# *Resource Guide* to the Arkansas Curriculum Framework for Students with Disabilities for Tenth Grade Science

Summer 2007
Amended 2009

## Purpose and Process

The Individuals with Disabilities Education Act and No Child Left Behind mandate that schools provide access to the general education curriculum for all students receiving special education services. In recognizing the challenge of providing opportunities for students with disabilities to access general education curriculum, it is the desire of the Arkansas Department of Education to assist educators with this process. The goal is to assist school personnel who serve children with disabilities in conceptualizing, planning, and implementing activities that are aligned to the Arkansas Curriculum Framework.

The following document contains ideas for linking activities to the same science framework used for the general education curriculum. When selecting appropriate activities, decisions must be based on individual student needs and abilities. Collaboration with science personnel will provide assistance in linking science curriculum with the State framework. The Arkansas Alternate Portfolio Assessment must align to the Arkansas Curriculum Framework. Specifically, the Tenth Grade Science Portfolio Assessment for Students with Disabilities must align with the same Biology content standards upon which other tenth grade students are assessed. The Tenth Grade Science Portfolio Assessment must contain one entry from each of the nine content standards that are embedded in the four strands for Biology listed below.

Science Curriculum Framework

Biology Strands:

- Molecules and Cells (3 content standards)
- Heredity and Evolution (3 content standards)
- Classification and the Diversity of Life (1 content standard)
- Ecology and Behavioral Relationships (2 content standards)

In May 2007, the Arkansas Department of Education convened a task force of general education science teachers, teachers of students with disabilities, and administrators to collaborate and develop the following resource guide to be used to help with the process of developing a tenth grade science portfolio assessment for students with disabilities not accessing Biology or any equivalent course.

The committee identified which student learning expectations (SLEs) from the Arkansas Biology Science Curriculum Framework would be appropriate to include in this resource guide. Each SLE was evaluated by the committee to determine the essence of learning. Using the essence of the SLE, different levels of complexity of learning were written and organized within a matrix from least complex to most complex. This allows students to have access to the same content standards. Ideas for corresponding sample activities were also included. Each individual student's abilities must first be considered when selecting ideas from this guide. Augmentative communication equipment and/or other adaptations should be used to make accommodations for students who require them to meet the SLE. Teachers will need to use creativity in adapting the suggested activities to meet students' individual needs.

Although this publication is not intended for generating specific test item activities for the Arkansas Alternate Portfolio System for Students with Disabilities, its purpose is to provide Arkansas educators with a process for determining alignment between models of education that have been to some extent separate. Using the activities as idea starters, the educators can then individualize and develop specific activities that align with the education program, demonstrate performance of skills, and document educational opportunities. The members of the committee do not intend this publication to be used as a checklist, a menu of alternate assessment "test activities or items," or as Individualized Education Plan (IEP) goals and objectives. The resources listed in this document are meant to give teachers some ideas of ways to access materials for teaching science to students with disabilities. This is not an exhaustive list and Web sites may change over time.

***COMMITTEE MEMBERS***

| ***Science Educators*** | ***Special Educators*** |
|---|---|
| Betty Van Devender, Beebe School District | Ruth Eyres, Little Rock School District |
| Felecia Doster, Warren School District | Sheryl Farris, Springdale School District |
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# Biology

| Strand | Content Standard |
|---|---|
| Molecules and Cells | |
| | 1. Students shall demonstrate an understanding of the role of chemistry in life processes. |
| | 2. Students shall demonstrate an understanding of the structure and function of cells. |
| | 3. Students shall demonstrate an understanding of how cells obtain and use energy *(energetics*). |
| Heredity and Evolution | |
| | 4. Students shall demonstrate an understanding of *heredity*. |
| | 5. Students shall investigate the molecular basis of genetics. |
| | 6. Students shall examine the development of the *theory* of *biological evolution.* |
| Classification and the Diversity of Life | |
| | 7. Students shall demonstrate an understanding that organisms are diverse. |
| Ecology and Behavioral Relationships | |
| | 8. Students shall demonstrate an understanding of ecological and behavioral relationships among organisms. |
| | 9. Students shall demonstrate an understanding of the ecological impact of global issues. |

***** changes made due to alignment study requested by USDOE in January 2009

| **Molecules and Cells** | **Content Standard 1:**<br>Students shall demonstrate an understanding of the role of chemistry in life processes. | | | | |
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| ***Student Learning Expectation*** | ***Essence of Student Learning Expectation*** | ***Less Complex*** → | | | ***More Complex*** |
| MC.1.B.1 Describe the structure and function of the major organic molecules found in living systems:<br>• *carbohydrates*<br>• *proteins*<br>• *enzymes*<br>• *lipids*<br>• *nucleic acids*<br><br>**Resources: United Streaming** | *Describe the structure and function of organic molecules in living things | Group foods as starches (carbohydrates), fats (lipids), and proteins<br><br>*Example:<br>Use pictures or actual food to sort and classify foods by primary nutrient (e.g., bread is a carbohydrate, chicken is a protein) | *Compare examples of carbohydrates, lipids, and proteins to their functions<br><br>*Example:<br>Using two identical sets of pictures of various foods, create two posters; on the first poster, group the foods as carbohydrates, lipids, or proteins; on the second poster, group the same foods by function: stored energy (lipids), quick energy (carbs), proteins (build muscle); compare the type of food to its function | *Apply knowledge of organic molecules (carbohydrate, lipid, protein) to foods<br><br>*Example:<br>Record a food diary; identify the organic compounds found in the foods eaten (some foods may contain more than one group); Relate foods to functions in the body (e.g., chart with words or pictures)<br><br>**see Appendix** | *Describe the structure of organic molecules (carbohydrate, lipid, protein) and their functions<br><br>*Example:<br>Create chart comparing elements found in carbohydrates, lipids, and proteins<br><br>**see Appendix** |

| **Molecules and Cells** | **Content Standard 1:**<br>Students shall demonstrate an understanding of the role of chemistry in life processes. | | | | |
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| MC.1.B.3 Investigate the properties and importance of water and its significance for life:<br>• surface tension<br>• *adhesion*<br>• *cohesion*<br>• *polarity*<br>• *pH* | *Investigate why the properties of water are important to life | Determine the effects of water on living things<br><br>Example:<br>Using two (2) plants, water one plant, do not water the other; record observations of both plants | *Investigate the properties of water and relate to a function in living things<br><br>*Example:<br>Conduct penny activity demonstrating surface tension and cohesion of water<br><br>**See Appendix** | *Investigate the properties of water and relate to a function in living things<br><br>*Example:<br>Conduct celery activity demonstrating adhesion and cohesion<br><br>**See Appendix** | *Research the effects of water deprivation on living things<br><br>*Example:<br>Respond to one or more writing prompts (e.g., investigate the effects of prolonged dehydration on the human body) |

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| MC.1.B.4 Explain the role of energy in chemical reactions of living systems:<br>• *activation energy*<br>• *exergonic reactions*<br>• *endergonic reactions* | Describe how energy can be taken in or given off in living systems | *Identify food as a source of chemical energy for animals and humans<br><br>*Example:<br>Match pictures of food to pictures of appropriate animals (e.g., grass-cow, lion-antelope)<br><br>**Resources: AGFC** | *Recognize that food contains chemical energy which is measured in calories<br><br>*Example:<br>Collect nutrition labels from a variety of foods; group labels from least energy to most energy (calories)<br><br>**Resources: Energy** | *Compare the number of calories in several foods to the number of calories burned during common activities<br><br>*Example:<br>Create a poster or other visual comparing calories in foods to amount of exercise needed to "burn" those calories<br><br>**Resources: Energy** | Demonstrate how food has energy to produce heat<br><br>Example:<br>Burn potato chips or peanuts in a soda can oven and describe what is happening with the energy<br><br>**Resources: Scientific American website, Diagram** |

| **Molecules and Cells** | **Content Standard 2:** Students shall demonstrate an understanding of the structure and function of cells. | | | | |
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| ***Student Learning Expectation*** | ***Essence of Student Learning Expectation*** | ***Less Complex*** → | | | ***More Complex*** |
| MC.2.B.1 Construct a hierarchy of life from cells to *ecosystems*<br><br>**Resources: United Streaming** | Depict the progression of life from cells to ecosystems | Sequence the progression of life<br><br>*Example:<br>Sequence pictures | Demonstrate the progression of life<br><br>Example:<br>Create a picture book/flip book; use clear transparencies to layer the progression of life:<br>1st sheet-cell<br>2nd sheet-tissue<br>3rd sheet-organ<br>4th sheet-organ system<br>5th sheet-body | Illustrate progression from cell to ecosystem<br><br>*Example:<br>Make a graphic map (picture line) that shows progression from cell to ecosystem to include any or all of the following: cell, tissue, organ, system, organism, population, community, ecosystem | Model an ecosystem<br><br>Example:<br>Construct a diorama of an ecosystem and label the various levels<br><br>**Resources: Ecology** |

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| MC.2.B.2 Compare and contrast *prokaryotes* and *eukaryotes* | Compare cells with and without a nucleus | Recognize cells with and without a nucleus<br><br>Example:<br>Place hair gel in two (2) sandwich bags; place a marble in one bag; student recognizes one bag represents a cell without a nucleus and one bag represents a cell with a nucleus | Identify cells with and without a nucleus<br><br>Example:<br>Take two (2) half cored oranges and fill each with gelatin adding a grape to one; student identifies which represents a cell with or without a nucleus | Develop and identify models of a cell with and without a nucleus<br><br>Example:<br>Use various colors of modeling clay, create and label cell models with and without a nucleus | Compare cells with and without a nucleus<br><br>Example:<br>Observe cells using a microscope or internet Web site and record results on lab sheet<br><br>**Resources: Cells Alive Web site** |

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| MC.2.B.4 Relate the function of the *plasma* (*cell) membrane* to its structure<br><br>**Resources: Cells; United Streaming** | *Demonstrate the role of the cell membrane | *Demonstrate that the cell membrane allows certain materials to pass in and out of the cell<br><br>Example:<br>Use a mesh laundry bag to demonstrate a cell membrane--mesh bag allows water and detergent in and keeps other clothes in the washing machine out; boil-in-bag rice that allows water to enter, but keeps rice inside | Demonstrate the function of the cell membrane by using common materials<br><br>Examples:<br>Common materials may include fish net, colander, slotted spoon, sifter, window screen | Illustrate the role of the cell membrane<br><br>Examples:<br>Make tea or coffee to demonstrate how the granules stay in the bag and the water penetrates, then describe how this process compares to a cell membrane | *Demonstrate the movement of material across the cell membrane<br><br>Examples:<br>Using dialysis tubing filled with glucose/starch, tie the tubing and place in water for one hour or more; test the water for simple sugar by dropping Benedict solution/iodine in the water; if the water changes color, it is a positive for sugar/starch<br><br>**Resources: Lab Descriptions** |

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| MC.2.B.5 Compare and contrast the structures of an animal cell to a plant cell<br><br>**Resources: Cells** | *Demonstrate differences between animal and plant cells | *Demonstrate common structures found in both plant and animal cells (cell membrane, cytoplasm, nucleus)<br><br>*Example:<br>Using a picture of an animal cell and a picture of a plant cell, identify structures the cells have in common | *Create plant and animal cell models<br><br>*Examples:<br>Craft foam, edible cell models, colored felt<br><br>(plant cell model should include chloroplast, cell wall, and large vacuole) | Compare and contrast plant and animal cells<br><br>Examples:<br>Create a Venn diagram using gallon bags divided into three (3) sections, placing like items in the center section and different items in the outer sections; create a paper Venn diagram<br><br>**See Appendix** | Analyze the differences between plant and animal cells<br><br>*Examples:<br>Observe cells through a microscope and record findings on a lab sheet (plant cell - elodea and animal cell -cheek); draw both a plant and animal cell and label cell structures on both; create a T-chart to compare cell structures; observe plant and animal cells (e.g., video, pictures) and complete observation chart<br><br>**See Appendix** |

| **Molecules and Cells** | **Content Standard 2:** Students shall demonstrate an understanding of the structure and function of cells. | | | | |
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| MC.2.B.6 Compare and contrast the functions of *autotrophs* and *heterotrophs*<br><br>**Resources: Ecology** | Compare and contrast what producers and consumers do in an ecosystem | Identify producers and consumers<br><br>*Example:<br>Create a visual by grouping pictures of organisms that use energy from the sun (producers) and organisms that get energy directly from plants or animals (consumers) | Determine consumers and producers in a system<br><br>*Example:<br>Create a balanced classroom terrarium identifying both consumers and producers | Classify consumers and producers in an ecosystem<br><br>Example:<br>Take photos of organisms in the environment (e.g., flowers and bees) then use the photos to create a page/poster about of consumers and a page/poster about producers | Create and label examples of interactions between producers and consumers<br><br>Example:<br>Create a biome in a box or a diorama that shows labeled consumers and producers in action (e.g., deer eating grass) |

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| MC.2.B.11 Discuss *homeostasis* using *thermoregulation* as an example | *Demonstrate how organisms maintain body temperature | *Demonstrate the importance of organisms maintaining their temperature<br><br>*Example:<br>Take and record the temperature of every student in the room over a period of time and chart the results to demonstrate regulation of body temperature | *Compare body temperatures<br><br>*Example:<br>Take and record the temperature of every student in the room over a period of time and graph the results, then discuss the results in relation to maintenance of body temperature | *Demonstrate how physical activity affects the regulation of body temperature<br><br>*Example:<br>Take student's temperature before and after physical activity (e.g., physical therapy and/or occupational therapy, walking to and from lunch, regular or adaptive physical education class) and use the data to create a chart comparing the before and after temperatures, then discuss the results | *Research methods that birds and mammals use to regulate their body temperature (e.g., blubber, thick fur, fluffing feathers, panting)<br><br>*Examples:<br>Write a report; create a poster or slide presentation |

| **Molecules and Cells** | **Content Standard 3:** Students shall demonstrate an understanding of how cells obtain and use energy *(energetics)*. | | | | |
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| ***Student Learning Expectation*** | ***Essence of Student Learning Expectation*** | ***Less Complex*** → | | | ***More Complex*** |
| MC.3.B.1 Compare and contrast the structure and function of *mitochondria* and *chloroplasts*<br><br>**Resources: United Streaming, Cells** | *Demonstrate how animal cells and plant cells get their energy | *Compare plant and animal cell structures that function in energy conversion<br><br>*Example:<br>Label chloroplasts and mitochondria on diagrams of animal and plant cells (mitochondria are located in both animals and plants, chloroplasts are located in plants only) | *Model the structure of chloroplasts and mitochondria in cells<br><br>*Example:<br>Create a simplified model of a plant cell highlighting chloroplasts and mitochondria and a simplified model of an animal cell highlighting mitochondria | *Compare and contrast the structure and function of mitochondria and chloroplasts<br><br>*Examples:<br>Create a Venn diagram or T-chart; write a paragraph | *Describe the relationship between mitochondria and chloroplasts in the functions of photosynthesis and cellular respiration<br><br>*Examples:<br>Create a flowchart or diagram; write a paragraph; experiment with oxygen production using Elodea and snail<br><br>**Resources: Cells**<br><br>**See Appendix** |

| **Molecules and Cells** | **Content Standard 3:** Students shall demonstrate an understanding of how cells obtain and use energy *(energetics)*. | | | | |
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| ***Student Learning Expectation*** | ***Essence of Student Learning Expectation*** | ***Less Complex*** → | | | ***More Complex*** |
| MC.3.B.3 Compare and contrast *aerobic* and *anaerobic respiration:*<br>▪ *lactic acid fermentation*<br>▪ alcoholic fermentation<br><br>**Resources: Lab Descriptions** | *Demonstrate cellular respiration with and without the use of oxygen | *Observe anaerobic (without oxygen) and aerobic (with oxygen) cellular respiration (mitochondria of plants and animals)<br><br>*Examples:<br>Shake milk and lemon juice together in a jar demonstrating lactic acid fermentation; complete a T-chart comparing fermentation to cellular respiration; bake Amish bread or fruitcake<br><br>**Resources: Recipe** | *Demonstrate the results of alcoholic fermentation (yeast) and cellular respiration (mitochondria of plants and animals)<br><br>*Example:<br>Sample experiment:<br>Ingredients<br>• 125 ml of warm water<br>• 60 ml of sugar<br>• soda bottle<br>• package of yeast<br>• balloon that fits neck of soda bottle<br>Combine sugar and water in the bottle, shake to mix, add yeast, quickly place a balloon over the neck of the bottle and agitate bottle for a few seconds, record results; compare results to cellular respiration in animals and plants<br>**Resources: Lab Descriptions** | *Record practical applications of aerobic and anaerobic respiration (e.g., making cheese or yogurt; sewage treatment, athletic endurance)<br><br>*Examples:<br>Watch video on how cheese is made and complete a listening sheet; contact American Dairy Council for information which can be used to create a student project<br><br>**Resources: United Streaming** | *Compare and contrast lactic acid fermentation, alcoholic fermentation and cellular respiration<br><br>*Example:<br>Create and label a poster with examples of cellular respiration, lactic acid fermentation, and alcoholic fermentation<br><br>**Resources: Lab Descriptions** |

| **Molecules and Cells** | **Content Standard 3:** Students shall demonstrate an understanding of how cells obtain and use energy *(energetics)*. | | | | |
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| ***Student Learning Expectation*** | ***Essence of Student Learning Expectation*** | ***Less Complex*** → | | | ***More Complex*** |
| MC.3.B.5 Compare and contrast *cellular respiration* and *photosynthesis* as energy conversion pathways | *Demonstrate how organisms produce and transfer energy | *Recognize that photosynthesis stores energy and cellular respiration releases energy for cell use<br><br>*Example:<br>Create visual comparing photosynthesis and cellular respiration<br><br>**See Appendix** | Determine the outcome of energy conversion in respiration and photosynthesis<br><br>*Example:<br>Sample experiment:<br>• place clear plastic bag over plant<br>• place plant in sunlight<br>• observe water collection in bag over 2-3 days<br>• chart results<br><br>(water is a by-product of cellular respiration)<br><br>**Resources: Lab Descriptions** | Interpret the results of cellular respiration<br><br>*Example:<br>Sample experiment:<br>• obtain seeds and soak overnight<br>• place potting soil in container with clear lid<br>• plant seeds in soil and cover with clear lid<br>• observe for several days and record the results<br><br>(water should collect on the bottom surface of the lid)<br><br>**Resources: Lab Descriptions** | Compare cellular respiration and photosynthesis<br><br>Examples:<br>Construct a Venn diagram; create a poster or slide presentation<br><br>**Resources: United Streaming** |

| **Heredity and Evolution** | **Content Standard 4:**<br>Students shall demonstrate an understanding of *heredity*. | | | | |
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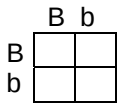
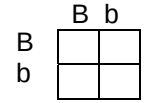
| ***Student Learning Expectation*** | ***Essence of Student Learning Expectation*** | ***Less Complex*** → | | | ***More Complex*** |
| HE.4.B.1 Summarize the outcomes of Gregor Mendel's experimental procedures<br><br>**Resources: Genetics, United Streaming** | *Compare dominant and recessive traits | Identify traits of plants and animals given real examples or photographs<br><br>*Example:<br>Identify traits, such as height, hair color, eye color, flower color<br><br>**Resources: Animals and Plants** | Sort plants or animals based on dominant and recessive traits given real examples or photographs<br><br>Examples:<br>Sort by tall/short, dark hair/light hair, dark eyes/light eyes | Distinguish traits as dominant or recessive<br><br>*Examples:<br>Give specific examples of dominant and recessive traits using pictures, charts, or case studies of various traits | *Explain how offspring acquire dominant and recessive traits (e.g., guinea pigs, pea plants)<br><br>*Example:<br>Create imaginary animal with dominant and recessive traits (Reebops activity)<br><br>**Resources: Genetics** |
| HE.4.B.3 Use the *laws* of probability and *Punnett squares* to predict *genotypic* and *phenotypic ratios*<br><br>**Resources: Genetics, United Streaming** | Predict appearance of organisms based on inherited genes | Identify inherited traits<br><br>Example:<br>Match offspring to parents using picture cards of living things (e.g., chick to chicken, puppy to dog) | Predict the appearance of offspring based on observation of parents<br><br>Example:<br>Use picture cards depicting various traits such as height, hair color, eye color, flower color | Predict appearance of offspring using manipulatives with a pre-constructed Punnett square<br><br>Example:<br>Use colored candy or checkers<br><br>  <br> | Complete a Punnett square to predict the appearance of offspring<br><br>Example:<br>  <br> |

| **Heredity and Evolution** | **Content Standard 4:**<br>Students shall demonstrate an understanding of *heredity*. | | | | |
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| HE.4.B.5 Analyze the historically significant work of prominent geneticists<br><br>**Resources: Genetics, United Streaming** | *Recognize major genetic discoveries that have had an impact on society | *Recognize major genetic discoveries and their impact on society<br><br>*Example:<br>Create a collage depicting genetic discoveries (e.g., DNA structure, Human Genome Project, genetically modified foods)<br><br>**Resources: Genetics** | *Recognize that major discoveries in genetics have occurred over time<br><br>*Example:<br>Create a timeline of major genetic discoveries (e.g., Mendel, Watson and Crick, Human Genome Project)<br><br>**Resources: Genetics** | Research a major discovery in genetics and its impact on society<br><br>*Examples:<br>Write a report; create a poster<br><br>**Resources: Genetics** | *Create a multi-media presentation outlining the genetic discovery of one major geneticist including the impact on society<br><br>**Resources: Genetics** |

| **Heredity and Evolution** | **Content Standard 5:**<br>Students shall investigate the molecular basis of genetics. | | | | |
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| ***Student Learning Expectation*** | ***Essence of Student Learning Expectation*** | ***Less Complex*** → | | | ***More Complex*** |
| HE.5.B.3 Compare and contrast the structure and function of *DNA* and *RNA*<br><br>**Resources: Genetics, United Streaming** | Identify the differences between DNA and RNA | Recognize DNA (double strand) and RNA (single strand) models<br><br>Examples:<br>Models made of licorice candy, pull and peel candy, yarn, string cheese | Distinguish between the appearances of DNA and RNA<br><br>Examples:<br>Sort materials by appearance such as a zipper, string, string cheese, fabric hook and loop fasteners, pull and peel candy | Depict or illustrate the appearances of DNA and RNA<br><br>*Example:<br>Label or assemble a model of DNA and RNA<br><br>**Resource: Genetics** | Make 3-D models of DNA and RNA and identify their functions<br><br>*Examples:<br>Design a puzzle; create model from marshmallows and toothpicks |
| HE.5.B.4 Describe and model the processes of replication, *transcription*, and *translation*<br><br>**Resources: Genetics, United Streaming** | Model DNA replication | Model DNA replication through physical movement<br><br>*Example:<br>Compare processes from daily routine, such as imitation of motor movements (cross-lateral movement) or calisthenics, to the process of DNA replication | *Model replication of DNA by using common items<br><br>*Example:<br>Make copies using carbon paper or fabric hook and loop fasteners and compare that to the process of DNA replication | *Model replication of DNA by repeating a pattern to create a two-dimensional model<br><br>*Example:<br>Using objects with four different colors and/or shapes, create two strands representing a DNA molecule, separate the two strands and use each strand to make a new strand (the result will be two double-stranded DNA models) | *Assemble a 3-D model of DNA replication using a prepared model or puzzle<br><br>Example:<br>Use index cards to make puzzle pieces<br><br>**Resources: Genetics** |

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| HE.5.B.6 Identify effects of changes brought about by *mutations:*<br>• beneficial<br>• harmful<br>• neutral<br><br>**Resources: Genetics, United Streaming** | Identify the effects of changes in DNA | *Recognize that mutations are changes in DNA<br><br>*Example:<br>Using a DNA model (e.g., colored paper, colored candies or marshmallows) remove or change a section to represent a mutation; take before and after pictures | Identify harmful or beneficial changes<br><br>*Example:<br>Group examples of changes caused by mutations as either beneficial (e.g., animal or plant camouflage, larger fruit or flowers in plants) or harmful (e.g., sickle-cell anemia, cystic fibrosis, antibiotic resistant bacteria)<br><br>Note: Resistance to antibiotics is helpful to bacteria, but harmful to humans. | Distinguish among mutations in living things as beneficial, harmful, or neutral<br><br>*Example:<br>Create a visual (e.g., poster, slide show) comparing effects of harmful mutations (e.g., sickle-cell anemia, cystic fibrosis, antibiotic resistant bacteria) and beneficial mutations (e.g., animal or plant camouflage, larger fruit or flowers in plants) | *Research a genetic disorder caused by a mutation<br><br>*Examples:<br>Write a report; create a poster or slide show presentation |

| **Heredity and Evolution** | **Content Standard 6:** Students shall examine the development of the *theory* of *biological evolution.* | | | | |
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| ***Student Learning Expectation*** | ***Essence of Student Learning Expectation*** | ***Less Complex*** → | | | ***More Complex*** |
| HE.6.B.1 Compare and contrast Lamarck's explanation of *evolution* with Darwin's *theory* of *evolution* by *natural selection*<br><br>**Resources: Evolution** | Recognize how organisms change over time | *Describe changes in organisms that have taken place over time<br><br>*Example:<br>Compare pictures of fossils to present-day animals (e.g., elephant, horse, whale) | *Organize pictures of an organism's evolutionary history<br><br>*Example:<br>Organize pictures showing how a species of animal has changed over time (e.g., whale, horse, birds) | *Create a picture timeline of an organism's evolutionary history<br><br>*Example:<br>Create a timeline showing the evolution of an animal (e.g., whale, horse, birds) | *Compare and contrast Lamarck's explanation and Darwin's Theory of Evolution<br><br>*Examples:<br>Compare using Venn diagram or T-chart |
| HE.6.B.3 Analyze the effects of *mutations* and the resulting *variations* within a *population* in terms of *natural selection*<br><br>**Resources: Evolution** | Recognize how natural selection results in variations within populations | Recognize that populations vary<br><br>*Example:<br>Group pictures of various species into an appropriate population (e.g., different breeds of dogs, horses, cows, cats) | Identify changes that occur in organisms for survival<br><br>Example:<br>Use pictures of organisms that show camouflage, mimicry, other adaptations | Compare traits that allow natural selection<br><br>Example:<br>Compare two animals and identify traits that enable them to survive in their environment | Analyze adaptations needed for natural selection<br><br>Example:<br>Select pictures of terrestrial animals and describe or draw changes that would allow the animals to adapt to life in water |

| **Heredity and Evolution** | **Content Standard 6:**<br>Students shall examine the development of the *theory* of *biological evolution.* | | | | |
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| ***Student Learning Expectation*** | ***Essence of Student Learning Expectation*** | ***Less Complex*** → ***More Complex*** | | | |
| HE.6.B.4 Illustrate *mass extinction* events using a time line<br><br>**Resources: Evolution, Mass Extinction** | Identify events of mass extinction over time | Recognize that mass extinction is the loss of a species<br><br>*Example:<br>Using pictures, create a timeline depicting time before and after the mass extinction of the dinosaurs | Identify species on Earth that have become extinct<br><br>Examples:<br>Dinosaurs, saber-tooth cats, wooly mammoth, dodo bird | Depict mass extinction events<br><br>*Example:<br>Create a timeline that depicts two or more mass extinction events | Research an extinct or endangered animal<br><br>*Examples:<br>Write a report; create a poster or slide show presentation |

| **Heredity and Evolution** | **Content Standard 6:**<br>Students shall examine the development of the *theory* of *biological evolution.* | | | | |
|---|---|---|---|---|---|
| ***Student Learning Expectation*** | ***Essence of Student Learning Expectation*** | ***Less Complex*** → ***More Complex*** | | | |
| HE.6.B.5 Evaluate *evolution* in terms of evidence as found in the following:<br>• fossil record<br>• *DNA* analysis<br>• *artificial selection*<br>• morphology<br>• embryology<br>• viral *evolution*<br>• geographic distribution of related *species*<br>• *antibiotic* and *pesticide resistance* in various organisms<br><br>**Resources: Evolution, United Streaming** | Recognize that the theory of evolution is supported by evidence | Recognize that organisms leave proof of their existence<br><br>Examples:<br>Place a finger in mud or plaster, fingerprint; cooking activities that use moldings | Identify specific evidences of evolution<br><br>*Example:<br>Create a representation of how fossils can be found in various layers on the Earth's surface | Construct a model of a fossil<br><br>Examples:<br>Create drawing, clay model, or plaster model of a fossil | Research evidences of fossil records<br><br>*Examples:<br>Report on fossils found in Arkansas; create slide presentation on fossils found in Arkansas |

| **Classification and the Diversity of Life** | **Content Standard 7.** Students shall demonstrate an understanding that organisms are diverse. | | | | |
|---|---|---|---|---|---|
| ***Student Learning Expectation*** | ***Essence of Student Learning Expectation*** | ***Less Complex*** → ***More Complex*** | | | |
| CDL.7.B.2 Differentiate the characteristics of the six kingdoms:<br>• Eubacteria<br>• Archaea<br>• Protista<br>• *Fungi*<br>• Plantae<br>• Animalia<br><br>**Resources: Classification** | *Categorize organisms based on the characteristics of the six kingdoms | Identify different kingdoms<br><br>*Example:<br>Match pictures of organisms to the correct kingdom, based on its characteristics (e.g., tree to plant kingdom, dog to animal kingdom, mushroom to fungi kingdom)<br><br>**Resources: AGFC** | Match organisms to their correct kingdom based on common characteristics<br><br>Examples:<br>Use question & answer, quiz game, matching game | Place appropriate organisms in their corresponding kingdom based on common characteristics<br><br>*Example:<br>Design photo pages of organisms using pictures taken on campus; group and label according to kingdom | *Create a model of a new organism and justify its inclusion into an existing kingdom based on common characteristics<br><br>*Examples:<br>Create model using cardboard, chenille wire, clay, plaster, or multimedia slide |

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|---|---|---|---|---|---|
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| CDL.7.B.4 Classify and name organisms based on their similarities and differences applying *taxonomic nomenclature* using *dichotomous keys*<br><br>**Resources: Classification** | Recognize similarities and differences of organisms by using a classification key | Determine organisms can be classified by similarities and differences by use of a one step key<br><br>*Example:<br>Use pictures with yes or no answer key | Classify an organism by using 3-4 step keys<br><br>Example:<br>Choose animals and classify them based on where they live (e.g., rain forest, ocean, livestock, zoo) | Classify a collection of organisms by using a classification key<br><br>*Examples:<br>Make leaf collection, insect collection, seed collection, wildflower collection | *Design a classification key<br><br>*Example:<br>Create a key to identify common objects (e.g., eraser, pencil, paperclip, marble, donuts)<br><br>**Resources: Classification** |
| CDL.7.B.5 Investigate Arkansas' *biodiversity* using appropriate tools and *technology*<br><br>**Resources: Ecology** | *Investigate *biodiversity* in Arkansas | Identify trees and animals in Arkansas<br><br>*Examples:<br>Identify through campus field study or picture study (e.g., cardinal, gray squirrel, pine tree, oak tree) | Identify organisms native to Arkansas<br><br>Example:<br>Identify plants and/or animals native to Arkansas<br><br>**Resources: AGFC** | Categorize the biodiversity of Arkansas by state or regions<br><br>Example:<br>Scavenger hunt by state or region (e.g., fish animals, birds, plants)<br><br>**Resource: Arkansas State Parks** | Create a depiction of Arkansas biodiversity<br><br>Examples:<br>Create a mural or poster |

| **Classification and the Diversity of Life** | **Content Standard 7.** Students shall demonstrate an understanding that organisms are diverse. | | | | |
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| CDL.7.B.7 Evaluate the medical and economic importance of *viruses*<br><br>**Resources: Viruses, United Streaming** | *Describe the medical and/or economic importance of viruses | *Identify common viruses experienced by the class including medical and/or economic effects<br><br>*Example: Create a flowchart indicating cause and effect of viral disease (e.g., stomach viruses, colds, West Nile, chicken pox, influenza) | *Explain how easily viruses are spread including the medical and/or economic significance<br><br>Examples: Hand-washing technique using glitter-ball passed hand-to-hand (use make-up glitter)and complete Student Lab Activity Report; blow up balloon, place hole-punch pieces inside the balloon, pop the balloon and observe the spread of paper pieces then complete Student Lab Activity Report **(see Appendix)**<br><br>**Resources: County Extension Office (Body Walk Program) AR Dept. of Health** | Assess current news events related to viruses<br><br>Example: Make a scrapbook of current events relating to viruses | Research childhood diseases and vaccines<br><br>*Examples: Research sources (e.g., Internet, school nurse, guest speaker) to create a report, slide presentation, or poster |

| **Classification and the Diversity of Life** | **Content Standard 7.**<br>Students shall demonstrate an understanding that organisms are diverse. | | | | |
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| CDL.7.B.8 Compare and contrast life cycles of familiar organisms<br>▪ sexual reproduction<br>▪ asexual reproduction<br>• metamorphosis<br>• *alternation of generations*<br><br>**Resources: United Streaming, Reproduction** | Describe how organisms reproduce and develop | Sequence different metamorphic organisms<br><br>Examples:<br>Ladybugs, frogs, butterflies | Illustrate types of asexual reproduction<br><br>Example:<br>Create a visual of one or more asexual processes (e.g., budding, regeneration, binary fission, vegetative propagation) | Distinguish different steps of fertilization<br><br>Example:<br>Label the steps in the fertilization of an egg | Compare and contrast sexual and asexual reproduction<br><br>Example:<br>Create a Venn diagram |

| **Classification and the Diversity of Life** | **Content Standard 7.** Students shall demonstrate an understanding that organisms are diverse. | | | | |
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| ***Student Learning Expectation*** | ***Essence of Student Learning Expectation*** | ***Less Complex*** → | | | ***More Complex*** |
| CDL.7.B.17 Describe the structure and function of the major parts of a plant:<br>▪ roots<br>▪ stems<br>▪ leaves<br>▪ flowers<br><br>**Resources: Plants** | *Identify the various parts of a plant and the corresponding function(s) | Examine a live plant and identify its parts<br><br>Examples:<br>Lily, zinnia, rose | Label the parts of a plant<br><br>Example:<br>See diagram in Appendix | Identify the function of each part of the plant. (root, stem, leaf, flower)<br><br>Example:<br>Label each plant part with the corresponding function(s) by playing pin the function on the plant game | Construct a model of a plant<br><br>Examples:<br>Create model using clay, paper, chenille wire, foam board, plaster, multimedia slide |
| CDL.7.B.19 Evaluate the medical and economic importance of plants<br><br>**Resource: Plants, United Streaming** | Explore the impact that plants have on our lives | Identify important plants that are used by humans<br><br>Examples:<br>Corn, potato, carrots, peas, cotton | Associate plant products with the plant source<br><br>*Examples:<br>Corn meal for human consumption or animal feed is made from corn; cloth for clothing or bedding is made from cotton | Identify plants that are economically important<br><br>*Examples:<br>Soybeans or cotton can be used to produce many products; cash crops, such coffee or rice are sold in markets | Research plants that are medically beneficial<br><br>Examples:<br>Aloe vera, chamomile or aspirin (willow tree) |

| **Classification and the Diversity of Life** | **Content Standard 7.** Students shall demonstrate an understanding that organisms are diverse. | | | | |
|---|---|---|---|---|---|
| ***Student Learning Expectation*** | ***Essence of Student Learning Expectation*** | ***Less Complex*** → | | | ***More Complex*** |
| CDL.7.B.22 Compare and contrast the major vertebrate classes according to their nervous, respiratory, excretory, circulatory, digestive, reproductive and integumentary systems<br><br>**Resources: United Streaming, Body Systems** | *Investigate the major body systems of vertebrates | *Recognize the major body systems of vertebrates<br><br>*Example: Outline the human body, include one body system, and label the major organs (e.g., digestive, respiratory) | *Match body systems to their major functions<br><br>Example: Use Internet activity to match body systems to their functions<br><br>**Resources: Body Systems** | Explain the function of body systems<br><br>Examples: Use graphic organizer or foldables | *Research and report information about the functions of various body systems<br><br>*Examples: Write a report; create a poster or slide presentation |

| **Ecology and Behavioral Relationships** | **Content Standard 8.** Students shall demonstrate an understanding of ecological and behavioral relationships among organisms. | | | | |
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| ***Student Learning Expectation*** | ***Essence of Student Learning Expectation*** | ***Less Complex*** → ***More Complex*** | | | |
| EBR.8.B.1 Cite examples of abiotic and *biotic factors* of *ecosystems*<br><br>**Resources: Ecology, United Streaming** | Identify living and nonliving things | Recognize living and nonliving things<br><br>Example:<br>Match or sort living/nonliving things using picture cards | Locate pictures or representations of living and nonliving things<br><br>Examples:<br>Scavenger hunt; find pictures in magazines | Collect examples of living and nonliving things<br><br>*Example:<br>Collect and label examples of living things (e.g., insects, leaves, wildflowers) and nonliving things (e.g., rocks, minerals, soil) | Model an ecosystem with living and nonliving things<br><br>Example:<br>Terrarium, aquarium, diorama |
| EBR.8.B.2 Compare and contrast the characteristics of *biomes*<br><br>**Resources: Ecology, United Streaming** | *Compare characteristics of biomes | *Recognize that there are a variety of biomes on Earth<br><br>*Examples:<br>Using pictures, group biomes by characteristics (e.g., hot-cold, dry-wet, trees-no trees) | Determine the types of biomes<br><br>*Examples:<br>Match pictures of biomes to the appropriate name; create a biome collage or notebook | Classify organisms to their biomes<br><br>Example:<br>Match plants and animals to the appropriate biome | Illustrate the characteristics of a biome<br><br>*Examples:<br>Create a representation of a biome (e.g., diorama, slide presentation, poster) |

| **Ecology and Behavioral Relationships** | **Content Standard 8.** Students shall demonstrate an understanding of ecological and behavioral relationships among organisms. | | | | |
|---|---|---|---|---|---|
| ***Student Learning Expectation*** | ***Essence of Student Learning Expectation*** | ***Less Complex*** → ***More Complex*** | | | |
| EBR.8.B.3 Diagram the carbon, nitrogen, phosphate, and water cycles in an *ecosystem*<br><br>**Resources: Ecology** | Illustrate ecosystem cycles | Recognize that materials move in a system<br><br>Example:<br>Measure and record the evaporation of water over time | Describe an example of movement of materials<br><br>Example:<br>Chart precipitation patterns | Sequence the steps of an ecosystem cycle<br><br>Examples:<br>Magnets, pictures, skit | Illustrate the steps in an ecosystem cycle<br><br>Example:<br>Diagram one or more of the listed cycles |
| EBR.8.B.4 Analyze an *ecosystem's* energy flow through food chains, food webs, and *energy pyramids*<br><br>**Resources: Ecology, United Streaming** | Recognize how energy flows through an ecosystem | Recognize that organisms need energy<br><br>Example:<br>Students respond to questions (e.g., Why do you need to eat? Why do plants need water and sunlight?) | Demonstrate the linear flow of energy in living things<br><br>Example:<br>Construct a food chain | Distinguish between producers and consumers<br><br>Examples:<br>Sort pictures; create T- chart or Venn diagram | Describe complex energy flow among living things in an ecosystem<br><br>Example:<br>Construct a food web indicating the flow of energy through an ecosystem |

| **Ecology and Behavioral Relationships** | **Content Standard 8.** Students shall demonstrate an understanding of ecological and behavioral relationships among organisms. | | | | |
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| EBR.8.B.5 Identify and predict the factors that control *population*, including *predation*, *competition*, crowding, water, nutrients, and shelter<br><br>**Resources: Ecology** | Identify factors that control population size | Recognize basic needs of organisms<br><br>Examples:<br>Food, water, shelter, air, space | Recognize factors that limit population size<br><br>Example:<br>See camouflaged butterfly activity in Resources<br><br>**Resources: Ecology** | Predict the effect of factors on population growth<br><br>Examples:<br>Predator/prey relationships, mutualism, water supply, food supply, natural disasters | Analyze population growth<br><br>Example:<br>Construct a graph displaying change in population size over time |
| EBR.8.B.8 Identify the properties of each of the five levels of *ecology:*<br>• Organism<br>• *Population*<br>• *community*<br>• *ecosystem*<br>• *biosphere*<br><br>**Resources: Ecology, United Streaming** | Distinguish among the levels of ecology | Identify levels of ecology<br><br>Example: | Sequence the levels of ecology from specific to whole<br><br>Example:<br>Arrange pictures in order of ecological levels | Model the levels of ecology<br><br>Example:<br>Construct diagram displaying relationships existing among parts of an ecosystem | Examine levels of ecology<br><br>Example:<br>Mark off a three (3) square meter area outside, record examples of ecological levels within the area, and complete the Student Lab/Activity Report (see Appendix) |

| **Ecology and Behavioral Relationships** | **Content Standard 9.** Students shall demonstrate an understanding of the ecological impact of global issues. | | | | |
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| ***Student Learning Expectation*** | ***Essence of Student Learning Expectation*** | ***Less Complex*** → ***More Complex*** | | | |
| EBR.9.B.1 Analyze the effects of human *population* growth and *technology* on the environment/*biosphere*<br><br>**Resources: Ecology** | Describe effects that humans have on the environment | Recognize that humans affect the environment<br><br>Examples:<br>Pollution, global warming, picking up trash, recycling | Identify positive and negative human effects on the environment<br><br>Examples:<br>Construct a list of ways to conserve energy; create flyers and/or brochures | Predict the effects of human population growth on the environment<br><br>Examples:<br>Food shortage, loss of habitat, extinct species | Research positive/negative human impacts on the environment<br><br>Examples:<br>Create an informative poster, report, or multi-media presentation defending the protection of an endangered species |
| EBR.9.B.3 Assess current world issues applying scientific themes (e.g., global changes in climate, *epidemics*, *pandemics*, ozone depletion, UV radiation, natural resources, use of *technology*, and public policy) | Examine current science issues that affect the world | Recognize that science is in the news<br><br>Examples:<br>Create a scrapbook, bulletin board, or journal using newspaper articles | Identify a current world issue with a scientific theme<br><br>Example:<br>Classify articles or multimedia presentations around a particular scientific topic reported in the news | Describe a current world issue with a scientific theme<br><br>*Example:<br>Write and perform a skit | Research and report causes and effects of current world issues with scientific themes<br><br>*Examples:<br>Write report; create poster or slide presentation |

**Biology Glossary for Grade 10 Science**

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| Abiotic factor | Any nonliving component of an *ecosystem* (e.g., sunlight, air, water, soil) |
| Activation energy | The kinetic energy required to initiate a chemical reaction |
| Active transport | The movement of a substance across a plasma (cell) membrane against a concentration gradient |
| Adhesion | The property of sticking to some other substance |
| Aerobic respiration | Growing or metabolizing only in the presence of molecular oxygen |
| Alcoholic fermentation | The process by which pyruvic acid is converted to ethyl alcohol |
| Alleles | Alternate forms of a *gene* or *DNA* sequence, which occur on either of two homologous *chromosomes* in a diploid organism |
| Alternation of generation | Alternating sexual and asexual generation reproduction |
| Amino acid | Any of 20 basic building blocks of *proteins*--composed of a free amino (NH2) end, a free carboxyl (COOH) end, and a side group (R) |
| Anaerobic respiration | Growing or metabolizing only in the absence of molecular oxygen |
| Anaphase | Third phase of *mitosis*, beginning when sister *chromatids* separate from each other and ending when a complete set of daughter *chromosomes* have arrived at each of the two poles of the cell |
| Antibiotic resistance | The ability of a microorganism to produce a *protein* that disables an antibiotic or prevents transport of the antibiotic into the cell |
| Applied science | The practical use of scientific information to improve human life |
| Artificial selection | Breeding organisms by humans for specific phenotypic characteristics |
| Asexual reproduction | Nonsexual means of reproduction which can include grafting and budding |
| Autotroph | An organism that uses energy to synthesize organic molecules from inorganic substances |
| Bacteria | A single-celled, microscopic prokaryotic organism |
| Base pair (bp) | A pair of *complementary nitrogenous bases* in a *DNA* molecule |
| Biodiversity | The wide diversity and interrelatedness of earth organisms based on genetic and environmental factors |
| Biological *evolution* | Change in allele frequency of a *species* or *population* over time |
| Biome | A geographic area characterized by specific kinds of plants and animals |
| Biosphere | The area on and around Earth where life exists |
| Biotic factor | A living component of an *ecosystem* |
| Carbohydrates | Compound containing carbon, hydrogen, and oxygen in the approximate ratio of C:2H:O (e.g., sugars, starches, and cellulose) |

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| Cell cycle | The events of cell division; includes *interphase*, *mitosis*, and *cytokinesis* |
| Cellular respiration | The process by which cells generate ATP through a series of redox (chemical) reactions |
| Cell theory | The *theory* that all living things are made of cells, that cells are the basic units of organisms, and that cells come only from existing cells |
| Centromere | The central portion of the *chromosome* to which the spindle fibers attach during mitotic and meiotic division |
| Chloroplasts | A plastid containing chlorophyll; the site of *photosynthesis* |
| Chromatid | Each of the two daughter strands of a duplicated *chromosome* joined at the *centromere* during *mitosis* and *meiosis*. |
| Chromosome | A single *DNA* molecule, a tightly coiled strand of *DNA* |
| Chromosome theory of heredity | The *theory* that states that *genes* are located on *chromosomes* and that each *gene* occupies a specific place on a *chromosome* |
| Citric acid cycle (Kreb's) | Series of chemical reactions in *aerobic respiration* in which a acetyl coenzyme A is completely degraded to carbon dioxide and water with the release of metabolic energy that is used to produce ATP; also known as Kreb's cycle |
| Cladogram | A branching diagram that illustrates taxonomic relationships based on the principles of claudistics |
| Codominance | An inheritance relationship in which neither of two *alleles* of the same *gene* totally mask the other |
| Cohesion | The property of sticking together; like substances sticking together |
| Commensalism | The close association of two or more dissimilar organisms where the association is advantageous to one and doesn't affect the other(s) |
| Community | All the *populations* in one area |
| Cytokinesis | The division of cytoplasm of one cell into two new cells |
| Cytoskeleton | Framework of the cell composed of a variety of filaments and fibers that support cell structure and drive cell movement |
| Deletion | *Chromosome* abnormality in which part of the *chromosome* is missing; loss of one or more *base pairs* from *DNA* which can result in a frameshift |
| Dichotomous key (classification key) | Classification tool used in identifying organisms or materials |
| Diffusion | The process by which molecules move from an area of greater concentration to an area of lesser concentration |
| DNA (Deoxyribonucleic acid) | An organic acid and polymer composed of four *nitrogenous bases*--adenine, thymine, cytosine, and guanine; the genetic material of most organisms; exists as a double-stranded molecule held together by *hydrogen bonds* |
| Domain | Taxonomic category that includes one or more kingdom (e.g., Bacteria, Archaea, Eukarya) |
| Dominance | A characteristic in which an allele that expresses its *phenotype* even in the presence of a recessive allele |
| Double helix | The *DNA* molecule, resembling a spiral staircase in which the paired bases form the steps and the sugar-phosphate backbones form the rails |
| Ecology | The study of the interactions of organisms with their environment and with each other |
| Ecosystem | The organisms in a plant *population* and the biotic and *abiotic factor*s which impact on them |
| Electron transport chain | Series of chemical reactions in the thylakoid membrane or inner *mitochondrial* membrane during which hydrogens or their electrons are passed along with the release of energy |

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| Endergonic reaction | A reaction requiring a net input of free energy |
| Endocytosis | The process by which a cell surrounds and engulfs substances |
| Energetics | Use of energy |
| Energy pyramid | Summarizes interactions of matter and energy at each trophic level |
| Enzymes | *Proteins* that control the various steps in all chemical reactions |
| Epidemic | An outbreak of a contagious disease that spreads widely and rapidly |
| Eukaryote | An organism whose cells possess a *nucleus* and other membrane-bound vesicles, including all members of the protist, fungi, plant and animal kingdoms; and excluding *viruses*, bacteria, and blue-green algae |
| Evolution | The long-term process through which a *population* of organisms accumulates genetic changes that enable its members to successfully adapt to environmental conditions and to better exploit food resources |
| Exergonic reaction | A reaction that gives off free energy |
| Exocytosis | The process in which a vesicle inside a cell fuses with a cell membrane and releases its contents to the external environment |
| Frameshift mutation | A *mutation* that results in the misreading of the code during *translation* because of the change in the reading frame |
| Fungi | Microorganisms that lacks chlorophyll |
| Gamete | A haploid sex cell, egg or sperm, that contains a single copy of each *chromosome* |
| Gene | The functional unit of heredity; a locus on a *chromosome* that encodes a specific *protein* or several related *proteins* |
| Genome | The complete genetic material contained in an individual; the genetic complement contained in the *chromosomes* of a given organism, usually the haploid *chromosome* state |
| Genotype | The structure of *DNA* that determines the expression of a trait |
| Genus | A category including closely related *species*; interbreeding between organisms within the same category can occur |
| Germ Theory of Disease (Koch's Postulates) | A set of criteria used to establish that a particular infectious agent causes a disease |
| Glycolysis | A pathway in which glucose is oxidized to pyruvic acid |
| Heterotroph | An organism that obtains organic food molecules by eating organisms or their by-products |
| Homeostasis | The stable internal conditions of a living thing |
| Host | Animal or plant on which or in which another organism lives |
| Human Genome Project | A project coordinated by the National Institutes of Health (NIH) and the Department of Energy (DOE) to determine the entire *nucleotide* sequence of the human *chromosomes* |
| Hydrogen bond | A relatively weak bond formed between any hydrogen atom (which is covalently bound to a nitrogen or oxygen atom) and a nitrogen or oxygen with an unshared electron pair |
| Hypotheses | Statement or predictions that can be tested |
| Incomplete dominance | A condition where a heterozygous off- spring has a *phenotype* that is distinctly different from, and intermediate to, the parental *phenotypes* |

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| Independent assortment | The *law* stating that pairs of *genes* separate independently of one another in *meiosis* |
| Interphase | Period of time where a cell carries on metabolism and replicates *chromosomes* prior to cell division |
| Inversion | A *mutation* that occurs when a *chromosome* piece breaks off and reattaches in reverse orientation |
| k-strategist | *Species* characterized by slow maturation, few young, slow *population* growth and reproduction late in life |
| Karyotype | All of the *chromosomes* in a cell or an individual organism, visible through a microscope during cell division |
| Law | An observation that happens every time under a certain set of conditions |
| Lactic acid fermentation | The process by which pyruvic acid is converted to lactic acid |
| Light dependent | Reaction of *photosynthesis* that requires light; light energy is absorbed converted to chemical energy in the form of ATP and NADPH |
| Light independent | The fixing of carbon dioxide in a 3 carbon compound for use in sugar production or other end products |
| Lipid | Any of a group of organic compounds that are insoluble in water but soluble in nonpolar solvents; serve as energy storage and are important components of cell membranes |
| Lysogenic cycle | A type or phase of the *virus* life cycle during which the *virus* integrates into the *host chromosome* of the infected cell, often remaining essentially dormant for some period of time |
| Lytic cycle | A phase of the *virus* life cycle during which the *virus* replicates within the *host* cell, releasing a new generation of *viruses* when the infected cell lyses |
| Mass extinction | One of the brief periods of time during which large numbers of *species* disappeared |
| Meiosis | The reduction division process by which haploid *gametes* and *spores* are formed consisting of a single duplication of the genetic material followed by two mitotic divisions |
| Metaphase | Second phase of *mitosis* in which the *chromosomes* line up across the equator of the cell |
| Microbe | A microorganism |
| Mitochondria | *Organelles* that are the sites of *aerobic respiration* in eukaryotic cells |
| Mitosis | The replication of a cell to form two daughter cells with identical sets of *chromosomes* |
| Molecular biology | The study of the biochemical and molecular interactions within living cells |
| Molecular genetics | The branch of genetics that deals with the expression of *genes* by studying the *DNA* sequences of *chromosomes* |
| Multiple alleles | Three or more *alleles* of the same *gene* that code for a single trait |
| Mutation | An alteration in *DNA* structure or sequence of a *gene* |
| Mutualism | A form of *symbiosis* in which both organisms benefit from living together |
| Natural selection | The differential survival and reproduction of organisms with genetic characteristics that enable them to better utilize environmental resources |
| Nitrogenous bases | The purines (adenine and guanine) and pyrimidines (thymine, cytosine, and uracil) that comprise *DNA* and *RNA* molecules |
| Nonvascular plant | A plant that lacks vascular tissue and true roots, stems, and leaves |
| Nucleic acids | The two *nucleic acids*, deoxyribonucleic acid (*DNA*) and ribonucleic acid (*RNA*), are made up of long chains of molecules called *nucleotides* |
| Nucleotide | A building block of *DNA* and *RNA*, consisting of a nitrogenous base, a five-carbon sugar, and a phosphate group |

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|---|---|
| Nucleus | The membrane-bound region of a eukaryotic cell that contains the *chromosomes* |
| Organelle | A cell structure that carries out a specialized function in the life of a cell |
| Osmosis | The *diffusion* of water across a selectively permeable membrane |
| Parasitism | The close association of two or more dissimilar organisms where the association is harmful to at least one |
| Passive transport | The movement of substances across a plasma (cell) membrane without the use of cell energy |
| Pandemic | An epidemic over a wide geographic area and affecting an exceptionally high proportion of the population |
| Pathogen | Organism which can cause disease in another organism |
| Pesticide | A substance that kills harmful organisms (e.g., an insecticide or fungicide) |
| pH | Indicates the relative concentration of hydrogen ions and hydroxide ions in a substance |
| Pinocytosis | A type of *endocytosis* in which a cell engulfs solutes of fluids |
| Phagocytosis | A type of *endocytosis* in which a cell engulfs large particles or whole cells |
| Phenotype | The observable characteristics of an organism, the expression of *gene alleles* (*genotype*) as an observable physical or biochemical trait |
| Phospholipids | A class of *lipid* molecules in which a phosphate group is linked to glycerol and two fatty acetyl groups; a chief component of biological membranes |
| Photosynthesis | The process by which light energy is converted to chemical energy stored in organic molecules |
| Plasma (cell) membrane | A selectively permeable surface that encloses the cell contents and through which all materials entering or leaving a cell must pass |
| Point mutation | A change in a single *base pair* of a *DNA* sequence in a *gene* |
| Polarity | Molecules having uneven distribution of charges |
| Population | A local group of organisms belonging to the same *species* and capable of interbreeding |
| Primary succession | Succession that occurs in a newly formed habitat that has never before sustained life |
| Prokaryote | A bacterial cell lacking a true *nucleus*; its *DNA* is usually in one long strand |
| Prophase | First phase of *mitosis* in which duplicated *chromosomes* condense and mitotic spindle fibers begin to form |
| Protein | An organic compound composed of one or chains of polypeptides which in turn are formed from *amino acids* |
| Protein synthesis | A formation of *proteins* using information coded on *DNA* and carried by *RNA* |
| Pure science | The gathering of new information or the discovery of a new relationship or fact for sake of knowledge |
| Punnett square | A type of grid used to show the gametes of each parent and their possible offspring; a type of grid that can indicate all the possible outcomes of a genetic cross |
| Radioactive dating | A method of determining the age of an object by measuring the amount of a specific radioactive isotope it contains |
| Recessive gene | Characterized as having a *phenotype* expressed only when both copies of the *gene* are mutated or missing |
| Relative dating | A method of determining the age of fossils by comparing them to other fossils in different layers of rock |
| Ribosome | A sub-cellular structure that is the site of *protein synthesis* during *translation*. |
| RNA (ribonucleic acid) | An organic acid composed of a single strand of *nucleotide* that acts as a messenger between *DNA* and the *ribosomes* and carries out the process of *protein synthesis*: composed units of adenine, guanine, cytosine, and uracil |
| Secondary succession | The sequential replacement of *population* in a disrupted habitat |

| | |
|---|---|
| Segregation | The *law* stating that pairs of *genes* separate in *meiosis* and each *gamete* receives one *gene* of a pair |
| Sex influenced | Description of a trait that is caused by a *gene* whose expression differs in male and females; (e.g., male patterned baldness) |
| Sex linkage | The presence of a *gene* on a sex *chromosome*; (e.g., hemophilia, color-blindness) |
| Sexual reproduction | The process where two cells (*gametes)* fuse to form one hybrid, fertilized cell |
| Species | A classification of related organisms that can freely interbreed |
| Spore | A form taken by certain *microbes* that enables them to exist in a dormant stage. It is an asexual reproductive cell |
| Symbiosis | The close association of two or more dissimilar organisms where both receive an advantage from the association |
| Taxonomic nomenclature | The procedure of assigning names to the kinds and groups of organisms according to their taxa |
| Technology | Practical use of scientific information to improve the quality of human life: see also *applied science* |
| Telophase | Final phase of *mitosis* during which *chromosomes* uncoil, a nuclear envelope returns around the chromatin, and a nucleolus becomes visible in each daughter cell |
| Theory | A well tested explanation of natural events |
| Thermoregulation | The maintenance of internal temperature within a range that allows cells to function efficiently |
| Translation | The process of converting the genetic code in *RNA* into the *amino acid* sequence that makes up a *protein* |
| Transcription | Process in which *RNA* is made from *DNA* |
| Vaccine | A preparation of dead or weakened *pathogen* that is used to induce formation of antibodies or immunity against the *pathogen* |
| Variation | Differences in the frequency of *genes* and traits among individual organisms within a *population* |
| Vascular plants | A plant that has phloem and xylem |
| Virus | An infectious particle composed of a *protein* capsule and a nucleic acid core, which is dependent on a *host* organism for replication |

# Appendix

# Resources for Grade 10 Science Alternate Assessment

| Resource | Where to find it |
|---|---|
| Animals and Plants | Arkansas Game and Fish Commission (AGFC): http://www.agfc.com/education-class/programs.aspx<br>Plant and animal characteristics: http://www.epa.ie/researchandeducation/education/<br>Parts of a plant: http://www.primaryresources.co.uk/online/powerpoint/flower.ppt<br>http://its.guilford.k12.nc.us/webquests/plantquest/<br>http://www.uen.org/utahlink/activities/view_activity.cgi?activity_id=6988 |
| Body Systems | http://www.sciencenetlinks.com/interactives/systems.html<br>http://www.getbodysmart.com/<br>http://www.medtropolis.com/VBody.asp |
| Cells | http://pers.dadeschools.net/prodev/world_of_cells.htm<br>http://www.cellsalive.com/<br>http://www.usoe.k12.ut.us/curr/science/sciber00/7th/cells/sciber/cellcomp.htm<br>http://www.ecostudies.org/chp/Module1/1C8A_Aquatic_Interactions.pdf |
| Classification | Dichotomous Key: http://sciencespot.net/Media/sillysci.pdf<br>http://www.scribd.com/doc/9682508/Classification-Dichotomous-Key-Doughnut-Sort<br>http://watershed.csumb.edu/ron/roncor/cor/did.htm<br>Insects: http://sciencespot.net/Pages/kdzinsect.html<br>Kingdoms: http://www.ric.edu/ptiskus/Six_Kingdoms/Index.htm<br>Leaf collection: http://forestry.about.com/od/treeidentification/a/leaf_collection.htm |
| Cooperative Extension Service | http://www.uaex.edu/ |
| Ecology | Camouflaged Butterfly Activity: http://sftrc.cas.psu.edu/LessonPlans/Wildlife/AnimalCamouflage.html<br>Missouri Botanical Gardens: http://www.mbgnet.net/<br>How to make a terrarium: http://www.instructorweb.com/lesson/maketerrarium.asp<br>Biodiversity: http://www.naturalheritage.com/<br>State Parks: http://www.arkansasstateparks.com/<br>Food Chains and Biomes: http://www.picadome.fcps.net/lab/currl/food_chain/default.htm<br>http://www.thewildclassroom.com/biomes/biomes/index.html<br>http://www.harcourtschool.com/activity/food/food_menu.html<br>Cycles: http://www.kidzone.ws/water/<br>http://epa.gov/climatechange/kids/carbon_cycle_version2.html<br>Ecosystems: http://necsi.org/projects/evolution/co-evolution/pred-prey/co-evolution_predator.html<br>Human impact: http://www.census.gov/main/www/popclock.html<br>http://www.hobart.k12.in.us/jkousen/Biology/impact.html |

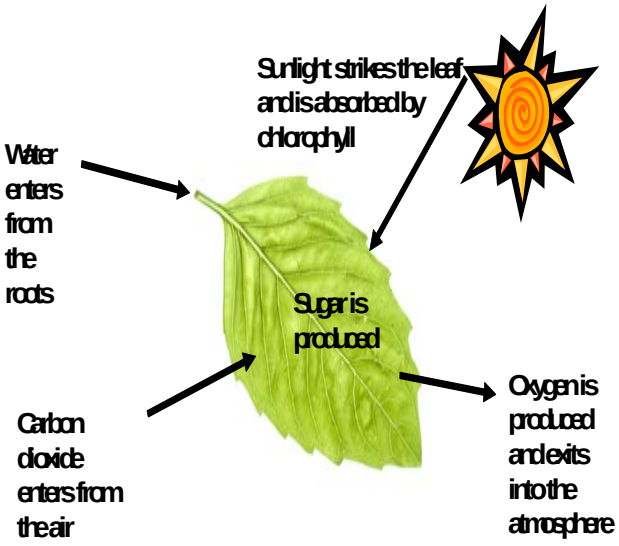
| | |
|---|---|
| Energy | Calories burned: http://www.tooelehealth.org/Community_Health/CVD/Calories_Burned.html<br>Learning about calories: http://kidshealth.org/kid/stay_healthy/food/calorie.html<br>How to read a nutrition label: http://www.cfsan.fda.gov/~dms/foodlab.html#twoparts<br>American Dairy Council Nutrition Games: http://www.adadc.com/index_files/EducatorsArea.html |
| Genetics | Interactive Genetics website: http://www.dnalc.org/home.html<br>Elementary genetics: http://www.ology.amnh.org/genetics/index.html<br>http://www.yourgenome.org/<br>Geneticists: http://www.pbs.org/wgbh/aso/databank/index.html<br>Punnett squares: http://www.emints.org/ethemes/resources/S00001476.shtml<br>DNA model: http://school.discovery.com/lessonplans/programs/modeldna/<br>Interactive DNA model: http://learn.genetics.utah.edu/units/basics/builddna/<br>Reebops: http://www.scpub.org/data//files/copyreebops-9742.pdf<br>Major discoveries in genetics: http://science.discovery.com/convergence/100discoveries/big100/genetics.html<br>Sickle cell anemia: http://school.discoveryeducation.com/lessonplans/programs/bodybydesign/<br>DNA model lesson: http://www.umaine.edu/nsfgk-12/images/PDFs/gumdrop.pdf<br>Build a DNA model: http://nobel.scas.bcit.ca/resource/dna/dna_sweets.htm |
| Lab Descriptions | Diffusion and other labs: http://www.biology-resources.com/biology-experiments2.html#Diffusion<br>Collecting water from a plant: http://scene.asu.edu/habitat/activities/leaf_transpiration.html<br>Anerobic Respiration (fermentation): http://www.lesaffreyeastcorp.com/SoY/educators.html<br>http://www.funsci.com/fun3_en/exper1/exper1.htm<br>Assorted: http://www.middleschoolscience.com/life.htm<br>http://www.madsci.org/<br>http://school.discovery.com/<br>http://powayusd.sdcoe.k12.ca.us/pusdcves/er_fourth.htm |
| Mass Extinction | http://dsc.discovery.com/earth/wide-angle/mass-extinctions-timeline.html |
| Properties of Water | Arkansas Project Wet:: http://www.adeq.state.ar.us/water/branch_planning/watershed_outreach_education/projectwet.htm<br>Iowa Project Wet: http://www.uni.edu/~iowawet/H2OProperties.html |
| Recipe | Amish Bread recipe: http://www.armchair.com/recipe/bake002.html |
| Reproduction | Asexual reproduction: http://biology.about.com/library/gallery/blhydra.htm<br>http://www.saburchill.com/chapters/chap0031.html<br>Sexual reproduction: http://www.saburchill.com/chapters/chap0037.html<br>Insect metamorphosis video: http://www.pbs.org/wgbh/nova/satoyama/transform.html<br>Frog metamorphosis pictures: http://www.countrysideinfo.co.uk/metimage.htm |

| | |
|---|---|
| Science News | http://science.nasa.gov/<br>http://www.cnn.com/TECH/space/<br>http://www.eurekalert.org/<br>http://www.pbs.org/saf/educators.htm<br>http://www.nasa.gov/vision/space/livinginspace/index.html<br>http://pumas.jpl.nasa.gov/<br>http://health.discovery.com/ |
| United Streaming videos, blackline masters and quizzes on a variety of science topics | www.unitedstreaming.com |
| | Animal Adaptations |
| | Basics of Biology, The: How Living Things are Structured |
| | Biologically Speaking: Genetics and Heredity |
| | Biologically Speaking: Systems of the Human Body |
| | Biology: The Science of Life: Ecology: Organisms in Their Environment |
| | Biology: The Science of Life: Making New Life: The Basics of Reproduction |
| | Biology: The Science of Life: The Flow of Matter and Energy in the Living World: Photosynthesis and Cellular Respiration |
| | Biomes: Our Earth's Major Life Zones |
| | Cheese Factory |
| | Energy and the Chemistry of Life |
| | Evolution |
| | Greatest Discoveries with Bill Nye: Genetics |
| | Importance of Plants, The |
| | Learning About Ecology |
| | Life Science: Viruses |
| | Natural Selection of Plants and Animals |
| | Reproduction in Organisms |
| | Simply Science: Maintaining Equilibrium |
| | TLC Elementary School: Life Cycles |
| Viruses | http://www.bam.gov/<br>http://www.archives.gov/exhibits/influenza-epidemic/ |

# Activities and Worksheets

1. Photosynthesis and Respiration
2. Comparison of Mitochondria and Chloroplasts
3. Label the Parts of a Plant
4. Aerobic and Anaerobic Respiration
5. Animal and Plant Cell Observation Chart
6. Food Diary
7. Compare carbohydrates, lipids, proteins, and nucleic acids
8. Celery Activity:  Investigate the properties and importance of water
9. Penny Activity:  Investigate the properties and importance of water
10. Pollution Activity
11. Science Lab/Activity Report Sheet

# Photosynthesis



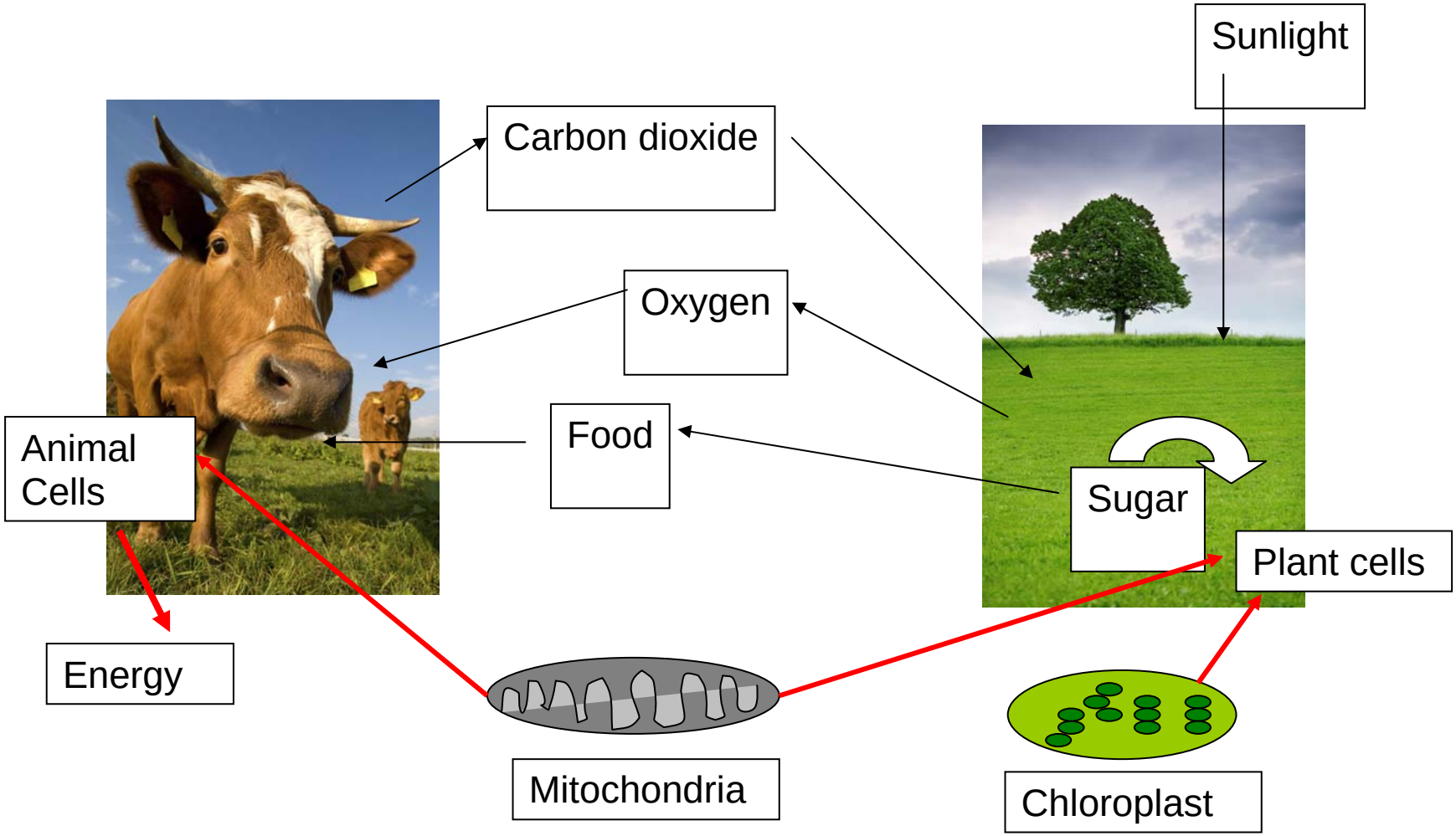

# Respiration

Organisms take in oxygen which cells use to convert the sugar into energy.

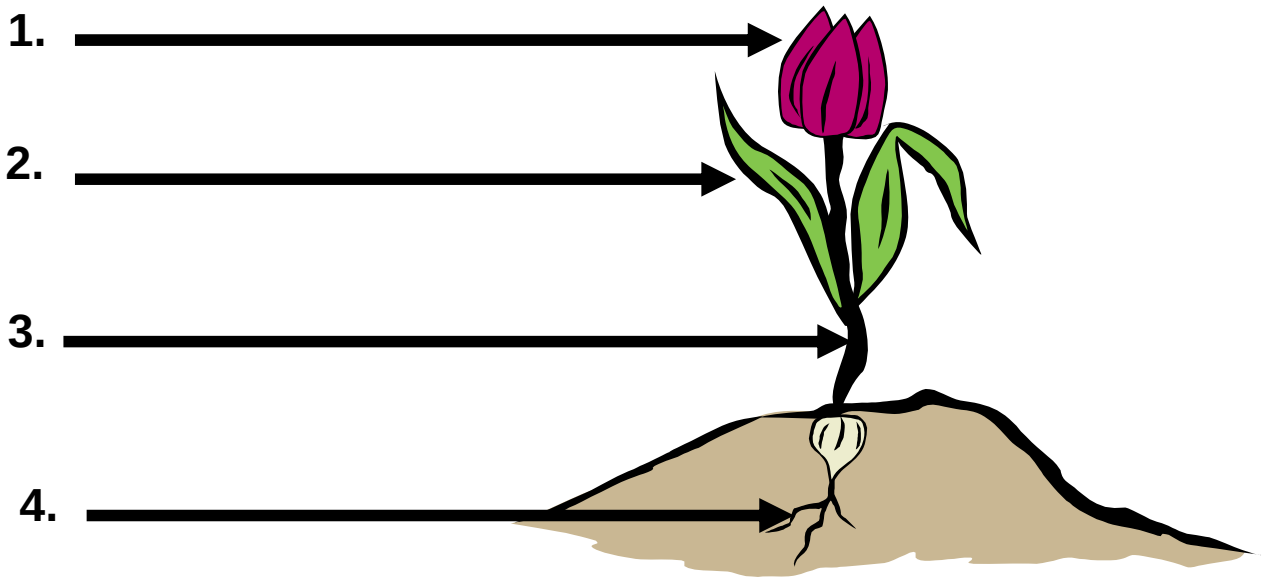
Organisms release carbon dioxide from cells as a waste product.

Organisms take in sugar from the food they eat.

# Comparison of Mitochondria and Chloroplasts

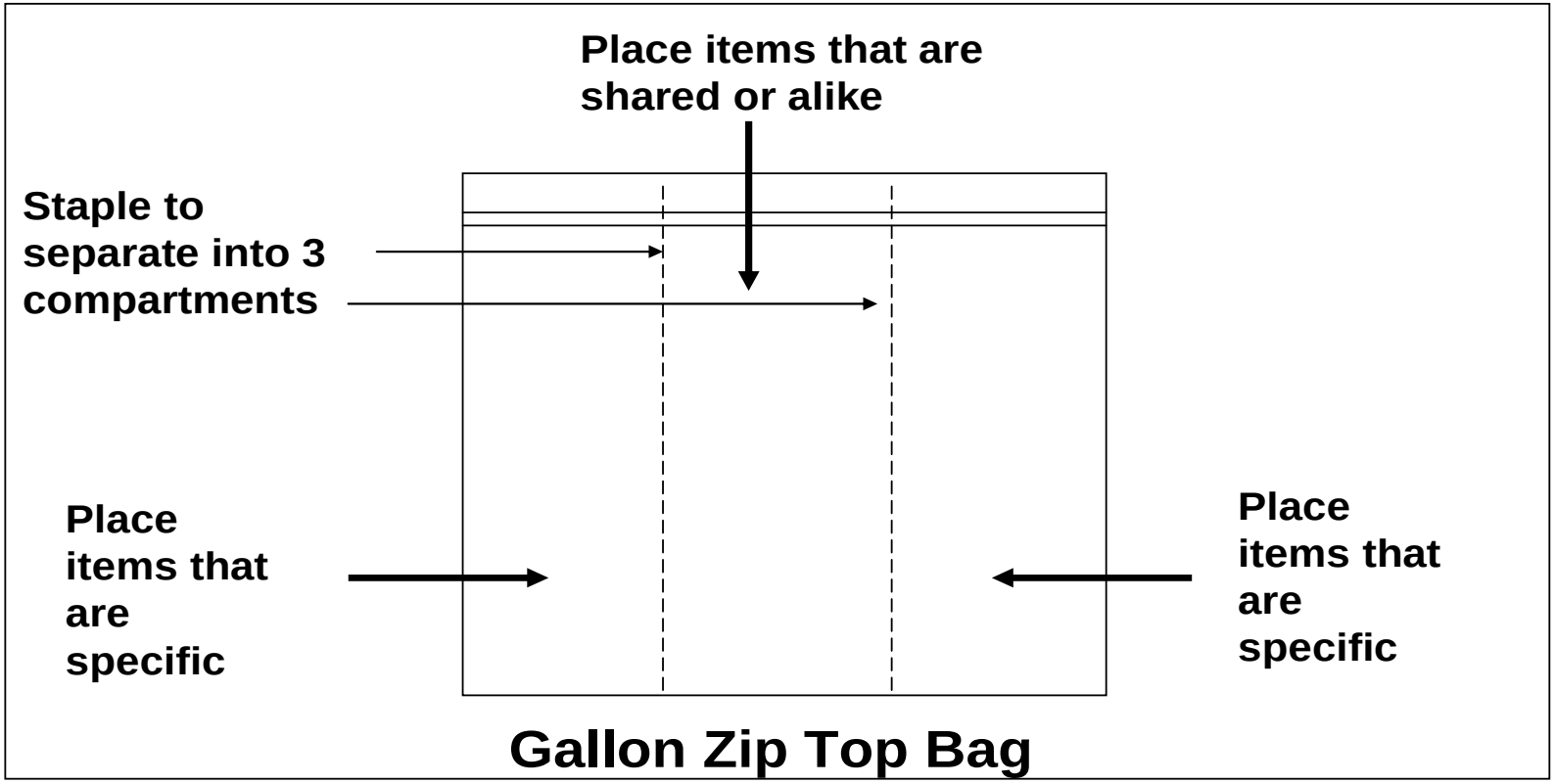


# Label the Parts of a Plant




**Stem** **Root** **Flower** **Leaf**

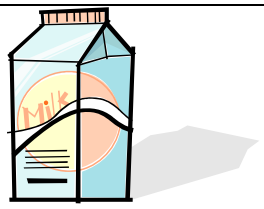
# Physical Example of a Venn Diagram



Name:_____ Date: _____

# Aerobic and Anaerobic Respiration

Compare the processes of aerobic and anaerobic respiration by placing an X in the correct box.

| Process | | With oxygen | Without oxygen |
|---|---|---|---|
| Cow getting energy from eating grass |  | | |
| Changing milk into buttermilk |   | | |
| Kids using energy to play soccer |  | | |
| Yeast making bread rise |  | | |
| Making yogurt from milk |   | | |

# Animal and Plant Cell Observation Chart

If you observe the cell structure, write “YES” in the space.
If you do **not** observe the cell structure, write “NO” in the space.

| Cell Structures | Animal Cell | Plant Cell |
|---|---|---|
| Cell membrane | | |
| Nucleus | | |
| Ribosome | | |
| Endoplasmic Reticulum | | |
| Mitochondria | | |
| Golgi Complex | | |
| Chloroplast | | |
| Cell wall | | |
| Vacuole | | |

Name:_____ Date:_____

**MC.1.B.1**

# Food Diary

| | **Foods** | Carbs | Lipids | Proteins | Stored Energy | Quick Energy | Builds Muscle |
|---|---|---|---|---|---|---|---|
| **1** | | | | | | | |
| **2** | | | | | | | |
| **3** | | | | | | | |
| **4** | | | | | | | |
| **5** | | | | | | | |
| **6** | | | | | | | |
| **7** | | | | | | | |
| **8** | | | | | | | |
| **9** | | | | | | | |
| **10** | | | | | | | |
| **11** | | | | | | | |
| **12** | | | | | | | |
| **13** | | | | | | | |
| **14** | | | | | | | |
| **15** | | | | | | | |

Name:_____ Date: _____

## MC.1.B.1

Compare carbohydrates, lipids, proteins, and nucleic acids by completing the table below.

| | Carbohydrates | Lipids | Proteins | Nucleic Acids |
|---|---|---|---|---|
| **Contains which elements? (circle all that apply)** | Carbon<br>Hydrogen<br>Oxygen<br>Phosphorous<br>Nitrogen | Carbon<br>Hydrogen<br>Oxygen<br>Phosphorous<br>Nitrogen | Carbon<br>Hydrogen<br>Oxygen<br>Phosphorous<br>Nitrogen | Carbon<br>Hydrogen<br>Oxygen<br>Phosphorous<br>Nitrogen |
| **Examples of foods** | | | | Your body makes nucleic acids from the foods that you eat |
| **How is it used by your body?** | | | | |

1. List the elements that are found in all of the molecules.

_____

_____

2. What molecule(s) contain nitrogen?

_____

3. Which molecule is made up of only carbon, hydrogen, and oxygen?

_____

## Celery Activity: Investigate the properties and importance of water

**Materials:**

- Stalks of celery with leaves attached
- Glass or jar of water
- Red or blue food coloring
- Table knife

**Background:**

Adhesion is the attraction of a water molecule to other types of molecules (like the inside surface of a straw). Cohesion is the attraction of water molecules to other water molecules. Together these properties allow water molecules to travel up a tube such as a plant stem.

**Activity:**

1. Add enough food coloring to the water to give it a dark color
2. The teacher should use a knife and cut about an inch off of the bottom of the end of each stalk
3. Place the celery stalks in the water.
4. Observe the celery several times a day to determine if the color has moved up the stalk and leave overnight.
5. The next day observe the color of the leaves of on the stalk. Starting at the bottom of the stem, the teacher should cut off an inch at a time and allow the students to observe the tiny holes that have the same color as the food coloring.

**Observations:**

1. Describe how the celery appeared after 1 hour

_____

_____

2. Describe how the celery appeared the next day.

_____

_____

3. Describe how the celery looked on the inside.

_____

_____

4. Describe the two properties of water that allowed the water to move up the stem of the celery.

_____

_____

5. Describe why these properties are important to plants.

_____

_____

**Answers:**

1. Student should record their observations
2. The leaves of the celery should have taken on the color of the food coloring
3. There should be small round holes that are stained the color of the food coloring (these are called xylem tubes)
4. Adhesion- the property of water sticking to surfaces

Cohesion – the property of water molecules sticking to other water molecules

5. These properties are important because they allow water to move through tubes from the soil to all parts of a plant. The plant would not be able to grow very tall if water could not move through the plant.

Note: This activity also works well with carnations or white daisies.

Name: _____ Date:_____

## Penny Activity: Investigate the properties and importance of water

**Materials:** A penny, an eyedropper or pipette, a cup of water, and paper towels for each team of students.

**Background:**
Sometimes we call water $H_2O$. That's because water molecules each have two hydrogen atoms and one oxygen atom. While water molecules are neutral as a whole, one end of the water molecule tends to have a positive charge while the other has a negative charge (polarity). Each end of a water molecule is attracted to the opposite charged end of another water molecule. This is called "hydrogen bonding."

**Predict:** How many drops of water can you put on the top of a penny before it spills over? More than you may think!

**Activity:**

1. Clean a penny using a paper towel. Do not use soap!
2. Place the penny on a flat surface.
3. Using the eye dropper, drop water one drop at a time onto the penny.
4. Count the number of drops the penny will hold before the water spills over.
5. Try it again…see how many drops it will hold the second time.

**Observations:**

2. Do the water drops stay together or apart? _____

3. What property of water causes this? _____

4. Is the water flat on top of the penny or rounded up? _____

5. What property of water causes this? _____

**Significance for Living Things:**

6. Describe an example of why the property of cohesion is important for plants.

_____

_____

7. Describe an example of how certain insects use the surface tension of water.

_____

_____

**Answers:**
2. The water molecules stay together on top of the penny.
3. This property is called cohesion
4. The water is rounded up on top of the penny.
5. This property is called surface tension
6. Water moves from the soil, up the tubes inside the roots, through the tubes inside the stem to all the cells in the plant.
7. Certain insects called water striders "walk" on water using the thin film created by surface tension.

# Pollination Activity

Use pipe cleaners as bee legs (6) and tape to the bee.

Place powder in the center of the flower to represent “pollen”. Press “bee legs” into pollen then “fly” your bee to another student’s “flower” and land on their “flower”. This simulates the act of cross-pollination.

## Science Lab/Activity Report Sheet

Name _____

What is the date? _____ What is the month? _____

Hypothesis: What did you do today? What do you think would happen?

Materials-What supplies did you use?

Procedures-What did you do?

Observations-What did you see happen?

Results-Illustrate what happened.