STAAR Biology EOC Must-Know List

*adapted from “Things I Need to Know for the EOC,” Melissa Rountree, Cibolo Steele High School*

**Prokaryotic and Eukaryotic Cells**

Prokaryotic cells do not have a true nucleus.

In eukaryotic cells, the DNA is surrounded by a membrane.

Both types of cells have ribosomes.

Some eukaryotic cells and all prokaryotic cells are surrounded by a cell wall.

Eukaryotic cells have organelles surrounded by membranes.

Prokaryotic cells can reproduce only asexually, by fission or budding.

Eukaryotic cells reproduce asexually and sexually.

**Cellular Processes**

The products and reactants for photosynthesis are reversed in cellular respiration: The reactants of photosynthesis are carbon dioxide and water, which are the products of cellular respiration. The reactants of cellular respiration are oxygen and sugar, which are the products of photosynthesis.

Cellular respiration occurs in plant and animal cells.

Plants use sunlight during photosynthesis to convert energy from the sun in order to manufacture sugar and the chemical energy ATP and to release oxygen.

ATP is used by plant and animal cells.

As cellular respiration occurs, ATP is converted to ADP.

When plants are placed in darkness, cellular respiration continues, using ATP to convert sugar into ADP and releasing carbon dioxide. Photosynthesis stops in the absence of light energy.

Chemical formula for photosynthesis:
light + 6H2O + 6CO2 -->C6H12O6 + 6O2

Chemical formula for respiration:
C6H12O6 + 6O2 --> 6H2O + 6CO2 + ATP

**Transport of Molecules and Homeostasis**

Osmosis is the movement of water molecules across a semipermeable membrane.

Sometimes the movement of molecules across a semipermeable membrane requires energy.

When the number of molecules inside a cell is equal to the number of molecules on the outside of the cell, homeostasis has been reached—the cell is in equilibrium.

**Viruses: Structure, Replication and Disease**

Viruses lack the cell structures necessary for reproduction.

Viruses are considered to be nonliving.

Viruses can replicate by two methods—Lytic infection and Lysogenic infection.

Lysogenic infections occur when the nuclear material of the virus combines with the DNA of a cell before replication of the virus begins.

Viruses and cells have one structure in common, nucleic acids.

HIV is a virus that infects and destroys immune system cells.

**Cell Cycle**

The cell cycle is a continuous process of cell growth and reproduction.

The cell cycle goes through interphase, the longest phase, before undergoing mitosis and cytokinesis.

A cancer cell can develop during any part of interphase. A cancer cell is a cell that goes through the cell cycle continuously, never stopping in G0. These cells consume the body’s resources.

Growth results from mitosis.

There are checkpoints during the cell cycle to help cells divide correctly.

**Biomolecules**

Sugars, the smallest carbohydrates, serve as fuel.

Lipids store large amounts of energy.

A protein’s function depends on its unique sequence of amino acids.

Nucleic acids store and transmit hereditary information.

Organic molecules contain carbon–hydrogen bonds and are produced by organisms.

**Components of DNA**

DNA molecules contain four nitrogenous bases: adenine, guanine, cytosine, and thymine.

Two bases—adenine and guanine—are called purines.

Two bases—thymine and cytosine—are called pyrimidines.

Genes are pieces of DNA that pass traits to offspring.

Nucleotides are made up of a sugar, a phosphate group, a base, and hydrogen bonds.

The amounts of adenine and thymine found in DNA are equal.

DNA molecules are made up of a double helix containing two strands.

Weak hydrogen bonds hold the DNA molecule together.

DNA is found in all living organisms.

DNA stands for deoxyribonucleic acid.

DNA is referred to as “the blueprint of life” because it contains all the information in a living organism.

**Changes to the genetic code**

Mutations are changes in DNA that can be inherited.

Certain codons are responsible for starting the production of a protein, and other codons stop the process.

Mutations occur when bases are added or deleted and when segments of DNA are missing.

Not all mutations are harmful—some are very beneficial.

**Genetic Variations**

Analyze and make inferences about dominant and recessive traits.

Interpret and make predictions about genotypes and phenotypes.

Determine and interpret phenotypic ratios.

Understand the difference between Mendelian and non-Mendelian traits.

Use Punnett squares and other models to predict the results of genetic crosses involving X-linked traits.

Interpret results and make predictions from monohybrid and dihybrid crosses.

Evaluate the limitations of biological models.

**Scientific Evidence of Common Ancestry**

DNA sequences are used to determine how closely related organisms are to one another.

Examining fossil remains enables scientists to understand how modern organisms developed over time.

**Classification and Taxonomy**

Scientists use internal and external characteristics to classify organisms into similar groups.

Within the hierarchical classification system, the domain is the group that includes the greatest number of organisms and exhibits the greatest diversity of organisms.

The species is the group that includes the fewest number of organisms and exhibits the least diversity of organisms.

Taxonomy is a branching classification system that provides a standardized method for grouping organisms.

**Natural Selection and Adaptation**

No organism or population of organisms is perfectly adapted to its ecosystem.

Natural selection does not produce perfection in the organisms that are adapted to an ecosystem.

Adaptations are due to genes that are heritable.

Natural selection occurs as the result of three conditions: variations in characteristics in a population, heritable traits, and differences in fitness among organisms within a species.

Survival of the fittest does not refer to how physically fit or strong an organism is; rather, it refers to an organism’s ability to reproduce and pass on its traits to the next generation.

Natural selection does not act on an individual to make it better adapted to its environment.

There are biological and physical influences that determine the survival and success of organisms.

There are three types of evolution that occur as a result of natural selection—divergent evolution, convergent evolution, and coevolution.

**Interactions among Animal Systems**

Systems do not stand alone; they must work with other systems to enable the organism to function properly.

Each system has specific functions that it must perform, but each system is closely connected to other systems in the body and works with them to perform its functions.

**Interactions among Plant Systems**

Plants, like animals, are composed of different systems that interact to benefit the plant.

Some systems enable the plant to respond to stimuli it receives from its environment, such as touch, light, and gravity.

One system cannot survive without interacting and depending on other systems in the plant.

Each system is composed of smaller systems; for example, the transport system is composed of xylem and phloem found in the leaves, stems, and roots of plants.

The reproductive system reproduces either by sexual or asexual means, depending on the plant.

**Ecological Succession**

Species living in an ecosystem gradually change over time, as do the physical and chemical environments within that ecosystem.

Succession takes place because organisms interact with one another in an ecosystem.

In an ecosystem left undisturbed, succession follows predictable stages: primary, secondary, and climax communities.

Autotrophs are the first pioneer species to inhabit an ecosystem in the primary stage; they create conditions that may be favorable to other autotrophs.

Heterotrophs follow autotrophs in the stages of succession—first herbivore heterotrophs, then carnivores and omnivores.

An ecosystem reaches stability when it becomes a climax community. In this stage it is stable, mature, self-sustaining, and has reached an ecological equilibrium.

**Relationships among Organisms**

Organisms in an ecosystem exhibit different types of relationships as they interact.

Some ways organisms interact is by competing for food and other resources.

Relationships that may be found in an ecosystem include parasitism, commensalism, mutualism, competition, and predator/prey.

**Interactions through Trophic Levels**

Organisms in an ecosystem interact in ways that can be shown in food chains and food webs.

Ecological pyramids are used to illustrate how organisms in an ecosystem transfer matter and energy from one trophic level to another.

Approximately 10% of the available energy in a trophic level is passed on to the next trophic level. The remaining energy, approximately 90%, is used for metabolic functions or dissipated as heat.

Sunlight—radiant energy—is used by plants for photosynthesis. Organisms that feed on plants are able to use about 10% of the energy that was available to the plants.

The transfer and dissipation of energy continue from one trophic level to the next.

**Environmental change and stability**

Mutualism, commensalism, parasitism, competition, and predator/prey relationships are all types of interactions that occur among organisms in an ecosystem.

The stability of an ecosystem can be affected by a natural disaster.

Natural disasters such as hurricanes, droughts, floods, and so on can alter the stability of an ecosystem. These disasters can cause some organisms to diminish in number or become extinct so that their niche in an ecosystem is altered. It can take years for an ecosystem to recover from a natural disaster and regain stability.