Energy: The ability to do work or cause change Energy can be moved [transferred] from place to place by moving objects or through sound, light, or electric currents.

- **Conservation of Energy/ Energy Transfer** is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced.
- **Waves**: regular patterns of motion can be made in water by disturbing the surface. When waves move across the surface of deep water, the water goes up and down in place; there is no net motion in the direction of the wave except when the water meets a beach.
  Components: Wave amplitude: 1. crest 2. trough; Wavelength

***Incorporate sound waves and dolphins.**

Sound travels over long distances and can move 4.5 times faster in water than in air. Many marine mammals have adaptations for producing and receiving sounds underwater.

4th Grade From Molecules to Organisms: Structures and Processes

- **Ecosystem** :**Terrestrial** ecosystem- land based; Aquatic ecosystem- water-based Salt marsh: ecosystem between land and ocean
- **Abiotic** Describes non-living factors in the environment.(non-living non man made)
- **Biotic** Describes living factors in the environment.

Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.

Endoskeleton and Exoskeleton

Examples of external and internal structures of Animals

- Beak functions to allow animal (ex birds, turtles) to eat hard seeds and other types of food and to help protect itself
- Claw used to grasp branches, grab prey, and for protection
- Shells hard, outside covering on some animals; functions to provide camouflage and protects the internal structures of the body (Whelks, crabs, oysters…)
- Tamanend's Dolphins: **Behavioral adaptations** include echolocation (**sound waves**), social behavior, hunting strategies, and migration patterns. **External Structures** (Structural adaptations) include a streamlined body, blubber layer, dorsal fin, flippers, tail fin, blowhole, and teeth. **Internal Structures:** physiological adaptations include underwater vision, lung capacity, oxygen storage, thermoregulation, salt regulation, and sonar.

Plant Structure/ adaptations: *Vocabulary- traits introduced in 1st grade, Adaptations discussed in 3rd grade. Adaptations of structures are a focus in 4th.*

- **Roots**- Ex: roots in desert plants (e.g., cacti) grow shallow and wide to collect water; roots on water plants (e.g., water lily) have long roots that float underwater to collect nutrients; roots on some plants anchor the plant into the ground and store nutrients and water the plant needs (e.g., carrots, potatoes)
- **Stems-** trees develop woody stems (branches and trunks) that help support their large size
  Some plants have modified stems that are called **thorns** that help to protect the plant from being eaten
- **Leaves**- size, texture, thickness, and shape are adapted to the habitats in which the plant lives
- **Flowers-** special sizes, shapes, smells, and/or colors that attract organisms required for pollination
- **Fruit-** Some fruits are moist and fleshy (e.g., grapes, peaches, tomatoes)
  Some are covered by hard shells (e.g., bean/pea pods,coconuts)
- **Seeds** Some seeds have special structures that aid in dispersal:
  hooks that grab onto animal fur or clothes (e.g., sand spurs, cockleburs);
  hard, spongy coverings that allow them to float (e.g., coconuts);
  structures that allow them to be carried away by the wind (e.g., dandelions, maple tree seeds, pine tree
  some seeds are only dispersed when certain conditions are present (e.g., forest fire)

A **stimulus** is any change in an organism's surroundings that will cause the organism to react.

- Examples of environmental stimuli may be changes in temperature, amount of water, amounts or types of food, or other organisms present.
- The reaction to the stimulus is called a **response** and can be an action or behavior performed by the organism.

Reptiles (lizards, turtles, snakes) are **ectotherms**, meaning they cannot generate their own body heat but instead must move to a warm/sunny spot to absorb heat from the environment in order to have energy to digest food, etc. Mammals (humans, rabbits, dolphins/whales, bears, etc.) are **endotherms**, meaning they can generate their own body heat and do not have to warm up in order to digest food, etc. They may be active in colder temperatures than reptiles).

Animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

- Different **sense receptors** are specialized for particular kinds of information, which may be then processed by the animal's brain.
  Examples: Sense of smell could help an animal remember an odor.
  Sense of vision could help an animal remember a food source or predator
  Marine mammals may process sounds differently than a marine invertebrate, like a sea urchin.
- Animals are able to use their perceptions and memories to guide their actions. Ex. Migratory birds

Topographic Maps: Contour lines Sea Level

Biosphere: Living things
Hydrosphere Water is found in the ocean, rivers, lakes, and ponds. Water, as part of Earth's landforms, exists as solid ice and in liquid form.
Geosphere: solid and molten rock, soil, and sediments

Weathering: processes that break down rocks at or near the surface of the Earth.
Erosion: the movement of sediments and soil by water, wind, ice, and gravity.
Deposition: the dropping or depositing of sediments by water, wind or ice