LIVING CHARACTERISTICS

Organization - Living organisms are made of cells – each cell can perform all the processes of life.

Energy - Living organisms need energy, which is obtained from the environment

Environment - Living organisms respond and adapt to stimulus in their environment

Reproduction - Living organisms reproduce to maintain the species, however not every individual needs to reproduce for the species to continue

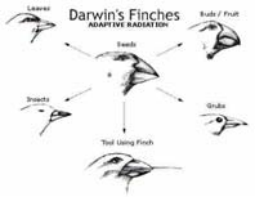
Growth - Living organisms grow and develop by consuming nutrients enabling them to change their body size and shape

Wastes - Living organisms produce wastes and get rid of wastes (solid, liquid and gas)

STRUCTURE

The structures (body parts) organisms have developed to perform life processes and tasks have different functions.

Structural variations - Similarity in structure with some variability can be seen among animals living in the **Galapagos Islands**. Charles Darwin studied many of the animals on the Galapagos Islands and determined the ***'Origin of the Species'*** as a result of his observations. Darwin's 13 closely related species of finches have different bill structures to perform the function of gathering food.



FUNCTION

All organisms have to perform certain tasks or functions to stay alive, but different plants and animals have developed different structures for doing similar functions.

Function	Plant	Animal
moving	Most plants don't move from place to place	wings, legs, fins, tails
food gathering	roots	claws, hands, tentacles, mouths, tongues
breathing	leaves, needles	gills, lungs, spiracles, skin

MICROSCOPE

An object made to appear larger than its actual size, is said to be **magnified**. A microscope magnifies (enlarges) images of small objects. Microscopes come in many shapes and sizes, including two types of electron microscopes:
TEM (transmission electron microscope) and
SEM (scanning electron microscope)
Medical researchers use fiber optics to create microscopes that can be used to see inside the body.

Micro-organisms were first discovered by **Anton van Leeuwenhoek**. **Robert Hooke** observed small honeycombed holes in a tiny piece of cork. He used the word ***cellulae*** to name them (Latin form of 'cell').

Identify the parts, function and handling hints of the **Compound Light Microscope**

CELL

A cell is the basic unit of life performing life functions for living things. Two scientists (Matthias Schleiden and Theodore Schwann) combined their observations of cells to make a hypothesis … ***all living things are made up of cells***.

Rudolf Virchow contributed his observation and together the **Cell Theory** was formulated:
… all living things are composed of one or more cells
… cells are the basic units of structure and function in all organisms

There are certain factors that can affect what you are able to see inside a cell, including:
… the type of microscope you use
… the power of the lenses
… the quality of the prepared slides

CELL

To carry out their work, cells need a constant supply of materials, such as oxygen, water and food particles and they also need to get rid of waste products, all these materials must pass through the cell membrane, most cells fall into a very narrow range of size between 10 - 50 micrometers.

The cells of an organism all work together to help perform the various functions that need to occur if the organism is to live. The specialized cells of the body perform task that enable the organism to survive on a daily basis.

All cells, plant and animal, have structures and each structure performs a specific function in order for the cell to maintain life. The specialized structures inside the cell are called **organelles** and they carry out specific functions

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CELL STRUCTURES
(found only in plant cells)

Cell Wall - are much thicker and more rigid than membranes, providing support for the plant or fungi
'Frame'

Chloroplasts - are the structures in which photosynthesis takes place

'Solar Panels'

CELL STRUCTURES
(found in both plant and animal cells)

Cell Membrane - surrounds and protects the contents of the cell
'Controlled Gateway'

Cytoplasm - distributes materials to different parts of the cell.
'Kitchen'

Nucleus - controls the cell's activities
'Command Center'

Vacuoles - is a membrane-bound sac acting as a storage space for surplus food, wastes and other substances the cell is unable to use immediately
'Storage Rooms'

Mitochondria - chemical reactions occur that convert energy into useable forms
'Powerhouse'

MULTI-CELLULAR organisms can:
- live in a wide variety of environments
- grow very large
- obtain their energy from a wide variety of foods
- have complex bodies
- specialize functions and work in harmony with other cells

UNICELLULAR Organisms can perform all life functions in a single cell.

Amoeba move around using foot-like projections called **pseudopods** (*false feet*).

Paramecium are covered in hair-like structures called **cilia**, which move back and forth

CELL PROCESSES

A **selectively permeable cell membrane** allows some substances to enter or leave, while stopping other substances. (A **permeable** membrane allows all materials through, while an **impermeable** membrane does not allow anything through). Particles' spreading out evenly throughout the cell is called **Diffusion**. It plays a part in moving substances into and out of a cell. Concentration determines the direction that diffusion occurs - high concentration to low concentration. The diffusion of water through a selectively permeable membrane is called **Osmosis**.

Transpiration is water loss occurring in the leaves. Movement of water throughout a plant happens because of differences in pressure. Leaves are the plant's food-producing organs (this is where **photosynthesis** takes place).

PHOTOSYNTHESIS takes place in the layer of cells that contain **chloroplasts** (these cells are called **palisade** cells). They are thin, allowing a large amount of light in (large surface area), and enabling the gases (in the air) to diffuse into the leaf cells. **Phloem Tissue** transports sugars manufactured in the leaves to the rest of the plant. **Xylem tissue** conducts water and minerals, absorbed by the root cells, to every cell in the plant. **Vascular tissues** connect the roots to the leaves.

ORGANIZATION

Cells with the same structure and function form **tissue - Tissues** form **Organs** (Plant organs include – roots, stem flowers and leaves)**,** which work together in **organ systems** within an **organism.** Plants typically have two systems; root system and shoot system (stems and leaves). A reproductive system (flowers, fruits and seeds) is often produced as a plant matures.

DIGESTIVE SYSTEM

Food enters your body through the mouth and then passes to the stomach and intestines. It is broken down along the way into usable, soluble particles that can be used by different cells. There are two types of digestion: **mechanical -** involving the physical breakdown of food into useable pieces and **chemical -** breaking down with ***enzymes*** the smaller pieces into usable nutrients.

RESPIRATORY SYSTEM

Breathing is the process, which moves air in and out of the lungs. The **diaphragm** muscles cause the air to be pushed out of and pulled into the lungs. **Diffusion** occurs between the **alveoli** (tissues of the respiratory system) and the **capillaries** (tissues of the circulatory system)

CIRCULATORY SYSTEM

Transports food and gases throughout our body. The blood vessels that carry blood away from your heart and transport it to all part of the body are called **arteries**.

The blood is returned to the heart from all parts of the body by the **veins**.

Arteries and veins are connected by **capillaries**, which allow the exchange of nutrients and gases. Capillaries have two adaptations for this:

- they are made of specialized epithelial tissue that is *only one layer thick*
- they are *very narrow* so that blood cells must pass through in single file

Oxygen goes from the alveoli to the capillaries and *Carbon Dioxide* goes from the capillaries to the alveoli

EXCRETORY SYSTEM

Waste removal in the body is done through the organs of the **excretory system**. (The respiratory and circulatory systems also assist in the process) **Ammonia** is a chemical waste that the body produces when cells break down protein. The **liver** converts the ammonia to a less harmful substance called **urea**. The urea is carried to the kidneys, where it is mixed with water, and other salts to produce **urine**. Urine can reveal diseases – that is why you often take a urine test for a doctor to determine if certain processes in the excretory system are functioning properly. The urine is transported to the bladder through the **ureter** tubes. The **bladder** expands and then releases the urine out through the **urethra**.

The **skin** also gets rid of waste (excess salt that the body does not need). This process, called '*sweating*' also keeps you cool.

NERVOUS SYSTEM

Nervous tissue is made entirely of specialized cells called **neurons**. A neuron's job is to *send and receive messages*. Small branches in the neuron, called **dendrites**, *receive messages*, which then pass them on through the cell body to the axon. The **axon** then *passes the messages on* to neighboring dendrites at a **synapse**.

The nervous system consists of two main divisions: the **central nervous system** - the brain and the spinal cord; and the **peripheral nervous system** - made up of the cranial (head) and spinal nerves, which travel to all parts of the body.

The **spinal cord** connects the brain to the peripheral nervous system. It contains **interneurons**, which connect one neuron to another.

ACHIEVEMENTS & DISCOVERIES

Prior to the 17th Century a simple cut or broken bone would have killed you. As doctors learned that 'germs' caused disease other discoveries followed.

Louis Pasteur was the first person to identify living micro-organisms as "germs". He suggested, and later proved his theory that these germs were the cause of most infectious diseases.
Joseph Lister determined that these germs were entering his patient's wounds, so he introduced the practice of cleanliness and sterilization to surgery.
Edward Jenner developed the first vaccine. He infected people with cowpox so that they would become immune to smallpox, and it worked.
James Lind treated sailors who had scurvy by feeding them oranges and lemons. It was later discovered that scurvy was caused by a lack of Vitamin C.

DISEASES & DISORDERS

Disorders of the Respiratory System
Bronchitis (which makes breathing difficult)
E**mphysema** (shortness of breath)
Lung cancer (fatal)

Disorders of the Circulatory System
Heart attacks (damage to heart muscle)
High blood pressure (hypertension)
Hypertension ('*the silent killer*') can lead to **Strokes** (brain damage).

Disorders of the Digestive System
Ulcers (sores on the lining of the stomach)
Colon cancer is caused by a low-fiber diet irritating the colon wall

Diseases can be transmitted by germs, or by environmental events. Diseases and disorders can also be inherited during reproduction through the transfer of genes responsible for specific diseases and disorders.

LIFE STYLE CHOICES

Diet, exercise, drugs, injury and disease can affect body systems and how they perform their functions.

Scientific Research has also determined that there are many factors, which can affect your cells, and consequently, your body systems.

These factors include:

- Diseases or conditions that are inherited from family
- Sensitivity (allergies) to environmental conditions; such as smog, pollen, dust, dairy products, or peanuts. Asthma is a condition, which reflects this kind of sensitivity.
- How you respond to physical, emotional and psychological stresses.
- How you treat your body in general – making healthy choices, instead of unhealthy choices