

In this document, you will find the key words and their associated definitions for **Biology A.**

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| Unit 2: Biochemistry | |
| Lesson 2: The Building Blocks of Life | * **ATP** – an energy-carrying molecule that is used by the cells of all living things * **autotroph** – organisms that can make their own food * **biomolecule** – a molecule that is produced by a living thing * **carbohydrate** – a biomolecule made of simple sugars * **carbon** – nonmetallic chemical element with an atomic number of 6 that bonds with many other elements * **covalent bond** – the connection between two atoms when they share a pair of electrons * **hydrocarbon** – a compound made of hydrogen and carbon atoms * **lipid** – a biomolecule made of fatty acids * **macromolecule** – a large molecule that contains many proteins * **nucleic acid** – a biomolecule made of nucleotides * **protein** – a biomolecule made of amino acids * **starch** – a carbohydrate that is made of long glucose chains |
| Lesson 3: What All Biomolecules Have in Common | * **amino acids** – the building blocks of protein * **disaccharide** – a sugar made of 2 monosaccharides * **enzymes** – proteins that speed up chemical reactions * **fatty acids** – the building blocks of lipids * **monosaccharide** – a simple sugar made up of one sugar molecule * **nucleic acid** – a biomolecule that contains genetic material * **nucleotides** – the building blocks of nucleic acids * **lipids** – biomolecules that make up cell membranes, store energy, and act as chemical messengers in the body * **polysaccharide** – a sugar made of 3 or more monosaccharides * **proteins** – made of amino acids; used to build body tissue and perform the life functions of cells * **starch**– a polysaccharide made up of long strands of glucose molecules |
| Lesson 4: The Essential Sugar Molecule | * **amino acids** – the building blocks of protein * **carbohydrates** – a biomolecule made of simple sugars * **cellular respiration** – the process by which glucose and oxygen form ATP * **dehydration synthesis** – a chemical reaction in which water is removed during the formation of a new molecule * **glucose** – a simple 6-carbon sugar * **nucleotide** – the building block of nucleic acids * **photosynthesis** – the process of changing light energy into stored chemical energy in the form of sugars * **starch** – a carbohydrate that is made of long glucose chains |
| Lesson 5: You Are What You Eat | * **carbohydrate** – a biomolecule used for energy in living things * **cellular respiration** – the process of taking the energy stored in the chemical bonds of sugar and oxygen and converting it to useable energy * **cellulose** – a carbohydrate made from glucose that is found in the cell walls * **chemical reaction** – a change that occurs when 2 or more substances combine to form a new substance * **conservation of matter** – during a chemical reaction, matter is neither created nor destroyed; it just changes form. * **glucose** – a simple 6-carbon sugar * **nucleic acid** – a biomolecule made from nucleotides, for example, DNA or RNA * **photosynthesis** – the process of changing light energy into stored chemical energy in the form of sugars * **protein** – a biomolecule made of amino acids |
| Lesson 6: Chemical Reactions | * **activation energy** – the energy input required to start a chemical reaction * **chemical equation** – a model of a chemical reaction * **chemical reaction** – a process in which the chemical arrangement of a substance changes * **denature** - the deactivation of a protein by an environmental change that causes a change in its structure and a loss of function. * **endothermic** – a change that absorbs more energy than it releases * **enzyme** – a specialized protein that speeds up a chemical reaction * **exothermic** – a change that releases more energy than it absorbs * **reactant** – a substance involved in a chemical reaction * **product** – the output of a chemical reaction |
| Lesson 7: Matter Conservations Matters | * **chemical reaction** – a process that changes the chemical structure of matter * **law of conservation of matter** – a scientific law that states that matter cannot be created or destroyed * **polysaccharide** – a sugar made from 3 or more monosaccharides * **product**– the output of a chemical reaction * **reactant**– the input of a chemical reaction |
| Lesson 8: Respiration Overview | * **ADP** – adenosine diphosphate, a nucleotide that becomes ATP when it gains a phosphorous group * **anaerobic** – a process that does not require oxygen * **ATP** – adenosine triphosphate, usable energy made from glucose and oxygen through the process of cellular respiration * **cellular respiration** – the process of making ATP from glucose and oxygen * **cofactor** – a nonprotein substance that helps enzymes catalyze chemical reactions * **electron transport chain** – a series of reactions that creates an electrochemical gradient to produce ATP * **glycolysis** – a process during which one glucose molecule is broken down into two 3-carbon molecules called pyruvates * **Krebs cycle** – a series of chemical reactions that forms ATP from Acetyl CoACoA * **NAD+** – nicotinamide adenine dinucleotide, an electron carrier used in metabolism * **net ATP** – the total amount of ATP after a cycle. If 2 ATP are used, and 4 ATP are gained, the net ATP is 2. |
| Lesson 9: Reliable Sources | * **corroborate** – to support with evidence or confirm with unbiased, valid sources * **peer-review -**evaluating the quality of work by members of the same profession before publishing as a reliable source * **reliability** – consistently valid and can be replicated * **reliable source** – a form of information that can be cited and provides consistently valid information supported by strong scientific evidence * **scientific explanation** – a statement supported by evidence that provides a reason for a natural scientific phenomenon * **validity** – accuracy |
| Unit 3: Cells and Body Systems | |
| Lesson 2: What Goes In Must Come Out | * **active transport** – the movement by energy of molecules across a cell membrane from low to high concentration * **aquaporins** – the protein channels that allow water to enter and leave a cell * **cell membrane** – a semipermeable membrane made of a double layer of lipids that surrounds a cell * **concentration gradient** – the gradual change in concentration of a solute in a solution * **diffusion** – the movement of molecules from an area of higher concentration to an area of lower concentration * **endocytosis** – taking large materials into a cell * **equilibrium** – the concentration inside of the cell is equal to the concentration outside of a cell * **exocytosis** – moving large materials out of a cell * **facilitated diffusion** – the diffusion of small, hydrophilic molecules across the cell membrane that requires a protein to help transport the molecule across the cell membrane * **hydrophilic** – water loving * **hydrophobic** – water fearing * **hypertonic** – a solution with higher concentration of solutes compared to another solution * **hypotonic** – a solution with lower concentration of solutes compared to another solution * **isotonic** – a solution with the same concentration of solutes compared to another solution * **multicellular**– made of many cells * **osmosis** – the diffusion of water molecules through a semipermeable membrane from higher concentration to lower concentration until equilibrium has been reached * **passive transport** – the movement of molecules across the cell membrane without the need for energy * **solute** – a material that is dissolved in a solvent * **solution** – a mixture in which a solute is dissolved into a solvent * **solvent** – a material that dissolves the solute * **vesicle** – a small fluid filled sac within a cell |
| Lesson 3: Structures of the Cell | * **anticodon** – a group of three bases in tRNA that is complementary to a codon on mRNA * **codon** – a group of three bases in mRNA that codes for an amino acid in the protein * **endomembrane system** – a network of membrane-bound organelles that are involved in the production and processing of proteins that will be integrated into a membrane, packaged into an organelle, or exported to the outside of the cell * **eukaryotic cell** – a type of animal or plant cell that contains membrane-bound organelles, such as a nucleus * **Golgi apparatus** – a membrane-bound organelle of the endomembrane system that processes, modifies, and sorts proteins coming from the rough endoplasmic reticulum in order to activate them and get them to their proper destination * **membrane-bound organelle** – an organelle that is surrounded by a lipid bilayer similar to the cell membrane * **nuclear envelope** – a double membrane that surrounds the nucleus and controls what enters and leaves the nucleus in eukaryotic cells * **organelle** – a small structure inside a cell that performs a specific function * **prokaryotic cell** – a type of cell, such as bacteria and archaea cells, that does not contain membrane-bound organelles * **ribosome** – an organelle, found either free-floating in the cytoplasm or attached to the endoplasmic reticulum, where proteins are made * **rough endoplasmic reticulum (ER)** – a membrane-bound organelle of the endomembrane system that is directly attached to the smooth ER and nuclear envelope that has ribosomes attached to it that synthesize proteins that will be inserted into a membrane, packaged into an organelle, or exported to the outside of the cell * **smooth endoplasmic reticulum (ER)** – a membrane-bound organelle of the endomembrane system that is directly attached to the rough ER and nuclear envelope that produces lipids and steroids for membrane production * **transcription** – the process by which RNA polymerase copies a segment of DNA into mRNA * **translation** – the process by which a ribosome produces protein based on the sequence of a mRNA * **vesicle** – a small, membrane-bound organelle that is used as a shuttle to move proteins and lipids from the endoplasmic reticulum to the Golgi apparatus and from the Golgi apparatus to the proteins’ final destination within or outside of the cell |
| Lesson 4: Cell Structures | * **cells** – the smallest unit of life that displays all of the characteristics of life * **eukaryote** – a type of cell that contains membrane-bound organelles * **membrane-bound organelle** – an organelle that is enclosed by a membrane * **organelle** – a small structure within a cell that performs a specific function, similar to organs in the body * **prokaryote** – a type of cell that lacks membrane-bound organelles |
| Lesson 5: Parts of a Multicellular Organism | * **bronchi** – tubes that carry air into the lungs * **carbon dioxide** – a gas exhaled from the body * **diaphragm** – a layer of muscle and connective tissue that separates the chest from the abdomen and pulls air into the lungs when it contracts * **invertebrate** – an animal that does not have a spinal column; not having a vertebrae * **model** – a representation of something based on data and observations that is used by scientists to help predict the behavior of complex systems, especially those that are too small or too large to work with directly * **multicellular** – an organism that is made of more than one cell * **organ** – a collection of tissues that work together to perform a specific function or set of functions * **organ system** – a group of organs, each with different functions but a similar collective purpose * **respiratory system** – the organ system that exchanges gases between an organism's internal and external environments * **tissue** – cells with the same function connected together into structures * **trachea** – the air tube connecting the mouth to the lungs |
| Lesson 6: Modeling Body Systems | * **chemical digestion** – the breakdown of food as a result of chemicals the body releases. * **mechanical digestion** – any type of physical act related to the breakdown of food, including chewing, churning of the stomach, or absorbing nutrients * **oxygenated** – a substance that contains oxygen, typically the blood * **oxygen-poor** – a substance that is lacking in oxygen, typically the blood after it travels through the body * **peristalsis** – a series of muscle contractions that move food through the gastrointestinal tract independent of gravity * **pulmonary loop** – the pathway that blood takes from the heart to the lungs * **reoxygenated** – adding oxygen to a substance, typically the blood after it has left the lungs and returns to the heart * **systemic loop** – the pathway of blood from the heart to other areas of the body |
| Lesson 7: Interactions Between Systems | * **artery** – a large blood vessel that carries blood away from the heart * **arteriole** – a smaller blood vessel that carries oxygenated blood * **capillary** – a tiny blood vessel * **deoxygenated** – a substance without oxygen * **elastic tissue** – tissue that can expand and contract without losing its shape * **oxygenated** – a substance that contains oxygen * **vein** – a blood vessel that carries blood back to the heart |
| Lesson 8: Models Versus Actual Body Systems | * **model** – a representation of something based on data and observations that is used by scientists to help predict the behavior of complex systems, especially those that are too small or too large to work with directly * **periosteum** – a layer of connective tissue that surrounds and protects a bone |
| Unit 4: Homeostasis Portfolio | |
| Lesson 1: Homeostasis Portfolio 1 | * **feedback mechanism** – a system that responds to a stimulus * **homeostasis** – a state of internal balance maintained by living organisms * **hypothesis** – a cause-and-effect statement that predicts what will happen in an experiment * **independent variable** – the variable in an experiment that the experimenter changes in order to see changes in the dependent variable if a relationship exists between them * **negative feedback system** – a feedback system that moves away from the stimulus * **positive feedback system** – a feedback system that moves in the direction of the stimulus * **stimulus** – an action or process that causes change |
| Lesson 2: Homeostasis Portfolio 2 | * **feedback mechanism** – a system that responds to a stimulus * **hypothesis** – a cause-and-effect statement that predicts what will happen in an experiment |
| Lesson 3: Homeostasis Portfolio 3 | * **feedback mechanism** – a system that responds to a stimulus * **homeostasis** – a state of internal balance maintained by living organisms |
| Unit 5: Cell Work | |
| Lesson 2: Photosynthesis | * **ADP** – adenosine di-phosphate; a lower energy, intermediate molecule used to convert to ATP by adding a third phosphate group * **ATP** – adenosine tri-phosphate: a molecule that carries energy inside cells and is the energy currency of a cell; a product of the light-dependent reactions of photosynthesis * **ATP synthase** – a protein that creates ATP from ADP during photosynthesis * **chlorophyll** – green pigment that captures the energy from the sun * **chloroplast** – organelle in a green plant cell that conducts photosynthesis * **electron transport chain** – system by which high-energy electrons are moved to photosystem I and hydrogen ions are pumped into the inside of the thylakoid during photosynthesis * **light-dependent reactions** – a series of reactions that take the light energy that is captured by the chlorophyll and convert it into chemical energy in the form of NADPH and ATP; consists of photosystem II, the electron transport chain, photosystem I and hydrogen ion movement and formation of ATP * **light-independent reactions (calvin cycle)** – a series of reactions that do not require the presence of light energy and that take the carbon from carbon dioxide and convert it to carbohydrates (glucose), amino acids, and other compounds * **NADP+** – nicotinamide adenine dinucleotide phosphate; an electron carrier molecule that accepts two high-energy electrons and one hydrogen ion to become NADPH * **NADPH** – nicotinamide adenine dinucleotide phosphate hydrogen; a product of the light-dependent reactions of photosynthesis used to power some of the reactions in the light-independent stage of photosynthesis * **photosynthesis** – process that transforms light energy into stored chemical energy * **photosystem I** – protein complex where the transfer of hydrogen ions to NADP+ to make NADPH occurs during photosynthesis * **photosystem II** – protein complex where light is absorbed, water is split, hydrogen ions are created, and oxygen is released during photosynthesis * **stroma** – fluid-filled space that surrounds the stacks of thylakoids inside the chloroplast, within which the light-independent reactions of photosynthesis occur * **thylakoid** – sack-like structure surrounded by a membrane inside chloroplasts where the light-dependent reactions of photosynthesis occur |
| Lesson 3: Photosynthesis: Energy Conversion | * **ADP** – adenosine di-phosphate; a lower energy, intermediate molecule used to convert to ATP by adding a third phosphate group * **ATP** – adenosine tri-phosphate; a molecule that carries energy inside cells and is the energy currency of a cell; a product of the light-dependent reactions of photosynthesis * **ATP synthase** — a protein that creates ATP from ADP during photosynthesis * **chlorophyll** — green pigment that captures the energy from the sun * **chloroplast** – organelle in a green plant cell that conducts photosynthesis * **electron transport chain** — system by which high-energy electrons are moved to photosystem I and hydrogen ions are pumped into the inside of the thylakoid during photosynthesis * **light-dependent reactions** – a series of reactions that take the light energy that is captured by the chlorophyll and convert it into chemical energy in the form of NADPH and ATP; consists of photosystem II, the electron transport chain, photosystem I, and hydrogen ion movement leading to formation of ATP * **light-independent reactions (Calvin cycle)** — a series of reactions that do not require the presence of light energy and that take the carbon from carbon dioxide and convert it to carbohydrates (glucose), amino acids, and other compounds * **NADP+** – nicotinamide adenine dinucleotide phosphate; an electron carrier molecule that accepts two high-energy electrons and one hydrogen ion to become NADPH * **NADPH** – nicotinamide adenine dinucleotide phosphate hydrogen; a product of the light-dependent reactions of photosynthesis used to power some of the reactions in the light-independent stage of photosynthesis * **photosynthesis** – process that transforms light energy into stored chemical energy * **photosystem I** — protein complex where the transfer of hydrogen ions to NADP+ to make NADPH occurs during photosynthesis * **photosystem II** — protein complex where light is absorbed, water is split, hydrogen ions are created, and oxygen is released during photosynthesis * **stroma** – fluid-filled space that surrounds the stacks of thylakoids inside the chloroplast, within which the light-independent reactions of photosynthesis occur * **thylakoid** – sack-like structure surrounded by a membrane inside chloroplasts where the light-dependent reactions of photosynthesis occur |
| Lesson 4: Photosynthesis Portfolio 1 | * **alternative hypothesis** – a hypothesis that guesses a noticeable difference between the variables in an experiment * **control** – the part of an experiment in which the variable is not changed to see what the end result would be if nothing were different * **hypothesis** – the answer that is thought to be correct for the observations * **null hypothesis** – a hypothesis that guesses there is no relationship between the variables in an experiment * **scientific method** – is the set way to make observations to find patterns so that they can be compared to other observations and patterns |
| Lesson 5: Photosynthesis Portfolio 2 | * **bar graph –**graphic means of quantitative comparison by rectangles with lengths proportional to the measure of the data or things being compared * **dependent variable** – variables that happen because of changes made to the independent variables * **experimental error –**an error that results from an equipment or procedural mistake * **experimenter error –** an error that results from a mistake made by the individual performing the investigation * **independent variable** – variables that are changed on purpose in order to see how things change; variable that is independent of the other variables and whose value determines one or more of the values of the other variables * **line graph –**a graph in which points representing values of a variable for suitable values of an independent variable are connected by a broken line * **outlier** **–**statistical observations that are markedly different in value from the others of the sample * **pie chart –**a circular chart cut by radii into segments illustrating relative magnitudes or frequencies * **quantitative data** – data given as numbers, such as a quantity, an amount, or a range * **qualitative data** – data given as words, such as a description, a type of plant, or a condition * **replicable** – investigations that can be repeated with the same results * **scatter plot –**a two-dimensional graph in rectangular coordinates consisting of points whose coordinates represent values of two variables under study |
| Lesson 7: Cellular Respiration and Matter | * **ATP –** adenosine tri-phosphate; a molecule that carries energy inside cells; the energy currency of a cell * **calorie –** a unit used to measure the energy stored in food * **Calorie –** 1000 calories or 1 kcal * **cellular respiration –** the process of combining food molecules with oxygen and using the chemical energy from these molecules to power all the activities that sustain life * **cytoplasm –** a thick solution, made up of water, salts and proteins, that fills each cell and is within the cell membrane * **mitochondria –** membrane bound organelle that make most of the chemical energy needed to power the cell |
| Lesson 8: Making and Breaking Bonds for Energy | * **ADP** – adenosine di-phosphate; a lower energy, intermediate molecule used to convert to ATP by adding a third phosphate group * **aerobic respiration** – uses matter from the food we eat and from the oxygen in the atmosphere to fuel our bodies * **ATP** – adenosine tri-phosphate; a molecule that carries energy inside cells; it is the energy currency of a cell. * **ATP Synthase** — a protein that creates ATP from ADP during photosynthesis * **cellular respiration** – process of combining food molecules and oxygen and using the chemical energy from these molecules to power all the activities that sustain life * **cytoplasm** – the gel-like fluid that fills a cell and holds the organelles in place * **electron transport chain** – the last step in breaking down glucose during cellular respiration in which several proteins embedded in the membrane of mitochondria transfer electrons, creating a charge gradient that drives the formation of ATP * **FADH** – nicotinamide adenine dinucleotide phosphate; an electron carrier molecule that accepts high-energy electrons and one hydrogen ion to become FADH2 * **FADH2** – Flavin adenine dinucleotide, an electron carrying molecule that donates electrons and hydrogens * **glycolysis** – the first step in breaking down glucose into two pyruvic acid molecules to extract the chemical energy for cell processes * **Krebs cycle**/**citric acid cycle** – the second step in breaking down glucose during cellular respiration, in which the products of glycolysis undergo several chemical reactions that release energy in the form of ATP, NADH and FADH2, and water and carbon dioxide as waste products * **mitochondria** – energy producing structure of the cell; organelle where food is converted to usable energy; the powerhouse of the cell * **NAD+** – nicotinamide adenine dinucleotide; an electron carrier molecule that accepts two high-energy electrons and one hydrogen ion to become NADH * **NADH** – nicotinamide adenine dinucleotide hydrogen; electron carrying molecule that donates electrons and hydrogens |
| Lesson 9: Cellular Respiration | * **byproduct** – a product that is produced when making something else * **cellular respiration** – process of combining food molecules and oxygen and using the chemical energy from these molecules to power all the activities that sustain life * **electronegative** – atoms and molecules that tend to acquire electrons in chemical reactions * **exothermic reaction** – chemical reaction that results in heat given off as a product because the energy required to break bonds is less than the energy required to make new bonds * **oxidation-reduction** **reaction** – a chemical reaction that involves transferring electrons between two or more atoms * **oxidation** – losing electrons * **reduction** – gaining electrons |
| Lesson 10: Energy and Matter Conservation | * **cellular respiration** – process of combining food molecules and oxygen and using the chemical energy from these molecules to power all the activities that sustain life * **energy** – the ability to do work * **law of conservation of energy** – states that energy cannot be created nor destroyed; you can only change from one form of energy to another * **law of conservation of matter** – states that matter cannot be created nor destroyed * **matter** – anything that takes up space and has weight |
| Lesson 11: Heat and Cellular Respiration | * **ATP** – adenosine triphosphate; a molecule that carries energy inside cells; it is the energy currency of a cell * **cellular respiration** – the process of combining food molecules and oxygen and using the chemical energy from these molecules to power all the activities that sustain life * **ectotherm**– an organism that depends on external sources to regulate its body temperature * **electron transport chain** – third step in cellular respiration which takes the energy in the electrons transported by NADH and FADH2 to create ATP * **endotherm**– an organism that can regulate its own body temperature and generate its own internal heat * **glycolysis**– first step in cellular respiration; starts breaking the sugar molecule down in the cell cytoplasm producing pyruvic acid and 2 ATPs * **Krebs cycle** – second step during cellular respiration; produces carbon dioxide and adds electrons to NAD+ and FAD+ to create NADH and FAHD2, which carry the high-energy electrons to the electron transport chain, the third step in the process. * **metabolic reactions** – chemical reactions that allow organisms to survive (including cellular respiration), and to shuttle energy to other parts of the body that require more energy * **thermogenesis**– the production of heat by living organisms as a by-product of metabolic activity |
| Unit 6: DNA | |
| Lesson 2: Genes, Chromosomes, and DNA | * **allele** – a version of a gene that codes for a different phenotype of a trait * **chromatin** – a material consisting of strings of nucleosomes that are wrapped together to form a rope-like structure in eukaryotes * **chromosome** – a thread-like structure in the cell nucleus that contains DNA wrapped around proteins called histones * **deoxyribose** – a sugar that forms the backbone of a DNA molecule * **DNA** – a nucleic acid molecule that contains genes * **dominant** – a trait that can be expressed with only one copy of the allele of a gene * **euchromatin** – a type of lightly staining chromatin that is loosely packed and allows for the transcription and translation of genes * **eukaryote** – a type of cell that contains membrane-bound organelles like a nucleus * **gene** – a section of a DNA molecule that codes for a protein * **heterochromatin** – a type of darkly staining chromatin that is tightly packed and does not allow for the transcription and translation of genes * **inorganic molecule** – a molecule that is not found in living things * **monomer** – building block of large molecules * **nitrogenous base** – a part of the nucleotide that contains carbon rings with nitrogen, oxygen, and hydrogen; there are four nitrogenous bases: adenine, thymine, guanine, and cytosine * **nucleosome** – a bead-like structure formed when DNA is wrapped around a single group of histone proteins in eukaryotes. * **nucleotide** – the building block of nucleic acids that consists of three parts: a phosphate group, a nitrogenous base, and a sugar * **organic molecule** – a molecule that contains carbon and is found in living things * **phosphate group** – a chemical group that consists of phosphorus and sulfur that links the backbone of DNA together * **polymer** – a large molecule made up of multiple monomers * **prokaryote** – a type of cell that does not contain membrane-bound organelles * **recessive** – a trait that can only be expressed if there are two copies of the same allele of the gene |
| Lesson 3: How Cells Make Proteins | * **amino acids** – a small molecule that makes up a protein * **codon** – a sequence of three bases that form a unit of genetic code in mRNA * **chromosome** – a threadlike structure in the cell that contains DNA * **cytoplasm** – a jellylike matrix of water, salts, proteins, and other materials within cells that allows for the flow of nutrients and organelles throughout the cell * **DNA** – a nucleic acid molecule that contains genes * **eukaryotic** – a type of cell that contains membrane-bound organelles such as a nucleus * **gene** – a section of a DNA molecule that codes for a specific protein * **genetic code** – a code used by all known organisms that translates mRNA codons into amino acids * **mRNA** – a nucleic acid that carries the genetic code from DNA to a ribosome * **mutation** – a change in the sequence of bases in a gene * **polypeptide** – a chain of amino acids formed during translation that will fold into a certain shape to make a protein * **prokaryotic** – a type of cell that does not contain membrane-bound organelles such as nuclei * **protein** – a large molecule that has many structural and functional purposes in cells * **RNA polymerase** – enzyme involved in making mRNA * **transcription** – the process that makes mRNA * **translation** – the process that produces a polypeptide chain from mRNA * **tRNA** – a type of RNA molecule that decodes the mRNA sequence into a protein * **ribosome** – an organelle that synthesizes proteins * **rRNA** – a type of RNA, called ribosomal RNA, that is part of the ribosome |
| Lesson 4: Gene Expression | * **codon** – a three-base sequence in mRNA that codes for a specific amino acid * **deletion** – a type of mutation that involves one or more bases being deleted from the DNA sequence * **DNA** – a nucleic acid that contains genes * **enzyme** – a protein that acts to speed up a chemical reaction in the body * **frameshift mutation** – a change in DNA that shifts the reading of the genetic message * **gene** – a section of DNA that eventually translates into a protein * **gene expression** – the process in which information from a gene is used to make a protein * **insertion** – a type of mutation that involves one or more bases being added to the DNA sequence * **missense mutation** – a type of substitution mutation in which the change in the DNA sequence changes the amino acid in the protein * **mRNA** – a nucleic acid formed by the process of transcription from DNA that is used to make a protein * **mutation** – a random change in the sequence of nucleotides in DNA or RNA * **nonsense mutation** – a type of substitution mutation in which the change in the DNA sequence changes the mRNA codon to a stop codon * **nucleotide sequence** – the order of the five bases (A,T,G,C, or U) in a nucleic acid in which three nucleotides form a codon that codes for one of the twenty amino acids that comprise a protein * **point mutation** – a change in a single point along the DNA sequence * **silent mutation** – a type of substitution mutation in which the DNA sequence is altered but the amino acid sequence remains the same * **substitution mutation** – a type of point mutation in which a single base in the DNA is changed into another base * **traits** – the physical characteristics of an organism |
| Lesson 5: Gene Expression and Gene Regulation | * **chromatin** – a complex of DNA and protein that comprises eukaryotic chromosomes * **chromatin remodeling** – the process by which DNA is unwound from its associated protein to allow for transcription or replication * **exon** – a portion of a gene that is expressed into protein * **gene expression** – a process by which genetic information is converted into proteins * **gene regulation** – the mechanisms that activate or repress the expression of a gene * **intron** – a portion of a gene that is not expressed into protein * **model organism** – an organism that is representative of many within its category and is easy to grow and study in a lab * **operon** – a group of related genes that operates together as a functional unit in prokaryotic cells * **post-translational control** – the regulation of gene expression by the modification of proteins * **promoter** – a segment in DNA that binds with the enzyme RNA polymerase * **repressor** – a regulatory protein and/or small molecule that inhibits transcription * **RNA polymerase** – an enzyme that copies a DNA genetic sequence into an mRNA sequence * **RNA processing** – a change RNA undergoes in the cell nucleus to become a mature mRNA molecule * **RNA silencing** – a way for the cell to control the translation of an mRNA using microRNAs; also known as RNA interference * **RNA splicing** – the process that removes introns from the mRNA before translation * **transcriptional control** –the regulation of gene expression by preventing a gene from being transcribed into mRNA * **transcription factors** – a class of proteins that regulates transcription in eukaryotes by interacting with RNA polymerase. * **translational control** – the regulation of gene expression by altering the lifespan of mRNA or the efficiency of translation |
| Lesson 6: Genetic Research | * **allele** – a version of a gene * **carrier** – an individual who has one recessive allele for a genetic disease but usually does not show symptoms of the disease * **DNA** – a double-stranded helix that carries genetic information on how to produce proteins * **dominant trait** – a trait that is expressed even if only one allele for the trait is present * **empirical question** – a question that can be answered by investigation and observation * **gamete** – a sex cell; sperm or egg * **genotype** – the genetic make-up for a particular trait * **heterozygous** – having two different alleles for a given gene * **homologous chromosomes** – a pair of chromosomes that carry the same genes in the same locations along the chromosome * **homozygous** – having two identical alleles for a given gene * **phenotype** – the observable characteristics of a trait * **protein synthesis** – the cellular process through which proteins are made * **Punnett square** – a diagram that is used to show the combinations and frequencies of the different genotypes and phenotypes among the offspring of a cross, in accordance with Mendelian inheritance * **recessive trait** – a trait that is expressed only if two alleles for the trait are present * **scientific method** – the method used to test scientific hypotheses |
| Lesson 7: Genetic Factors in Inheritance | * **allele** – a version of a gene * **codominance** – a non-Mendelian inheritance pattern in which both alleles for a gene are expressed equally * **complete dominance** – a Mendelian inheritance pattern in which one allele is dominant over the other allele and completely masks the phenotype of the recessive allele when at least one dominant allele is present in the genotype * **epistasis** – the interaction between genes that influences a phenotype * **genotype** – the genetic makeup or an individual * **heterozygous** – an individual who has two different alleles for a particular trait * **homozygous** – an individual who has two identical alleles for a particular trait * **incomplete dominance** – a non-Mendelian inheritance pattern that occurs when an allele for a specific trait is not completely expressed over its recessive allele * **multiple alleles** – a type of non-Mendelian inheritance pattern in which there are more than two alleles possible for a gene * **phenotype** – a physical characteristic resulting from the interaction of alleles * **pleiotropy** – a type of non-Mendelian inheritance pattern in which one gene affects multiple phenotypes * **polygenic trait** – a trait that is affected by multiple genes |
| Lesson 8: Genetically Modified Organisms | * **cross breeding** – the breeding of two organisms of different kinds or varieties * **genetic engineering** – the process of altering the DNA of an organism to change its traits * **genetically modified organism (GMO)** – an organism whose DNA has been manipulated * **hybrid** – the offspring of two organisms of different breeds, varieties, or species * **selective breeding** – the process of choosing only plants or animals with desirable traits to reproduce |
| Lesson 10: What is a Virus | * **capsid** – a protein coat surrounding the genetic material of a virus * **carnivore** – an organism that eats only other animals for energy * **evolution** – a change in the genetic makeup of a species over time * **herbivore** – an organism that eats only plants for energy * **host –** cell or organism that another organism lives in * **immune response** – the physiological response and defense of an organism to infectious agents and foreign tissue * **lysogenic cycle** – the viral genetic material incorporates itself into the host cell’s genome and gets replicated whenever the host cell replicates itself * **lytic cycle** – the virus injects its genetic material into the host cell, copies itself, and then forms new viruses that burst out of the host cell breaking the membrane of the host cell, killing it * **mutation** – a change in the sequence of the nitrogen bases making up the genetic material * **pathogen** – something that causes disease * **pathogenesis**– how a disease develops in an organism * **producer** – an organism that makes its own food * **prophage** – DNA from a bacteriophage that is incorporated into the host cell's DNA * **provirus** – DNA from a virus that is incorporated into the host cell’s DNA * **retrovirus** – a special virus that copies RNA back into DNA * **viral envelope** – a membrane layer surrounding a virus that is made from the cell membrane of the host cell * **virus** – an organism consisting of only nucleic acid and protein that uses other cells in order to replicate and make more viruses * **virus** – a strand of DNA or RNA inside of a protein coat |
| Unit 7: Mitosis | |
| Lesson 2: Complex Organisms | * **chromosome**– a structure within a cell that carries DNA. In plants and animals, most chromosomes are arranged in pairs within the nucleus of the cell. Chromosomes are replicated during cell division. * **differentiation**– an increase in the specialization of a cell * **DNA replication**– the process by which a DNA molecule is copied to produce two identical molecules * **G1** **(first gap)**– first step of interphase * **G2** **(second gap)**– third step of Interphase * **homologous** **chromosomes** –chromosome pairs that are similar in length, centromere location, and gene position. Homologous chromosomes may contain different alleles. * **interphase**– the process during which the cell begins to grow. * **mitosis**– a type of cell division in which a parent cell copies itself, resulting in two identical daughter cells. Mitosis is the form of cell division used in all cell growth except sexual reproduction. * **mitotic spindle**– small structure within the cell that will help organize the chromosomes * **multipotent stem cell**– a type of adult stem cell that can become many different types of specialized cells within a tissue or organ * **sister chromatids**– identical pairs of chromosomes formed during cellular replication |
| Lesson 3: Inputs and Outputs of Mitosis | * **daughter cell** – the two cells produced by cell division * **differentiation** – an increase in the specialization of a cell * **gene expression** – the process in which instructions in DNA are used to produce a protein or other functional product * **mitosis** – a type of cell division in which a parent cell copies itself, resulting in two identical daughter cells. Mitosis is the form of cell division used in all cell growth except sexual reproduction. * **parent cell** – the cell that divides to produce two daughter cells |
| Lesson 4: Mitosis in Complex Organisms | * **differentiated cell** – a cell that has changed from a less specialized to a more specialized cell type * **differentiation** – an increase in the specialization of a cell * **extraembryonic cells** – cells located outside the embryo * **gene expression** – the process in which instructions in DNA are used to produce a protein or other functional product * **multipotent stem cell** – a type of adult stem cell that can become many different types of specialized cells within a tissue or organ * **pluripotent cells** – the second type of stem cell to develop in an embryo * **senescent cell** – a cell that can no longer reproduce itself * **totipotent cells** – the first stem cells to arise in a developing embryo |
| Lesson 5: Mitosis and Genetic Information | * **binary fission** – a type of asexual reproduction in which a fully grown parent cell separates into two cells * **genetically identical** – when a cell or organism’s genetic material is an exact copy of the parent cell or organism’s genetic material, it is said to be genetically identical. Depending on gene expression, two cells may be genetically identical while possessing different attributes. |
| Lesson 6: Gene Expression | * **differential gene expression** – the process by which different genes in a cell activate during specialization * **gene expression** – the process in which instructions in DNA are used to produce a protein or other functional product * **multipotent cells** – cells that can differentiate into many types of specialized cells * **pluripotent cells** – cells that can differentiate into any cell type except extraembryonic * **senescent** – process in which cells exit the cell cycle and no longer divide but still carry out their function * **terminal differentiation** – cells that exit the cell cycle to provide a particular function and can no longer divide * **totipotent cells** – cells that can differentiate into any cell types within the body including extraembryonic |
| Lesson 7: How Cells Are Used in the Body | * **differentiation**– an increase in the specialization of a cell * **gene expression**– the process in which instructions in DNA are used to produce a protein or other functional product * **Hayflick limit**– the number of times a cell can divide before it is no longer able to propagate * **mitosis**– a type of cell division in which a parent cell copies itself, resulting in two identical daughter cells. Mitosis is the form of cell division used in all cell growth except sexual reproduction. * **proliferation**– the increase in number of cells by replication * **repair**– in complex organisms, the process by which new cells replace old or dead ones * **senescent cell**– a cell that can no longer propagate * **stem cells**– unspecialized cells capable of unlimited proliferation |
| Lesson 8: Disruptions of the Cell Cycle | * **apoptosis** – a series of steps the cell takes in order to self-destruct * **cancer** – a disease caused by disruptions in the cell cycle that leads to uncontrollable growth and reproduction of certain cell types * **cell cycle** – a sequence of specific steps taken by cells to prepare for and perform reproduction |
| Lesson 9: The Map is Not the Territory | * **limitations** – circumstances that control or reduce the complexity of the process |
| Unit 8: Genetic Variation | |
| Lesson 2: Genetic Variation from Meiosis | * **crossing-over** – the process that occurs when genetic information is swapped between homologous chromosomes * **gametes**– sex cells, which are egg and sperm cells * **haploid**– the state of having half the number of chromosomes as compared to body cells * **heredity** – the passing of genetic material found in chromosomes from parents to offspring * **homologous chromosomes** – a set of nonidentical chromosome pairs that are received from the sperm and the egg * **independent assortment** – the sorting of one pair of homologous chromosomes does not affect the sorting of another * **inheritable genetic variations** – changes in genetic material that can be passed to offspring * **karyotype** – a visual representation of the chromosomes within a cell * **meiosis** – a type of cell division that results in four daughter cells, each with half the number of chromosomes of the parent cell |
| Lesson 3: Genetic Variation from Errors | * **Cell theory** – all organisms are made of cells and they come from pre-existing cells * **DNA** – double-stranded molecule that carries genetic information * **DNA polymerase** – an enzyme that plays a critical role in placing nucleotides in the correct order * **Epigenetic changes** – DNA modifications that do not affect the sequence but the expression of certain genes * **Epigenome** – made of compounds and proteins that attach to DNA and can affect which genes are turned “on” or “off” in the production of certain proteins * **Frameshift mutation** – adding or removing base pairs so that the DNA sequence can no longer be put into exact triplets * **inheritable genetic variations** – changes in genetic material that can be passed to offspring * **Insertion mutation** – add extra base pairs to the DNA sequence making it longer than it should be to code specific proteins * **Methylation** – the attaching of methyl groups (made of one carbon and three hydrogen) to DNA to regulate gene expression * **mutation** – a change in a DNA sequence * **Over-methylation** – having too many methyl groups trying to regulate gene expression that can lead to neurological symptoms and disorders * **Point deletion** – when one base is deleted in the DNA sequence which can lead to incorrect protein synthesis * **replication** – the copying of genetic material * **Substitution mutation** – a nucleotide base is replaced with the wrong corresponding pair * **Under-methylation** – having too few methyl groups to help regulate gene expression that can lead to neurological symptoms and disorders * **viable errors** – changes that can be passed to living offspring |
| Lesson 4: Environmental Genetic Variation | * **DNA methylation** – groups of organic material (one carbon atom and three hydrogen atoms) that bond to DNA to aid in expressing gene traits * **environmental factors** – factors outside the body or from an organism's habitat that react with DNA to affect genes * **epigenetic changes** – changes in the way genes are expressed rather than the way the DNA is sequenced * **histone modification** – changes made to the expression of certain genes when the histone proteins coil with chromatin to form the chromosomes * **inheritable genetic variations** – changes in genetic material that can be passed to offspring * **mutation** – a change in a DNA sequence |
| Lesson 5: Genetic Mutations Produce Variation | * **homologous chromosome** – set of one maternal and one paternal chromosome that pair up during meiosis * **inheritable genetic variation**– changes in genetic material that can be passed to offspring * **mutation** – changing of the structure of a gene * **population bottleneck** – a sharp decline in a species population that leads to a decline in genetic diversity * **zygote** – diploid cell that is created when the sperm cell fertilizes the egg cell |
| Lesson 6: Genetic Variations Can Be Inherited | * **genotyping** – process used to determine the variants in DNA by comparing to a reference sequence * **inheritable genetic variations**– changes in genetic material that can be passed to offspring * **meiosis** – a type of cell division that results in four daughter cells, each with half the number of chromosomes of the parent cell * **mutation**– a change in a DNA sequence * **somatic cells** – all other cells in an organism except the reproductive cells * **variants** – small differences in DNA that can be detected from a cheek or saliva swab |
| Lesson 7: Sources of New DNA Combinations | * **adaptation** – beneficial mutation that can increase a species survival rate * **crossing-over** – the process that occurs when genetic information is swapped between homologous chromosomes * **homologous chromosomes**– pair of chromosomes, one from each parent, that pair up during meiosis * **mutations** – changes in DNA sequence |
| Lesson 9: Organizing Data About Expressed Traits | * **Codominance** – neither allele is either completely dominant or completely recessive so both traits appear simultaneously * **distribution**– how the variation in traits is spread across a population * **Founder effect** – occurs when a small group of individuals establish a new population away from the original and can have a reduced diversity compared to the original * **frequency** – the number of times a particular trait is seen in a population * **gene flow** – when genes move from one population to another * **genetic drift** – a change in the frequency of an allele in a population from generation to generation * **Incomplete Dominance** – a completely dominant allele is not present so a new version is expressed as a hybrid of the two * **inheritable genetic variation** – changes in genetic material that can be passed to offspring * **natural selection** – the process in which organisms better adapted to their environment tend to survive and produce more offspring |
| Lesson 10: Analyzing Data About Traits | * **distribution** – how the variation in traits is spread across a population * **Mendelian Traits** – traits that are controlled by a single gene and have little variation * **normal distribution** – a distribution that has a bell-shaped curve with more traits being expressed in the middle and the extreme variations at each end * **polygenic inheritance**– a trait is controlled by more than one gene * **variation** – the different traits that are found in a population |
| Lesson 11: Expressed Traits | * **correlation** – a relationship between two variables but it does not mean that one causes the other * **causation** – the act of producing an end result * **distribution** – how the variation in traits is spread across a population * **environmental factors** – factors outside the body or from an organism's habitat that react with DNA to affect genes. |