Keystone Biology Module A Fact Sheet

Basic Biological Principles

Module A Anchor 1

**Key Concepts:**

- Living things are made of units called cells, are based on a universal genetic code, obtain and use materials and energy, grow and develop, reproduce, respond to their environment, maintain a stable internal environment, and change over time.

- Prokaryotic cells do not separate their genetic material within a nucleus. In eukaryotic cells, the nucleus separates the genetic material from the rest of the cell.

- The cells of multicellular organisms become specialized for particular tasks and communicate with one another.

Chemical Basis of Life

Module A Anchor 2

**Key Concepts:**

- Water is a polar molecule. Therefore, it is able to form multiple hydrogen bonds, which account for many of its special properties.

- Water’s polarity gives it the ability to dissolve both ionic compounds and other polar molecules.

- Carbon can bond with many elements, including hydrogen, oxygen, phosphorus, sulfur, and nitrogen to form the molecules of life.

- The function of macromolecules is directly related to their chemical structure.

- Living things use carbohydrates as their main source of energy. Plants, some animals, and other organisms also use carbohydrates for structural purposes.

- Lipids can be used to store energy. Some lipids are important parts of biological membranes and waterproof coverings.

- Nucleic acids store and transmit hereditary, or genetic, information.

- Some proteins control the rate of reactions and regulate cell processes. Some proteins build tissues such as bone and muscle. Others transport materials or help fight disease.

- Chemical reactions always involve changes in the chemical bonds that join atoms in compounds.

- Chemical reactions that release energy often occur spontaneously. Chemical reactions that absorb energy will not occur without a source of energy.

- Enzymes speed up chemical reactions that take place in cells. This function is directly related to their structure, with each enzyme being specifically shaped to catalyze one particular reaction. Loss of structure causes loss of function.

- Temperature, pH, and regulatory molecules can affect the activity of enzymes.

Bioenergetics

Module A Anchor 3

**Key Concepts:**

- ATP can easily release and store energy by breaking and re-forming the bonds between its phosphate groups. This characteristic of ATP makes it exceptionally useful as a basic energy source for all cells.

- In the process of photosynthesis, plants convert the energy of sunlight into chemical energy stored in the bonds of carbohydrates.

- Photosynthetic organisms capture energy from sunlight with pigments.

- An electron carrier is a compound that can accept a pair of high-energy electrons and transfer them, along with most of their energy, to another molecule.

- Photosynthesis uses the energy of sunlight to convert water and carbon dioxide into high-energy sugars and oxygen.

- Among the most important factors that affect photosynthesis are temperature, light intensity, and the availability of water.

- Organisms get the energy they need from food.

- Cellular respiration is the process that releases energy from food in the presence of oxygen.

- Photosynthesis removes carbon dioxide from the atmosphere and cellular respiration puts it back. Photosynthesis releases oxygen into the atmosphere, and cellular respiration uses that oxygen to release energy from food.

- In the absence of oxygen, fermentation releases energy from food molecules by producing ATP.

- For short, quick bursts of energy, the body uses ATP already in muscles as well as ATP made by lactic acid fermentation.

- For exercise longer than about 90 seconds, cellular respiration is the only way to continue generating a supply of ATP.

Homeostasis and Transport

Module A Anchor 4

**Key Concepts:**

- Buffers play an important role in maintaining homeostasis in organisms.

- To maintain homeostasis, unicellular organisms grow, respond to the environment, transform energy, and reproduce.

- The cells of multicellular organisms become specialized for particular tasks and communicate with one another to maintain homeostasis.

- All body systems work together to maintain homeostasis.

- Passive transport (including diffusion and osmosis) is the movement of materials across the cell membrane without cellular energy.

- The movement of materials against a concentration differences is known as active transport. Active transport requires energy.

- The structure of the cell membrane allows it to regulate movement of materials into and out of the cell. The structure also determines how materials move through the cell membrane.