The Characteristics of Living things:

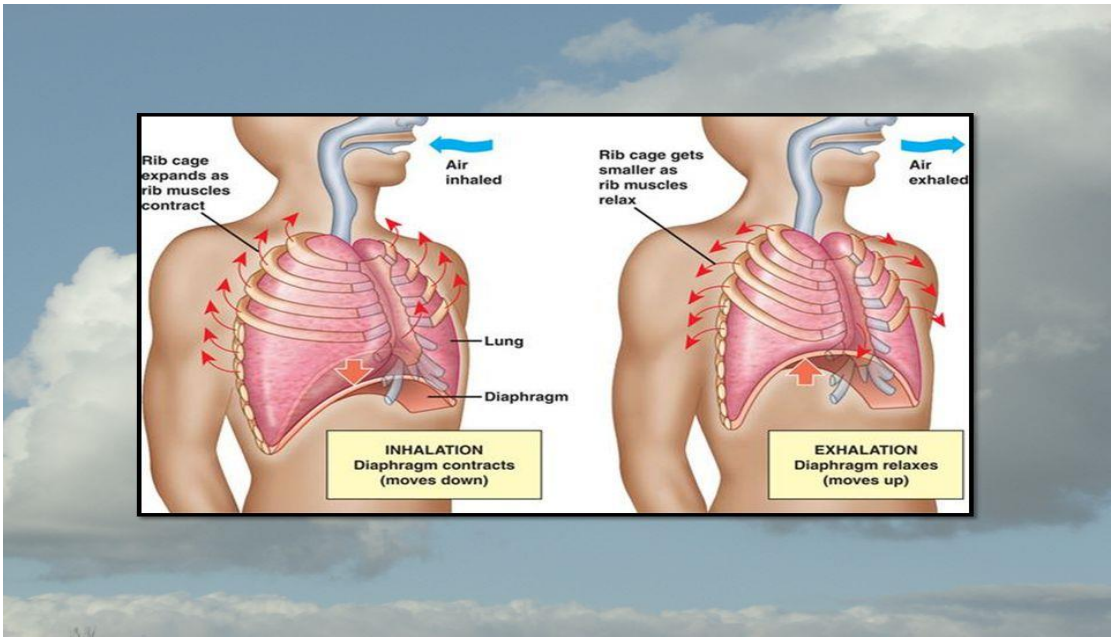
- **Cellular Reproduction** – they can make more of the same kind of organism.
- **Movement**- They can **move** and **change** their position.
- **Sensitivity** – they can detect or sense stimuli and respond to them, such as light, temperature and even gravity.
- **Growth** - they can permanently increase their size by increasing the number or size of their cells.
- **Cellular Respiration** – they can create chemical reactions that break down nutrient molecules in living cells to release energy.
- **Excretion** – they can excrete toxic materials, waste products of metabolism.
- **Nutrition** - Organisms can absorb nutrients, needed for growth and tissue repair.

Adaptation of organism: Adaptation is not always a simple matter; an organism must be viable at all stages of its development.

Respiration in Organisms: Respiration is the process, by which an organism takes in oxygen and release carbon dioxide. It involves the exchange of gasses between an organism and outside environment. The movement of air in and out of the body is known breathing.

The breathing involves two process: Inhalation and exhalation. During inhalation, the diaphragm moves down and the ribs move upwards and outwards, thereby increasing the space in the chest cavity. During exhalation, the diaphragm moves to its former position and the ribs move downwards and inwards, thereby

reducing the size of the chest cavity. This leads to the movement of air out of the lungs.



Homeostasis: Homeostasis is a general sense refers to stability or balance in a system. Homeostasis is an attempt to maintain the internal conditions of the system by limiting fluctuations. When a change occurs, there are two main types of feedback to which the system reacts:

Negative feedback: a reaction in which the system responds in such a way to reverse the direction of change. For instance, when the concentration of carbon dioxide in the human body increases, the lungs are signaled to increase their activity and expel more carbon dioxide.

Positive feedback: a response to amplify the change in the variable. Positive feedback is less common accurring than negative feedback, but it has its applications. For example of positive feedback, in blood clotting the platelets transform blood liquid to solidify. Another example is the secretion of oxytocin which makes the uterus to contract, leading to child birth.

Metabolism: is the set of chemical transformations within the cells of organisms. The three main purposes of metabolism are the conversion of food/fuel to energy to run cellular processes, conversion of food/fuel to building blocks for proteins, lipids, nucleic acids, and some carbohydrates, and the elimination of nitrogenous wastes. The word metabolism refer to all chemical reactions that occur in living organisms, including digestion and the transport of substances into different cells. Metabolism is usually divided into two categories: catabolism and anabolism.

Catabolism: is the set of metabolic pathways that breaks down molecules into smaller units that are either oxidized to release energy, or used in other anabolic reactions. Catabolism breaks down large molecules (such as polysaccharides, lipids, nucleic acids and proteins) into smaller units (such as monosaccharides, fatty acids nucleotides, and amino acids, respectively).

Anabolism: is the set of metabolic pathways that construct molecules from smaller units, these reactions require energy. Anabolism is powered by catabolism, where large molecules are broken down into smaller parts and then used up in cellular respiration. Anabolic processes tend toward "building up" organs and tissues. These processes produce growth and increase in body size. The balance between anabolism and catabolism is regulated by circadian rhythms.

Respond to Stumili: An animal's response to a stimulus is coordinated by its central nervous system (CNS). . Humans use reflex actions in only some of their behaviour, for example controlling the eye's pupil size. All living organisms need to respond to changes in the environment. Plants can also respond to stimuli but the response is usually **slower** than that of animals. Receptors are specialized cells that detect a stimulus. Their job is to convert the stimulus into electrical signal in nerve

cells. Some receptors can detect several different stimuli but they are usually specialized to detect one type of stimulus:

Light - photoreceptors in the eye.

Sound - vibration receptors in the ears.

Touch, pressure, pain and temperature - different receptors in the skin.

Taste and smell - chemical receptors in the tongue and nose.

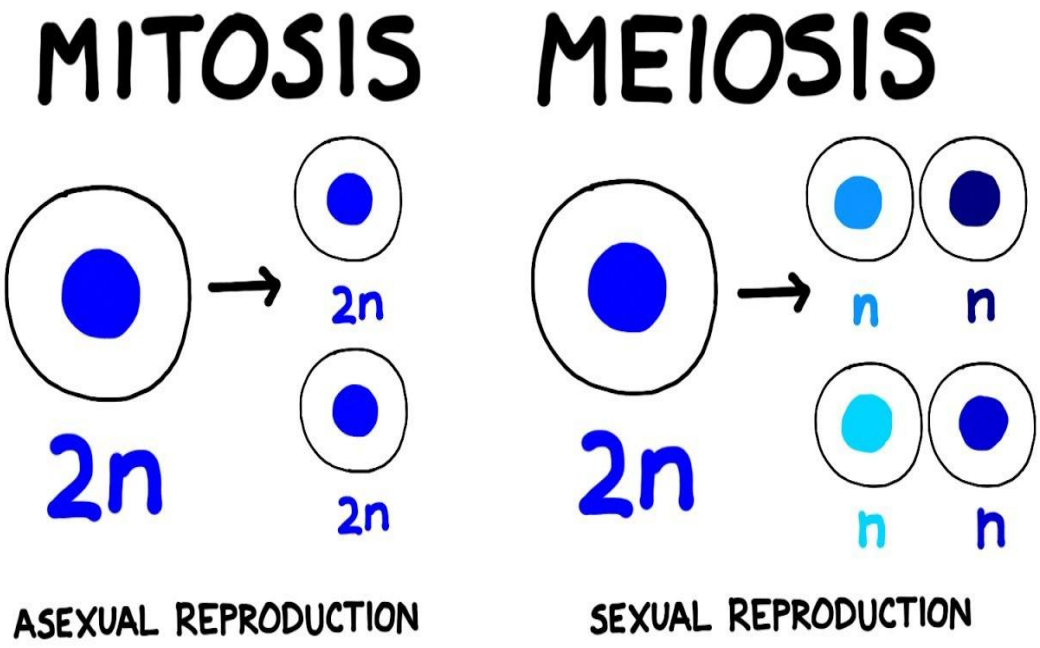
Position of the body - receptors in the ears.

Reproduction: is the biological process, which produce new organisms from their "parents". Reproduction is a main feature of all known life. There are two forms of reproduction: asexual and sexual.

Asexual reproduction is a type of reproduction by which offspring arise from a single organism, and inherit the genes of that parent only; it does not involve the fusion of gametes, and almost never changes the number of chromosomes. Asexual reproduction is the primary form of reproduction for single-celled organisms such as the Archaea and bacteria.

Sexual reproduction: is a form of reproduction where two distinct types of specialized reproductive cells called gametes fuse together, involving a female's large ovum (or egg) and a chromosomes of normal cells. They are created by a specialized type of cell division, which only occurs in eukaryotic cells, known as meiosis. The two gametes fuse during fertilization to produce DNA replication and the creation of a single-celled zygote which includes genetic material from both gametes. Two rounds of cell division then produce four daughter cells with half the number of chromosomes from each original parent cell. For instance, in human reproduction each human cell contains 46

chromosomes, 23 pairs, except gamete cells, which only contain 23 chromosomes.



Chemical Composition of Cells: The Molecular Composition of cells are composed of water, inorganic ions, and carbon-containing organic molecules. Water is the most abundant molecule in cells, its accounting for 70% or more of total cell mass. The smallest particle of an element that still retains its distinctive chemical properties is an atom, which is surrounded by a cloud of negatively charged electrons, The nucleus consists of two kinds of subatomic particles: **Protons**, which are positively charged, and **neutrons**, which are electrically neutral.

Biochemistry of Cells: Biochemistry can be divided in three fields; molecular genetics, protein science and metabolism. Biochemistry focuses on understanding how biological molecules

give rise to the processes that occur within living cells and between cells, which in turn relates greatly to the study and understanding of tissues, organs, and organism structure and function. The four main classes of molecules in biochemistry are carbohydrates, lipids, proteins, and nucleic acids.

Carbohydrates: Carbohydrate are, Monosaccharide, Disaccharide, and Polysaccharide. Two of the main functions of carbohydrates are energy storage and providing structure. There are more carbohydrates on Earth than any other known type of biomolecule; they are used to store energy and genetic information, as well as play important roles in cell to cell interactions and communications.

Lipids: Lipids Comprises a diverse range of molecules and water-insoluble or nonpolar compounds of biological origin, including waxes, fatty acids, fatty-acid derived phospholipids, sphingolipids, glycolipids, and terpenoids , like steroids.

Proteins: Are very large molecules—macro-biopolymers—made from monomers called amino acids. An amino acid consists of an alpha carbon atom attached to an amino group, $–NH_2$, a carboxylic acid group, –COOH, a simple hydrogen atom, and a side chain commonly denoted as "–R". The side chain "R" is different for each amino acid, there are 20 standard ones. This "R" group made each amino acid different, and the properties of the side-chains greatly influence the overall three-dimensional conformation of a protein.

Nucleic acids, so called because of their prevalence in cellular nuclei, it is the generic name of the family of biopolymers. They are complex, high-molecular-weight biochemical macromolecules that can convey genetic information in all living cells and viruses. The monomers are called nucleotides, and each consists of three components: a nitrogenous heterocyclic base (either a purine or a pyrimidine), a pentose sugar, and a phosphate group.