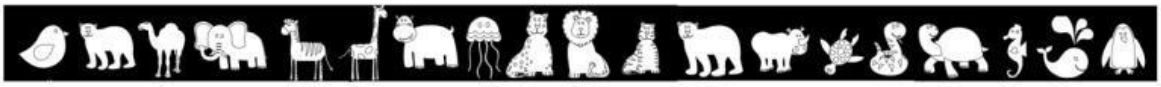
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LIVING ORGANISMS AND THE ENVIRONMENT



Characteristics of Living Organisms

In most animals, we can look at them and immediately know that they are alive by various signals and behaviors that they carry out. Telling whether or not a plant or an organism that is not visible to the naked eye is living is not as simple. However, there are features that all living organisms possess and they are called the characteristics of life or living organisms. All living organisms carry out:

1. **Growth:** a permanent increase in size and complexity. In order to look larger to another organism that may attack it, the blowfish can swell in size. This is not growth because the blowfish eventually returns to its previous size. Therefore, all living organisms must have cells in order to grow. If the organism is made of one cell that one cell will get bigger. If the organism has more than one cell, it will grow by adding new cells. Plants grow taller and wider while animals grow all over.

2. **Response:** living organisms are able to react to any change in the environment (stimulus). The main stimuli are touch, chemicals, heat, light and sound. Animals respond quickly and noticeably. Most plants react more slowly and it may not be as noticeable. Regardless of the type and intensity of the response, the organism does it in order to protect itself or to communicate with their environment.

3. **Movement:** the ability of the organism to reposition parts of itself (movement) or to relocate its entire body to another spot (locomotion). Animals move and locomote, while plants can only move.

4. **Feeding/Nutrition:** the intake of substances into the organism for nourishment. Plants are able to use sunlight energy to make its own food while animals, who cannot do this, feed on other organisms.

5. **Respiration:** the process by which food is broken down to release energy in an organism. Therefore, all living organisms take in oxygen gas and release carbon dioxide gas as a waste from respiration. This process occurs at a cellular level, meaning that it must occur in each individual cell.

6. **Excretion:** the release of metabolic waste from the organism. Metabolized substances are those that were taken into the organism in one form, and after undergoing various processes inside the organism such as digestion and respiration, are converted to another form. If the organism cannot use the new form of the substance or wants to get rid of it, it is excreted. Waste can be excreted in the urine, faeces or sweat.

LIVEWORKSHEETS

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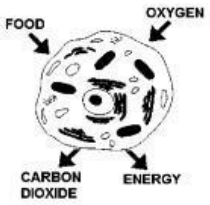
7. **Reproduction:** the ability to make new organisms. All organisms eventually die, so making new ones is very important. Reproduction is also important in passing genetic material (e.g. DNA) from one generation to another. Some organisms can reproduce by themselves (asexual reproduction) while others need an opposite gender to reproduce successfully (sexual reproduction).

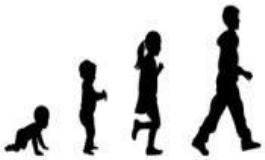
Student's Work

On the line beneath each picture, write the characteristic of life being observed. [1 mark each]









_____ _____ _____ _____







_____ _____ _____

Living, Non-living, Dead

Now that we have listed the characteristics which all living organisms possess, let us determine the difference between living and dead and living and non-living.

1. Living: being able to perform ALL seven characteristics of life.

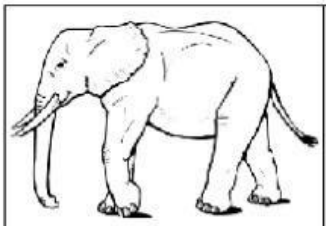
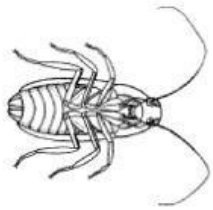
2. Non-living: being able to perform only SOME or NONE of the characteristics of life.

3. Dead: having once been able to perform ALL seven characteristics of life, but no longer able to do any of them.

LIVEWORKSHEETS

Date:

Examples

		
reproduce grow respire respond excrete move feed	respond excrete move	~~reproduce grow respire respond excrete move feed~~
LIVING	**NON-LIVING**	**DEAD**

Student's Work

Tabulate the following list of words in the columns beneath the appropriate headings.

HUMAN	**SKELETON**	**WORM**	**RUBBER BALL**
TELEVISION	**GREEN LEAF**	**CORPSE**	**BROWN LEAF**
FOSSIL	**CONCRETE**	**FLOWER**	**HAMMER**
SHARK	**CARCASS**	**PENCIL**	

LIVING	NON-LIVING	DEAD

[15 marks]

LIVEWORKSHEETS

Date:

CELLS



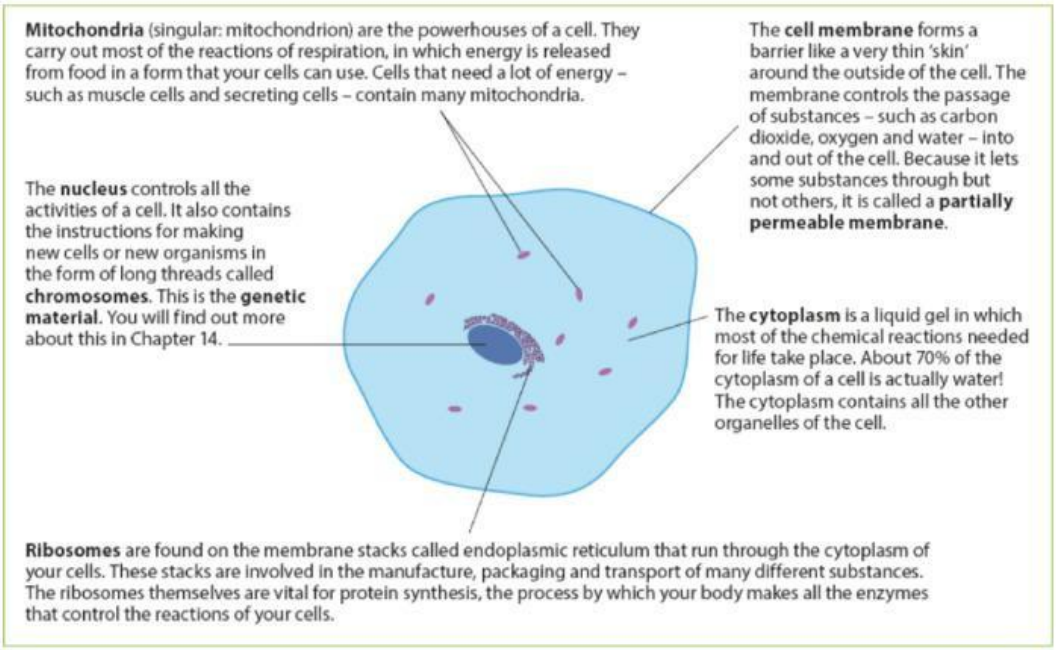
The cell is the basic unit of all living organisms. It is also the smallest structural and functional unit of living organism. The two main types of cells that we will be studying are the plant and animal cells. The hierarchy (order of the make-up) of living things is as follows:

ORGANELLE	→CELL	→TISSUE	→ORGAN	→SYSTEM	→ORGANISM
Mitochondrion	Liver cell	Liver tissue	Liver	Digestive system	Animal
Chloroplast	Mesophyll cell	Mesophyll layer	Leaf	Shoot system	Plant

THE ANIMAL CELL

The main parts of the animal cell are:

1. Cell membrane
2. Cytoplasm
3. Nucleus (plural nuclei)
4. Small vacuole
5. Mitochondrion (plural mitochondria)
6. Ribosome



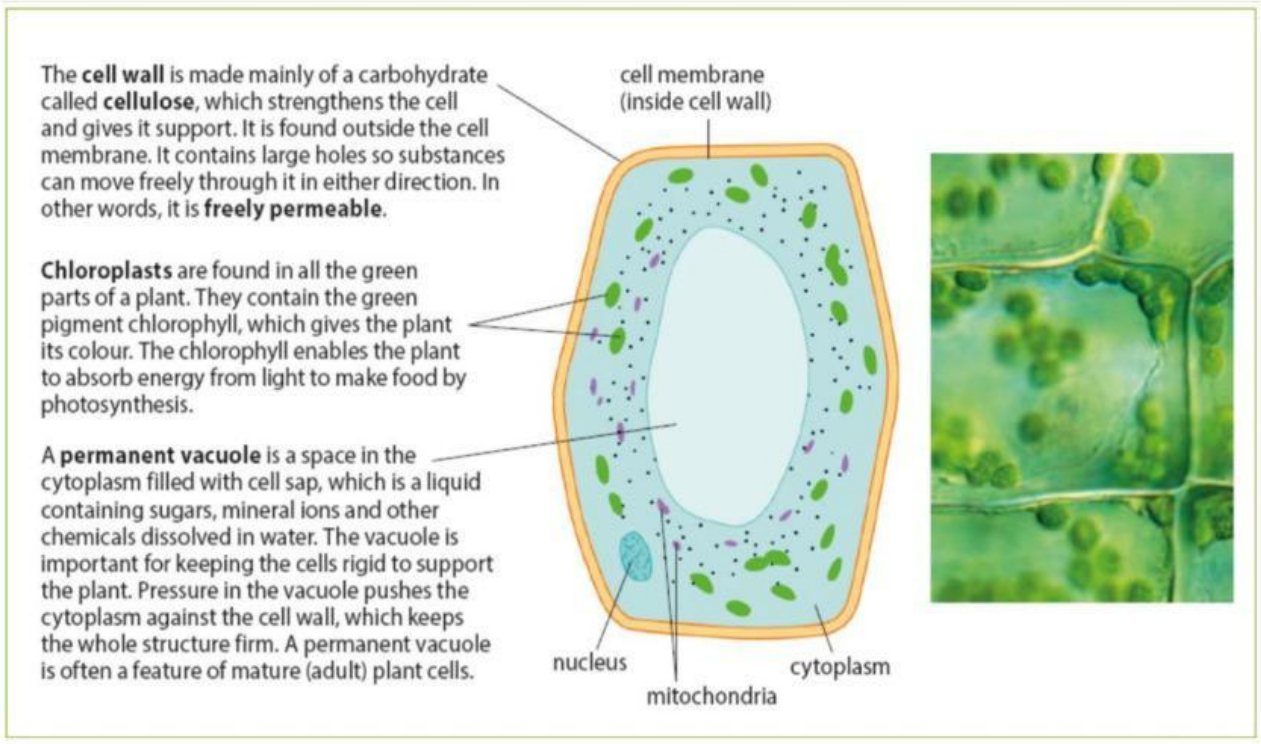
LIVEWORKSHEETS

Date:

THE PLANT CELL

The main parts of the plant cell are:

1. Cell wall
2. Cell membrane
3. Cytoplasm
4. Nucleus
5. Mitochondrion
6. Ribosome
7. Endoplasmic reticulum
8. Large vacuole
9. Chloroplast (with or without starch grains)



Structure and function of the parts of a typical plant/animal cell

The table below shows the main parts of a typical plant and animal cell as well as a description of their structure and function. The term **structure** refers to how something **looks** while the term **function** refers to how something **behaves**, works or its purpose. The term organelle means "small organ". Therefore, the organelles are the small structures found in the cell. Each organelle carries out a specific function, just like each organ has its specific function in the body. Do not confuse organelle wih structures like cell membrane, cell wall or cytoplasm.

LIVEWORKSHEETS

Date:

PART OF THE CELL	STRUCTURE	FUNCTION
1). Cell membrane	Made up of a fat and protein; a double layer. It is PARTIALLY PERMEABLE.	Forms the outer boundary of the cell. Helps to keep the contents of the cell intact and prevents them from mixing with outside. Since it is PARTIALLY PERMEABLE it only allows some substances to exit and enter the cell while preventing others.
2). Cytoplasm	Jelly-like substance made of 75-85% water and 15-25% dissolved substances.	Supports the organelles inside the cell, keeping them in place and is the site/place of chemical reactions in the cell.
3). Nucleus	Large round or oval-shaped organelle enclosed by a nuclear membrane. Contains a structure called the nucleolus.	Contains chromosomes, genes and DNA. It determines the shape and function of the cell. It determines what proteins the cell will make.
4). Mitochondrion	Oval or irregularly shaped structure with an infolding inner membrane which has respiratory enzymes on it. Smaller in plant cells.	Is the site or area of RESPIRATION in the cell where energy is made to carry out the functions of the cell.
5). Ribosome	Tiny, round organelles either laying free in the cytoplasm or attached to the endoplasmic reticulum.	The site where amino acids are linked together to make proteins.
6). Endoplasmic reticulum (E.R.)	A maze of membranes that run throughout the cell. E.R. with ribosomes on them are called rough E.R. and those without ribosomes are called smooth E.R.	Small molecules are transported around the cell in these channels, especially proteins made by the ribosomes
7). Cell wall	The outermost structure surrounding the plant cell. It is made up mostly of cellulose. It is FULLY PERMEABLE.	It gives shape, rigidity and protection to the cell. Since it is FULLY PERMEABLE it allows water and dissolved substances to enter and exit the cell freely.
8). Large vacuole	A membrane-enclosed space in the plant cell which contains cell sap (water, sugars and salts).	A storage site for substances in the plant cell that assists with osmosis in the cell and helps in maintaining the

LIVEWORKSHEETS

Date:

		shape of the cell.
9). Small vacuole	Small spaces in the animal cell.	Stores water and/ or dissolved food substances.
10). Chloroplast	Organelle enclosed by a double membrane which contains the green pigment chlorophyll.	Chloroplasts are the site of photosynthesis (the process by which a green plant makes its own food). The chlorophyll found here gives plants their green colour.
*11). Small masses	Starch grains in plant cells. Glycogen granules in animal cells.	Storage regions of sugars in plants and animals that can be broken down and used for respiration.



Student's Work

Similarities and differences between plant and animal cells

1. There are six **similarities** between plant and animal cells. Plant and animal cells both have:

a). _____ d). _____

b). _____ e). _____

c). _____ f). _____

[6 marks]

LIVEWORKSHEETS

Date:

2. A school can be compared to a plant cell because there are places, things and people who have roles just like in the cell. In the table provided below describe the function of each cell organelle and then state what person in your school serves a similar function in your school. The first one has been completed for you. [12 marks]

PART OF THE PLANT CELL	FUNCTION WITHIN THE PLANT CELL	WHO OR WHERE IN YOUR SCHOOL HAS A SIMILAR FUNCTION?
1. cell wall	Protection. Outer barrier.	Outer perimeter fence.
2. cell membrane		
3. cytoplasm		
4. nucleus	Controls what the cell makes and does.	The Principal.
5. mitochondrion		
6. ribosome		
7. endoplasmic reticulum (E.R.)	Channels that carry substances around inside the cell.	The walkways or hallways of the school.
8. Large vacuole		
9. Chloroplast		

LIVEWORKSHEETS

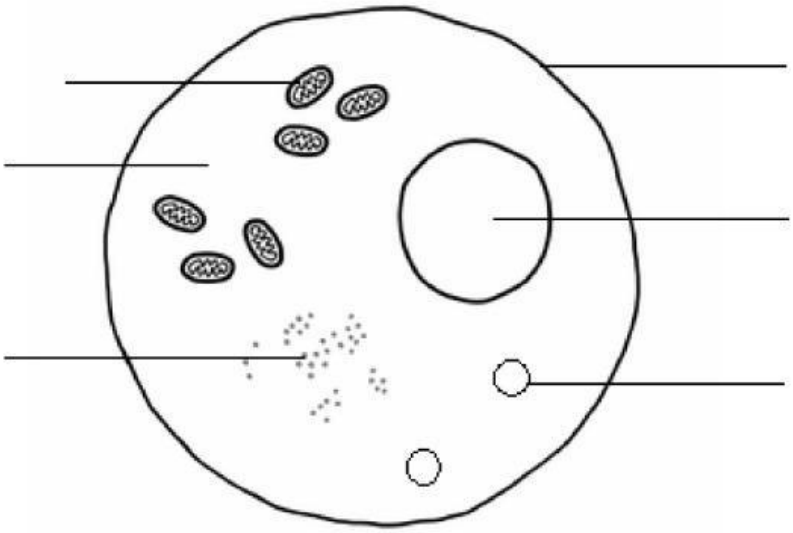
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3. Complete the table below to show some of the **differences** between plant and animal cells.

PLANT CELL	ANIMAL CELL
1. Has a cell wall that gives the cell a regular shape.	1.
2.	2. Has many small vacuoles.
3. Has chloroplasts so the plant cell can photosynthesize to make food.	3.
4.	4. The outermost layer is the cell membrane.
5. Mitochondria are very small.	5.

[5 marks]

4. Label the cell below. On the title line, indicate the type of cell (Plant or Animal).

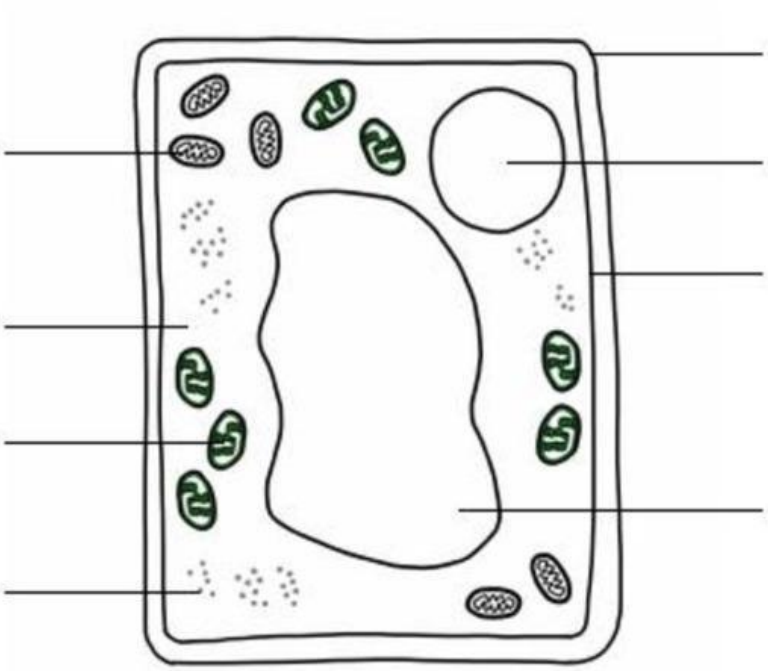


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LIVEWORKSHEETS

Date:

4. Label the cell below. On the title line, indicate the type of cell (Plant or Animal)



_____

SPECIALIZED CELLS

A single-celled organism can carry out all the processes necessary for its survival. However, the more cells that an organism possesses, the more complex it is and the more difficult it becomes to carry out life processes. The cells that divide (form new cells) in organisms are unspecialized or undifferentiated. This means that they have no one special function and that they all do the same things, look the same and have the same parts. Such cells may lack some parts which will develop later or they may have parts that will disappear over time.

Some cells develop in order to perform only one special function. This is called differentiation or specialization of cells. These special or differentiated cells usually look very different from other cells, having more or less parts than an undifferentiated cell. Both plants and animals possess their own special differentiated cells. A few of them are listed below.

LIVEWORKSHEETS

Date:

SPECIALIZED ANIMAL CELLS	SPECIALIZED PLANT CELLS
Sperm cell Egg cell (ovum) Muscle cell Nerve cell Red blood cell (erythrocyte) White blood cell (Lymphocyte) White blood cell (Granulocyte/Phagocyte) White blood cell (Monocyte)	Mesophyll cell Epidermal cell Root hair cell Guard cell Xylem tube Phloem tube



Student's Work

Define the following terms.

1. Cell specialization. [2 marks]

_____

_____

2. Structure [1 mark]

_____

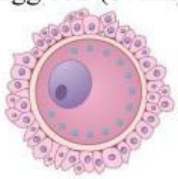
3. Function [1 mark]

_____

LIVEWORKSHEETS

Date:

Specialized Animal Cells

SPECIALIZED ANIMAL CELL	STRUCTURE	FUNCTION
Sperm cell 	• Consists of three regions called the head, the neck and the tail. • The head contains the nucleus (which holds the genetic material), cytoplasm and substances called enzymes that will help the sperm get into the egg. • The neck is the middle piece which contains mitochondria to give • the tail energy for swimming towards the egg cell.	The sperm fertilizes the egg by penetrating it so that its nucleus can fuse with the nucleus of the egg to produce and embryo (which will develop into a baby).
Egg cell (ovum) 	• Much larger than the sperm cell. • Does not move (immotile). • Consists of cell membrane, and cytoplasm containing nutrient-rich yolk. • Surrounded by a protective layer which thickens when penetrated by a sperm so that no other sperm can enter.	Fertilized by a sperm cell to form an embryo.
Muscle cell 	• Elongated cells tapered at both ends and bulging in the middle. • Contains cell membrane, cytoplasm and many mitochondria for energy.	Contract and relax to bring about movement.
Nerve cell 	• May be extremely long cells. • Consists of a cell body containing the nucleus. • The cell body also has fibres called dendrites radiating from it. • The longest dendrite is called the axon which carries the nerve impulse.	Responsible for transmitting messages around the body in the form of electrical nerve impulses.

LIVEWORKSHEETS

Date:

Red blood cell (erythrocyte) 	• Round, tiny, elastic and flexible so that they can squeeze through blood vessels. • They are called biconcave discs because they have a depression in the middle. • Contain no nucleus or mitochondria. • Consists of cell membrane, cytoplasm and a red pigment called haemoglobin which traps oxygen.	Transports oxygen in the bloodstream from the lungs and from cell to cell throughout the body.
White blood cell (Lymphocyte) 	• Consists of a cell membrane, cytoplasm and large round nucleus that takes up most of the inside of the cell.	Secrete substances called antibodies that are produced to destroy disease-causing organisms that invade the body.
White blood cell (Granulocyte/Phagocyte) 	• Consists of a cell membrane, cytoplasm with granules and a very irregularly shaped nucleus called a lobed nucleus.	Engulfs (swallows) foreign organisms and particles into the body. Digestive enzymes in the cytoplasm break them down so that they are harmless and do not further affect the body.
White blood cell (Monocyte) 	• Consists of a cell membrane, cytoplasm and a large bean-shaped nucleus.	Engulfs (swallows) foreign organisms and particles into the body. Digestive enzymes in the cytoplasm break them down so that they are harmless and do not further affect the body.

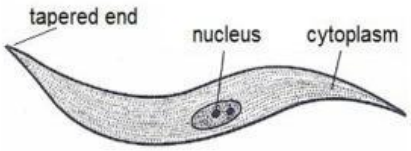
LIVEWORKSHEETS

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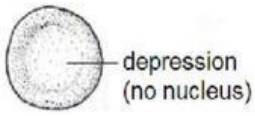
Student's Work

Below are diagrams showing each of the animal cells mentioned in the table above. Let's see how observant you are. Use the structural descriptions in the table to identify each cell. Write the name of the cell on the appropriate line. [2 marks each]

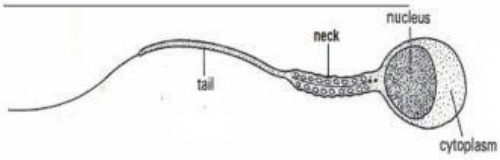
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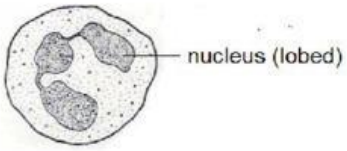
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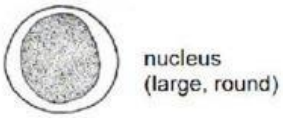
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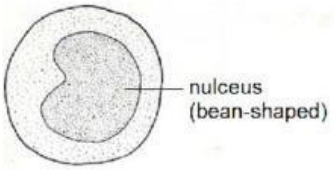
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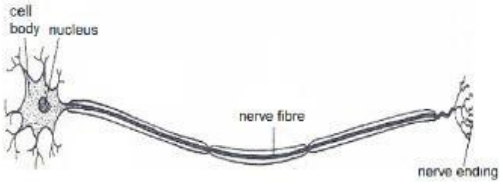
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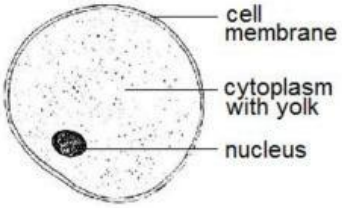
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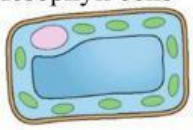
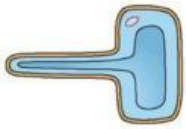
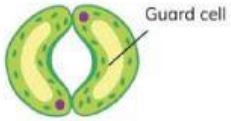
8



LIVEWORKSHEETS

Date:

Specialized Plant Cells

SPECIALIZED PLANT CELL	STRUCTURE	FUNCTION
Mesophyll cells 	• Look like typical plant cells containing all the parts that a typical plant cell has. • Contain many chloroplasts.	Primarily responsible for making food for the plant by the process photosynthesis since they contain so many chloroplasts.
Epidermal cell	• Look like typical plant cells but do not have any chloroplasts so that light can penetrate them and get to the mesophyll cell layers beneath.	Make up the outer layer of all plant parts (leaves, stems, and roots) where it is important for protection.
Root hair cell 	• Epidermal cells located at the plant roots. • The root hair is an extension of the cell allowing it to absorb more water than a regular epidermal cell would.	Absorbs water and minerals from the soil for the plant's use.
Guard cell 	• Are special epidermal cells because they contain chloroplasts and are shaped like beans. • They occur in pairs turned towards one another so that a space or pore called a stoma (plural stomata) forms between them. • Are mainly located on the surfaces of leaves.	Control the size of the stomata by adjusting their shape. This allows more or less gases to pass into and out of the leaf when necessary.
Xylem 	• Dead cells with thick cell walls and nothing else. • Long, extremely narrow, hollow tubes formed from columns of elongated cells stacked on one another. • The end walls of each individual cell have disappeared so that they appear like very long tubes.	Transport water from the soil and roots through the stem and to the leaves.

LIVEWORKSHEETS