of these is <u>not</u> a use for DNA fingerprinting?

A. To determine how individuals are related
B. To make messenger RNA
C. To determine a genetic sequence
D. To study inherited diseases

19. Biologists have discovered an animal called a cloudrunner, shown in the figure below.

Biologists are now trying to determine the cloudrunner's evolutionary relationship to other animals.

- What kinds of evidence and scientific techniques could the biologists use to determine the evolutionary relationship of the cloudrunner to other animals?

- How does this evidence demonstrate evolutionary relationships between the cloudrunner and other animal?

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Name _____Date _____ Period _____

Unit 11 Review: Body Works

Body Systems

1. What is the job of the circulatory system?

2. What is the job of the red blood cell?

3. What is the job of the white blood cell?

3. Identify the three types of blood vessels?
   a)

   b)

   c)

4. What is the job of the muscular system?

5. Identify the three types of muscular tissue? Give an example of organs possesing these muscle types.
   a)

   b)

   c)

6. What is the job of the skeletal system?

7. What other body system does the skeletal system work with?

8. Identify the three different kinds of joints? Give examples of each type of joint.

a)

b)

c)

9. What is the job of the endocrine system?

10. Identify two glands of the endocrine system and give their function.

a)

b)

11. What other system does the endocrine system work with?

12. What is the job of the nervous system?

13. Identify the job of a neuron and describe its parts.

14. What is the primary function of the respiratory system?

15. Identify the major passageways of the respiratory system.

16. What is the job of the diaphragm?

17. What is the job of the immune system?

18. Identify three kinds of cells involved in the immune response.

a)

b)

c)

19. What is the job of the circulatory system?

20. What are the three main parts of the circulatory system?

a)

b)

c)

21. What is the job of the digestive system?

22. Identify the parts of the digestive system?

23. What is the job of the excretory system?

24. Identify the components of the excretory system?

Maintenance of Homeostasis Through Feedback Within a Cell, Between Cells, and Between Cells and Their Environment

25. The table below lists enzymes that function in different locations in the human body, and the normal pH and temperature ranges of these locations.

ENZYMES IN THE HUMAN BODY

Location of enzyme	Enzyme	pH ranges of location	Temperature (°C) ranges of location
Mouth	Salivary amylase	6.0 - 7.0	36.7 - 37.0
Stomach	Pepsin	2.0 - 3.0	37.3 - 37.6
Small intestine	pancreatic amylase, trypsin, lipase	7.5 - 9.0	37.3 - 37.6

Use your understanding of the structure and function of enzymes to

- predict how the activity of pepsin will change after it moves from the stomach to the small intestine
- explain your prediction using data from the table
- describe how changes in pH and temperature affect enzyme activity
- predict how a fever of 40°C would affect enzyme activity

HSA Review

PREPARE FOR SUCCESS ON THE TEST!

Use this section of the resource book to help you prepare for the Biology HSA. The passing score for the Biology HSA is a 400 or higher.

Preparing for the Maryland Biology High School Assessment

The book titled: *Preparing for the Maryland High School Assessment* (with a bright green coverpage) is a valuable tool for review. You can use this resource throughout the year as you prepare for tests and benchmarks. The following table organizes the book by unit as they are covered in the Prince Georges County Curriculum Framework.

Unit	Pages
1: What is Life and How Do Scientists Study Life?	Topic 1: Pages 1-1 to page 1-18 Topic 9: Pages 9-1 to 9-20
2: Circle of Life	Topic 7: Pages 7-1 to 7-24 Topic 8: Pages 8-1 to 8-22
3. Foundations of Life	Topic 2: Pages 2-1 to 2-7 Topic 3: Pages 3-8 to 3-10
4. Basic Unit of Life	Topic 2: Pages 2-8 to 2-18
5. Powering Up for Life	Topic 3: Pages 3-1 to 3-7
6. Life is a Cycle	Topic 3: Pages 3-11 to 3-20
7. All in the Family	Topic 5: Pages 5-1 to 5-22
8. Family Tree	Topic 5: Pages 5-1 to 5-22
9. Express Yourself	Topic 3: Pages 3-11 to 3-20
10. Tree of Life	Topic 6: Pages 6-1 to 6-18
8: Body Works.	Topic 4: Pages 4-1 to 4-22
Test Preparation	Appendix A: Page A-1 to A-9 Appendix B: Page B-1 to B-3

Retired High School Assessment Questions

Familiarity and practice with retired high school assessment questions is an excellent way to review you knowledge as well as help you prepare for the high school assessment in May. You can access retired questions from the Maryland State Department of Education's website: www.mdk12.org.

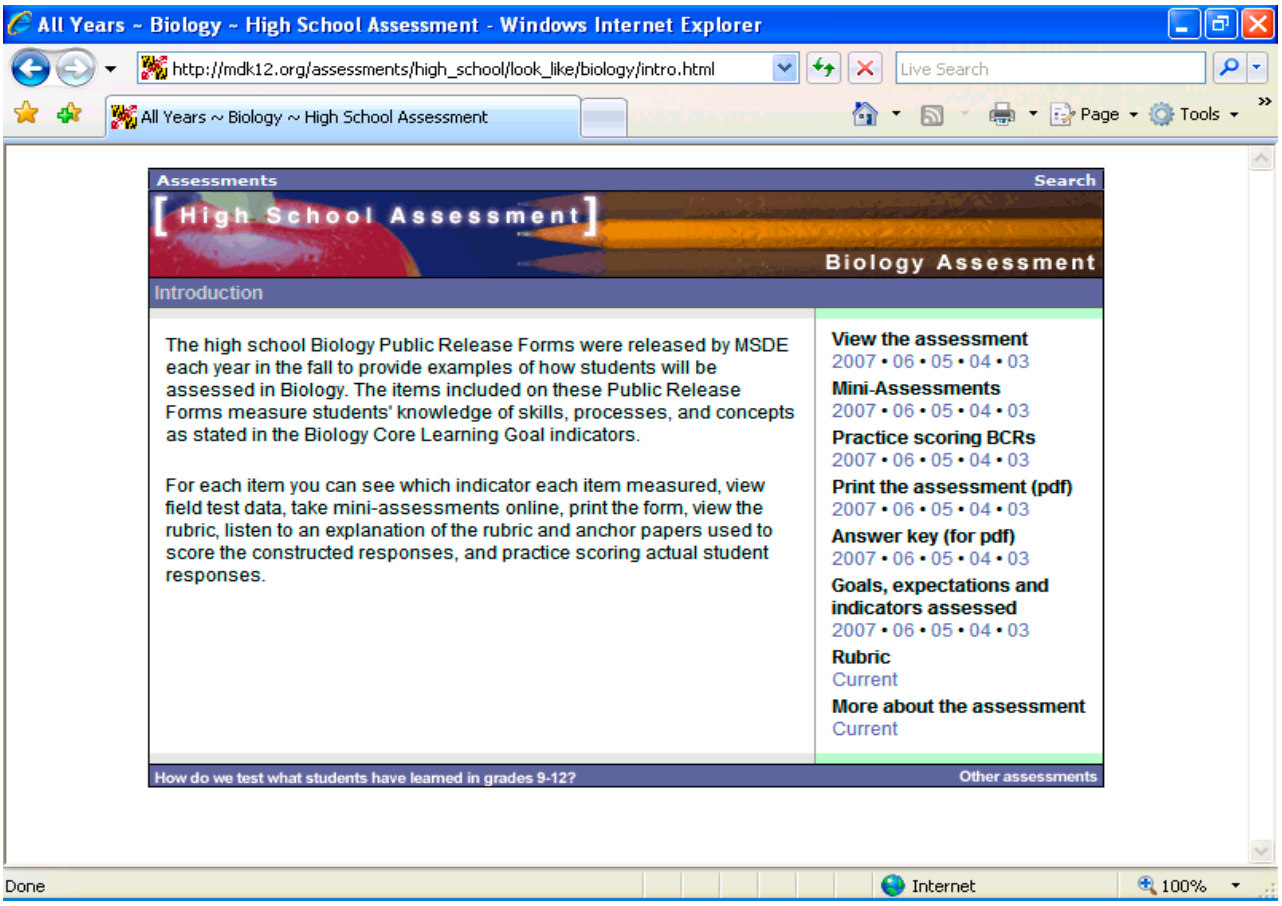
NOTE TO TEACHER: Please use the Biology Quiz Bowls to help you and your students evaluate their knowledge of concepts taught each quarter in preparation for the scheduled benchmarks. *See the Biology CFPG* for benchmark review/administration dates.

NOTE TO STUDENT: The more practice you get answering questions, the better your chances of being successful on the Biology HSA. Use the valuable resource of retired questions to help you become familiar with the format of the Biology High School Assessment.

Accessing retired Biology High School Assessment Questions.

You can type the following web address into the address window:

http://mdk12.org/assessments/high_school/look_like/biology/intro.html



You can then choose to view the assessment, take a mini assessment or practice scoring BCRs that were given on the assessment.

Drill and Practice

The pages that follow are opportunities for you to test your knowledge of what you are learning in Biology. Use them to review for upcoming quizzes, tests, and/or benchmarks.

NOTE TO TEACHER: You can use the following list of key terms to play a game of word bingo. A couple of word bingo boards follow the list of key terms.

NOTE TO STUDENT: Preparing for the Biology High School Assessment requires you to evaluate and assess yourself. In this section you will find a review for some of the key terms and concepts learned throughout the year.

KEY TERMS

Knowledge of the following words is essential for success on the Biology High School Assessment Exam.

Key Vocabulary Terms:

Science Skills and Processes

analysis	experimental design	meter
centi	graduated cylinder	milli
conclusion	Gram	observation
conclusion	Hypothesis	problem
control	independent (manipulated) variable	scientific method
data	Kilo	scientific notation
dependent (responding) variable	Liter	theory
experiment	Materials	triple beam balance

Biochemistry

acid	element	polarity
activation energy	enzyme	polymer
amino acid	ion	product
Atom	ionic bond	protein
base	lipid	reactant
carbohydrate	mixture	RNA
catalyst	monomer	solute
chemical reaction	monosaccharide	solution
compound	nucleic acid	solvent
covalent Bond	nucleotide	substrate
DNA	pH scale	van der Waals forces
electron		

Cell Structure and Function

active transport
cell
cell membrane
cell specialization
cell theory
cell wall
centriole
chloroplast
chromatin
chromosome
cilia
cytoplasm
cytoskeleton
diffusion
endocytosis
endoplasmic reticulum
equilibrium
eukaryote
exocytosis
facilitated diffusion
flagella
Golgi apparatus
homeostasis
hypertonic
hypotonic
isotonic
lipid bilayer
lysosome
mitochondria
nucleolus
nucleus
organ
organ system
organelle
osmosis
phagocytosis
pinocytosis
prokaryote
ribosome
tissue
vacuole
vascular tissue

Photosynthesis and Respiration

aerobic
anaerobic
ATP
autotroph
calorie
carbon dioxide
cellular respiration
chlorophyll
electron transport chain
energy
fermentation
glucose
glycolysis
heterotroph
Krebs cycle
light-dependent reactions
NADP+
oxygen
photosynthesis
pigment
sun
water

Cell Division

anaphase
cancer
cell cycle
cell division
centriole
centromere
chromatid
chromosome
crossing-over
cyclin
cytokinesis
diploid
haploid
homologous
interphase
meiosis
metaphase
mitosis
prophase
spindle
telophase
tetrad

Genetics and Heredity

allele
asexual reproduction
autosome
dominant
fertilization
gametes
gel electrophoresis
genetics
gentotype
heterozygous
homozygous
hybrid
karyotype
monohybrid cross
mutation
nondisjunction
pedigree
phenotype
probability
Punnett square
recessive
sex chromosome
sex-linked gene
sexual reproduction
trait
variation

DNA Replication and Protein Synthesis

adenine
amino acid
anticodon
base pairing
chromatin
clone
codon
cytosine
DNA polymerase
double helix
exon
gel electrophoresis
gene
genetic engineering
guanine
histone
intron
mRNA
mutation
nucleotide
promoter
replication
restriction enzymes
RNA polymerase
rRNA
selective breeding
thymine
transcription
translation
tRNA
uracil

Classification and Evolution

adaptation
classification
evolution
fitness
fossil
homologous structure
isolation
natural selection
survival of the fittest
theory

Ecology

abiotic factor
autotroph
biodiversity
biomass
biome
biosphere
biotic factor
chemosynthesis
climate
community
consumer
decomposer
denitrification
detritivore
ecological pyramid
ecology
ecosystem
evaporation
food chain
food web
genetic diversity
greenhouse effect
habitat
herbivore
heterotroph
limiting nutrient
mutualism
niche
nitrogen fixation
nutrient
omnivore
parasitism
pollution
population
predation
primary productivity
producer
resource
species
transpiration
trophic level
weather

Human Body Systems and Homeostasis

circulatory system
digestive system
endocrine system
equilibrium
excretory system
feedback inhibition
homeostasis
immune system
muscular system
nervous system
reproductive system
respiratory system
skeletal System

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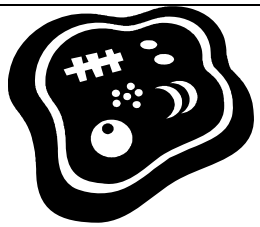
BIOLOGY BINGO

Directions: Choose vocabulary terms from the list determined by your teacher to fill in EACH square. ***Be sure to only use a word once.*** Select the words that you can clearly define. Mark the space as the definition of the word you chose is read aloud. The first student to get five in a row (across down or diagonal) and say: "biology is the study of life," wins. Remember, the more definitions you know, the greater your chance to win!

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		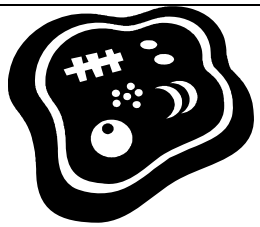		

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		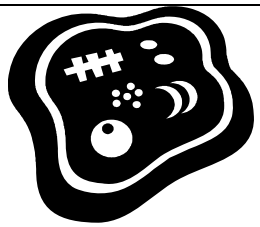		

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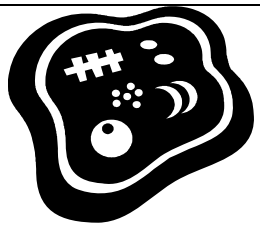
				

Biology Facts Students Absolutely Must Know

This review is in no way supposed to replace your study of the chapters. ***It should be a supplement***. There is much more to consider when studying for the state exam. Hopefully, this list will get you thinking and motivated to review further.

Scientific Method:

Experiments must be FAIR. This means:

- Test one variable at a time.
- Repeat the experiment several times without changing the procedures.
- Have a control group that receives no treatment so you have something to compare your test with.
- Control as many factors as you can that might interfere with your results.
- Include many items in the experiment. Example: 30 plants and not 2, 100 people, not 10.

The steps:

Title/Purpose – variable included. Example: The effects of fertilizer on the growth of sunflowers.
Independent variable: fertilizer. Dependent variable: growth
Hypothesis If… Then…
Materials - specific
Procedure - clear, can be repeated
Results - tests **what** happened – words, charts, graphs, tables
Conclusion - explains **why**

Equipment:

Graduated cylinder: volume, milliliters
Triple Beam Balance – mass, grams
Ruler – length, meters
Beaker
Microscope – compound, magnification – eyepiece 10X x the lens
Apron
Safety goggles

Biochemistry

Water is polar. It has oppositely charged regions that allow soluble substances to be pulled apart (dissolved). Sugar is polar, oil is not.

Carbohydrates – source of ENERGY

Monosaccharides – glucose, fructose simple sugars $C_6H_{12}O_6$

Form disaccharides by condensation (lose water when making larger molecules)
Glucose is blood sugar and is made by plants.

Polysaccharides – complex chains of glucose
Starch – storage in plants
Glycogen – storage in animals, later turns to fat
Cellulose, fiber – makes up cell walls, insoluble

Lipids – stored energy, make up cell membrane, insulation fats and oils
complex molecules – glycerol and fatty acids

Proteins – build body mass
Muscle
Made of 20 amino acids in various sequences and lengths
Made at ribosome's
Include enzymes – lower the energy needed for a reaction to occur. Have specific shape to fit with a substrate. Are reusable. Can be deactivated or denatured with extreme heat or cold.
Most prefer neutral pH- 7 – and body temperature – 37 °C

pH – acids and bases
acids – more H+
bases – more OH-
neutral – equal amounts
pH scale – 0-14, acid < 7, base > 7
a weak acid is a 6, a strong acid is a 1, strong base is a 14
stomach is about a 3

Cell Membrane
Lipid bilayer – phospholipids and proteins
Polar heads and non-polar tails
Selectively permeable: allows only certain substances in and out
Diffusion: movement of particles from an area of high concentration to an area of low concentration
Osmosis: diffusion of water
Isotonic – dynamic equilibrium – equal movement
Hypertonic – water with flow out of the cell to balance its environment
    The cell shrinks – fresh water cell in sugar water
Hypotonic – water will flow in the cell to reach a balance
    The cell swells (plant) or may burst (animal) – salt water cell in fresh water
*** What happens if you place 5% salt cell in a 10% salt solution?

Facilitated Diffusion – still passive transport, no energy needed
Transport Proteins – carrier, gate

Active Transport: energy is required – movement of particles from LOW to HIGH concentration

Endocytosis – large particles surrounded and engulfed
Exocytosis – large waste is expelled through the membrane

Cell Structure and Function

Cell Theory – cells are the basic unit of life, cells come form other cells
Prokaryotes – no nucleus, bacteria
Eukaryotes – membrane bound nucleus, animal, and plant

Cell parts you MUST know but don't count out the others!
Cell Membrane – plant and animal – regulates what enters and leaves
Cell Wall – cellulose – supports plant cell, is rigid
Nucleus – controls cell activities, contains DNA (genetic material)
Ribosome's – make proteins
Mitochondria – respiration, energy release, ATP
Chloroplast – Plants only – green pigment chlorophyll, carries out photosynthesis

Respiration and Photosynthesis

Energy on earth comes from the sun and is transferred to plants and then to animals. Much is lost as heat.
Respiration occurs primarily in the mitochondria of cells of plants and animals. It involves the breaking down of glucose in the presence of oxygen. (aerobic) The products of this reaction are carbon dioxide, water and ATP (energy). This reaction is EXERGONIC because energy is released.
Photosynthesis occurs in the chloroplasts of plant cells. It involves a reaction in which carbon dioxide and water combine in the presence of light energy to form glucose and release oxygen. It is an ENDERGONIC process because energy is put in (sun). It involves a light reaction – light is absorbed and converted to ATP, water is split, releasing oxygen. In the Calvin Cycle, or dark reaction, the H+ from the split water and CO_2 form 3 carbon sugars which in turn can form glucose, starch or cellulose.

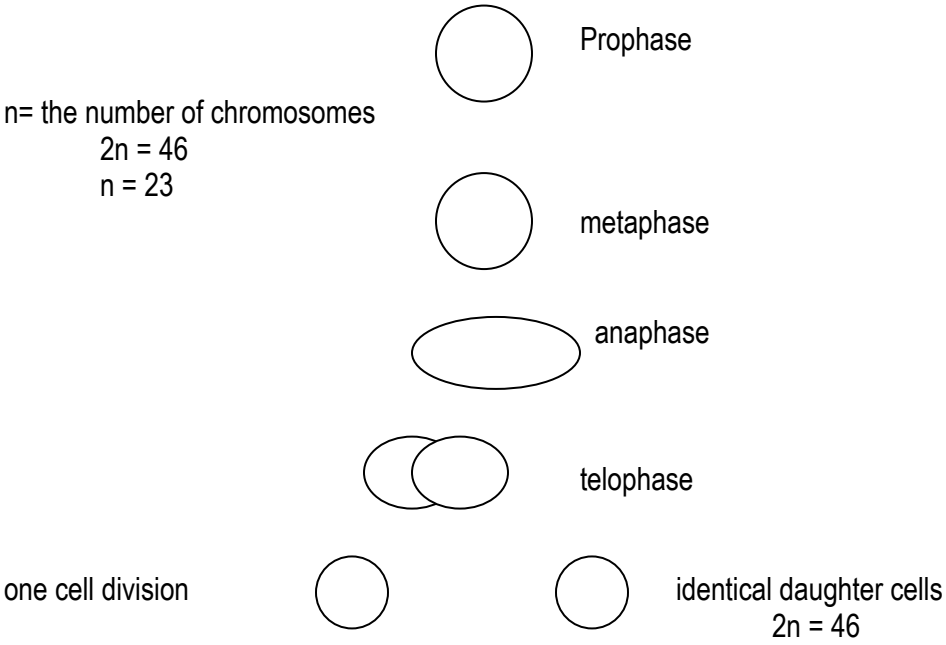
Respiration and photosynthesis are continuous and opposite processes.
Equations:
Respiration: $C_6H_{12}O_6 + O_2 \rightarrow CO_2 + H_2O + ATP$

Photosynthesis: $CO_2 + H_2O + \text{light energy} \rightarrow C_6H_{12}O_6 + O_2$

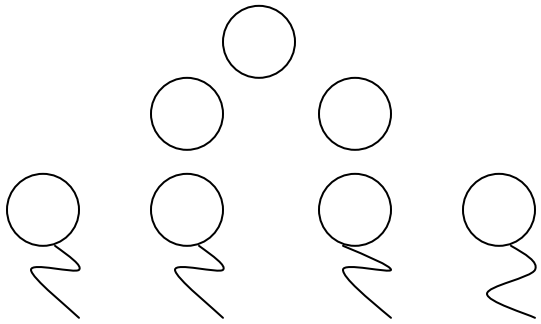
Humans could not live without the products of photosynthesis. They are the air we breathe and the food we eat, either directly or as part of the food chain.

Cell Division

Cell Cycle – includes interphase and mitosis
Mitosis – Reproduction of Body cell (skin, hair, bone, etc.)
4 phases: Prophase, Metaphase, Anaphase and Telophase.
Two identical daughter cells are produced. The chromosome number stays the same. Example: Humans have 23 pairs (46) chromosomes in each body cell. Each daughter cell will have this diploid number (2n)



Meiosis – Reproduction of gametes (sex cells)
Each cell goes through two (2) cell divisions producing four (4) gametes. These cells have the number found in body cells so that when fertilization occurs, the original number is returned. Example: 23 + 23 = 46
Allow variety! egg, sperm



Prokaryotes such as bacteria divide by the process of binary fission. These simple cells have no nucleus to surround the DNA. The cells produced are identical.

Genetics

Dominant genes are represented with a capital letter – D
Recessive genes are represented with a lower case letter – d. They are often hidden by a dominant gene.
Dd = the dominant trait. Must have two to express the recessive trait.
The genotype of a trait is the gene make-up – DD Dd dd
The phenotype is the expression of the genes – Tall, short, O blood
A homozygous (purebred) gene pair has two like genes for a trait – DD or dd
A heterozygous (hybrid) gene pair has two different genes – Dd or AO blood
XX = female
XY = male
Sex linked traits are traits that are carried on the X chromosome. Therefore, it is easier for a male to express a recessive sex linked trait because if he inherits one gene from his mother than he will show the trait.

Ex- X^HX^h = carrier female of hemophilia
X^h Y = male with the trait

A Punnett Square is a tool used to predict the outcome of a cross:

Cross a heterozygous with a Homozygous Recessive for dimples (D).

The results are expressed as a ratio or as percentages

	D	d
d		
d		

genotypes
DD = 0%
Dd = 50%
Dd = 50%

phenotypes
Dimples – 2 out of 4
no dimples – 2 out of 4

Practice:

1. Colorblindness is a sex linked recessive trait. Cross a carrier female with a man with normal sight.
2. Brown fur (B) is dominant over white in a type of mouse. What were the likely genotypes of the parents if the phenotypes of the offspring were 153 brown and 48 white?

DNA

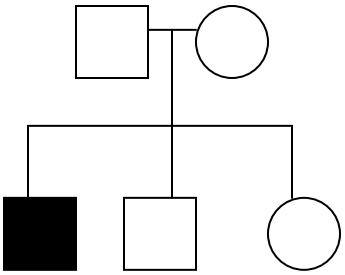
DNA – deoxyribonucleic acid – located in the nucleus
Nucleotide – a portion of DNA composed of a base, a sugar and a phosphate
4 bases: A pairs with T
C pairs with G
DNA is arranged in a double helix – has 2 strands and twists like a ladder.
Replication – process in which DNA makes a copy of itself – it unzips and free bases attach following the base pair rule.
DNA holds the code for the making of proteins needed for life. Three bases in a row is a codon that codes for one amino acid.

Protein Synthesis
DNA holds the codes for proteins but proteins are made at the ribosomes.
Transcription – mRNA codes for the protein by pairing with DNA bases.
There is no T in RNA language – U (uracil) is used instead. The single strand of RNA travels from the nucleus to the ribosome.
Translation – RNA attaches to a ribosome and awaits tRNA which is carrying the amino acid "ordered" by the mRNA. The amino acids are joined together to form a protein and tRNA is reused.
Example: DNA codon– TAC- in nucleus
MRNA codon- AUC from nucleus to ribosome
TRNA anticodon- UAC – carrying the amino acid methionine

Mutation
Mistakes in DNA replication
Examples are – duplication, point mutation, Etc.

A clone has exact copy of DNA – like an identical twin.
Genetic engineering – method of altering a gene to add change or delete a trait.
Errors in chromosome number can result in genetic disorders.
Ex- trisomy 21- Down's syndrome- 3 of these chromosomes used to detect abnormalities.
A karyotype is a photograph of chromosomes used to detect abnormalities.

Pedigree – chart used to trace a trait through a family history



The colored square shows the in heritance of a recessive trait. It must be hidden in each of the parents (homozygous dominant). The colored square cannot show a dominant trait because that would mean the parents are homo recessive and couldn't possibly have a child with the dominant trait.

Electrophoresis – method of identifying sections of DNA using gel. The results, shown as bands, are used to compare DNA of individuals – looking for similarities.

Example:	Evidence	Suspect 1	Suspect 2
	_____		_____
	_____	_____	_____
	_____	_____	_____

The DNA bands show that suspect 2 more closely matches the DNA evidence.

Natural Selection and Evolution
Evidence for evolution:
Fossils, homologous (similar) structures, vestigial (no longer used) structure, DNA, Embryos

Darwin – theory of natural selection
In nature, animals overproduce offspring.
The surviving offspring have variations.
Some variations are an advantage in a particular environment.
The organisms with the best variations will successfully reproduce and pass of these good traits.
Eventually, the new offspring will look different from the ancestors.
Over time, variations can become adaptations.
It is a gradual process and does not occur in individuals!!!
Ex- Certain fish in a population of fish blend in while the orange ones are eaten by predators. The sand colored fish survive, find mates and pass on the good trait.

Adaptation- Changes over time
Structural- body parts (i.e.-shell)
Behavioral- migration
Physiological- chemicals- venom

Species- can reproduce and produce offspring that can reproduce
New species can develop as a result of
- Geographic isolation- separation over time
- Adaptive radiation- divergent evolution- one species spreads out and changes to suit its new environment.

Classification

Living things are organized using Binomial Nomenclature- 2 part latin
Names- genus and species e.g.,- *Homo sapien*
5 Kingdoms of life

- Monera- unicellular, bacteria
- Protist- unicellular, ameba
- Fungi- usually multicelluar, yeast, mushroom, lives off other living things
- Plant- usually multicellular, photosynthesis
- Animal- multicellular, consumers

Organization:
Kingdom, Phylum, Class, Order, Family, Genus, Species.

Populations

A population is a group of the organisms of the same species that occupy a certain area.
Population growth can be measured by sampling and charting the data.
Biotic potential- a population grows without limits- a J curve.
Carrying capacity- a population grows steadily but is limited by a limiting factor. It is the greatest number of individuals that can be supported in an environment under certain conditions; makes an S curve.
Limiting factors can be density dependent- more crowded- the worse conditions get.
Ex- food supply, predators, disease.
Limiting factors can be density independent- crowds don't matter.
Ex- natural disasters, environmental changes

Ecosystems

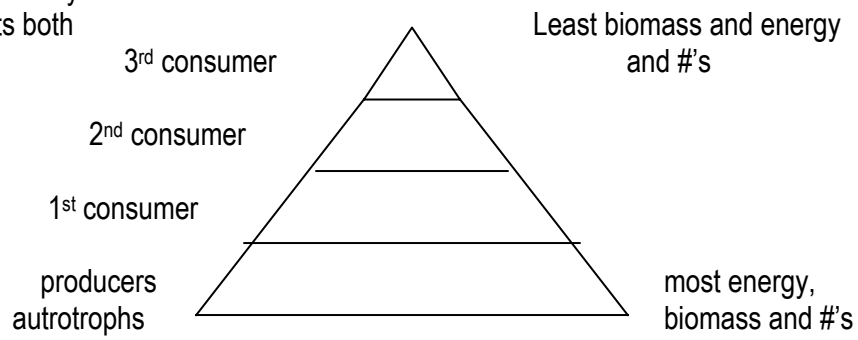
An ecosystem is made up of all of the biotic (living) and (nonliving) things in an environment
Producers- autotrophs- plants- make their own food by photosynthesis
Consumers- heterotrophs- rely on producers for life. Include animals, decomposers, and scavengers
Food chain- shows a simple food relationship and energy flow

Sun	→	plant	→	mouse	→	snake	→	hawk
Energy		Producer		1st consumer		2nd consumer		3rd consumer

A food web is complex, showing how different organisms feed off of the same foods and are connected. Any change in the web can affect many others.

A trophic level is feeding step. These steps are shown on a Pyramid of Energy (or Biomass or Numbers). This pyramid shows how the members of a food chain are organized by available energy, mass, and actual number. The greatest of all of these is found on the 1st trophic level made up of producers. Only 10% of the sun's energy is transferred because most is lost as heat.

Herbivore- plant eater- 1st consumer
Carnivore- Meat only
Omnivore- eats both



Cycles

Carbon cycle- Carbon is released during respiration, burning of fossil fuels, burning of trees and as decomposers break down dead organisms.
Carbon is used by plants to do photosynthesis.
The carbon is recycled continuously and is not lost.

Nitrogen cycle- Nitrogen makes up most of the air it is not a usable form for plants.
Bacteria can fix nitrogen to make it available for plants. Nitrogen is also released as decomposers break down dead organisms. The nitrogen is then recycled into the soil. Nitrogen is released in animal urine and waste. Animals take in nitrogen through food. Nitrogen is continuously recycled.

Succession

Succession- the natural changes and species replacements that take place in the communities of an ecosystem. Succession occurs in stages, some species move in as others die out.
Primary succession- the colonization of barren land by communities of organisms. Primary succession takes place where there are no living organisms -i.e., land after a lava flow. The 1st species to arrive is the pioneer species. They land is soon populated with other species.
A climax community is a mature stable community that undergoes little or no change- may take hundreds of years to form.
e.g., rock---moss---small plants, fungi,---soil builds---seeds arrive—trees
Secondary succession- a sequence of changes occurring after a natural disaster or other disruption affects an existing community. It differs than primary because soil already exists- less time is taken to reach a climax community.
Ex- fire in Yellowstone park wipes out all the large pine trees in the park.
Without the large pine trees, wild flowers grew.
Over time, grasses and then pine seedlings grow in the park again.

Miscellaneous Information to Know

Vitamins

A- prevents night blindness- fatty oily foods-, is fat soluble and stored in body (liver)
C- prevents scurvy- citrus fruits, is water soluble, not stored
D- prevents rickets- sources: milk, eggs, sun, stored
K- helps the blood clot- spinach, green leafy veggies, grains, stored

Some enzymes need a helper vitamin called a coenzyme to put together or take apart molecules. They are reusable.

Major Body Systems

Respiratory system- involves the exchanges of oxygen and carbon dioxide.
Circulatory system- involved in transporting oxygen and picking up carbon dioxide as waste. Also transports nutrients to the cells and picks up wastes.
Endocrine system- involved in the production of hormones.
Digestive system- involves the mechanical and chemical breakdown of food so that it can be transported to the cells.
Skeletal system- bones and their connections that allow movement

Scientific Notation: Used to express very large or small measures
$1.0 \times 10^{5} = 100{,}000$ – move 5 decimal places right (There are 5 zeroes)
$1.0 \times 10^{-5} = 0.00001$- Move 5 decimal places left

- Magnification with a microscope- Which is actually larger?
- Movement of the slide vs. what is seen in the microscope.

Biology HSA Student Resource Book Evaluation Form

This form is to be used by individual teachers to provide a reaction to the curriculum guide currently being used. At the end of each unit taught or after teaching from the entire document, please complete the form and send it to the Coordinating Supervisor of Special Area Programs, Department of Curriculum and Instruction, ISSC Building. Your input is necessary in order to assess what revisions must be made in the document. Thank you for helping to review and revise your curriculum so that it is meaningful to your teaching.

PGIN: 7690-3638

Biology HSA Student Resource Book
Name of Document

_____
Name of Unit/Chapter Evaluated

_____ _____
Instructional/Grade Level Publication Date

1. In-service was received on this publication. Yes _____ No _____
2. The in-service was (adequate, inadequate) for using this document.
3. Teachers could use further in-service on the following topics/chapters/units:

   _____

   _____
4. The errors/omissions noted in the document are on page(s)_____

   _____
5. The best written and most helpful sections or pages of this document are:

   _____

   _____
6. Information needs to be revised on the following:

   _____

   _____
7. The attached material (outline, lesson plan, etc.) should be added to the document.

   _____
8. Did the format of the guide make it easy to use? Yes _____ No _____

9. What changes would you like to see included? _____

   _____

10. Do the lessons contain realistic teaching time frames? Yes _____ No _____
11. Are there a sufficient number of teaching lessons/activities? Yes ____ No ____
12. Are there a sufficient number of available resources listed? Yes ____ No ____
13. Was the content appropriate for the level of teaching? Yes ____ No _____
14. Does the content adequately provide for Title IX (sex equality) guidelines?

    Yes ____ No ____

15. Does the content adequately provide for inclusion of information about

    multi-cultural and multiracial relationships? Yes ____ No ____

16. The following suggestions would improve this document: _____

    _____

    _____

    _____

    _____

Name (if desired) _____

School _____