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Grade 8

1ST EDITION

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LBK 28.0 я 72
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PREFACE

Natural science is an exciting and very useful subject. This textbook will show you all the beauty of it and will help you become true explorers. The main aim of this book is to answer the fundamental question: "What is science and what is its importance in our life?"

Starting from the first pages, you will realize that this textbook is completely different from any other usual textbook full of theoretical passages. Every chapter contains useful information, interesting facts, tasks for individual and group work. You will also learn how to conduct researches and experiments yourselves, search for information, make your own discoveries.

One more valuable feature of this textbook is the language. Every sentence has been carefully chosen so that it is not difficult for you to understand science in English language. Each page contains the translation of all the important terms, both in Kazakh and Russian. This textbook will not only help you improve your English, but it will also make you a part of a big international science community.

Please pay attention to the structure of this textbook. Remember: a textbook is no longer the only source of information in a modern world. With the help of carefully selected tasks, you are going to learn such important skills as critical thinking, problem solving, information analysis, creativity, imagination, teamwork, digital literacy etc.

If you have any questions, suggestions or ideas regarding the contents of this book, please feel free to contact us:

- via email: admin@astanakitap.kz

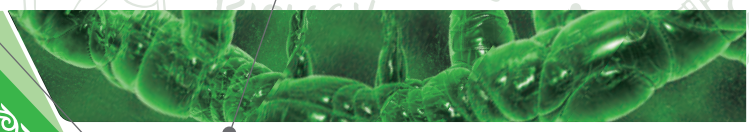
- via telegram app: @astanakitap

Best regards,,
team of authors, "Astana-kitap"

HOW TO USE THIS BOOK

Chapter title

Lesson opener question



11.1

EYE STRUCTURE

Lesson objectives

You will:

- explore the features of visual perception

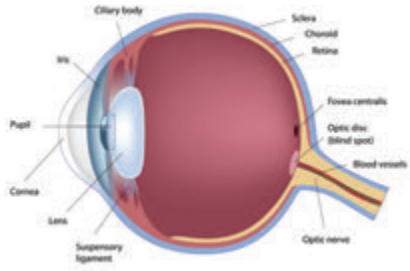
Human body on average has 75 trillion cells. Bacteria which live inside and outside human body are more than 75 trillions. How is this possible that we have more bacteria cells than our own cells?

Definitions of main terms

Key terms

Sclera *- white and the outermost layer of eye*
Cornea *- transparent part of eye that covers iris*
Retina *- the innermost layer of eye containing light-sensitive receptors*

Vision helps human to analyze the world. We see things, colours, processes using eyes. Eye is a complicated organ. It consists of three layers: inner, outer and middle.



Human eye structure

Main text

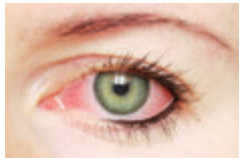
Outer layer consists of sclera and cornea. Sclera is a white layer. It protects eyes from damage. Cornea is a transparent layer.

Middle layer consists of three parts: iris, ciliary body and choroid. Ciliary body holds the lens of an eye. Lens focuses incoming light. Iris has eye colouring pigments. In the middle of the iris there is an opening called pupil. Light enter through this opening. Choroid has blood vessels. They bring nutrients to the eye.

Inner layer is a retina. It has cells called receptors. They receive information from outside and transfers it to our brain.

Facts

"Ішің ауырса, аузыңды тый. Көзің ауырса, қолыңды тый" *This is kazakh proverb about hygiene of eyes and preventing them from diseases like conjunctivitis. Conjunctiva is transparent membrane covering eyes. When it is inflamed, blood vessels that feed membrane become larger and visible. So, this makes whites of eye to turn pink. It is highly contagious.*



Interesting facts

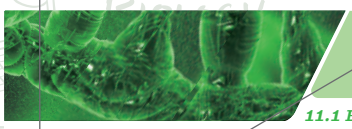
Activity

You are the mayor of the city called Cellorda (Cell Orda). Tell us about your city and citizens!
1. Who lives in Cell Orda?
2. Some bad bacteria want to attack Cell Orda. Soldiers protect the city. Who are they?
3. Now you have problems with energy supply. Who will find energy needed for Cell Orda
4. Work in groups. Show your city's life in action with your group.

Activities to do during the lesson by students

Questions to review the chapter

Experiment of the chapter



11.1 EYE STRUCTURE

Lab works

Eyesight

Pre-lab questions:

1. What is the importance of eye and why we should take care of it?
2. Which eye structure determines a person's eye colour?
3. What are similarities of eyes and camera?

Methods and materials: Sivtsev table, tape-measure.

Procedures:

Print Sivcev table on three A4 papers on landscape orientation.

Put it on the wall. 10th line of the table should be on the level of your eyes.

Illuminate the table with the lamp.

Stand 5 meters away from the table.

Close one eye and read which letters, aren't there many rows on the table.

If you do not see the letter come closer for 0.5 meters. Repeat until you see the letter.

Measure your eyesight using formula:

$V=d/D$

where,

V - eyesight

d - distance, when you see the letter

D - distance, where you started the measurement

Research time

How monomers link together or how polymers break down?
Take an interview from your chemistry teacher. Ask questions about building up and breaking down reactions. Write a short conclusion.

Mini research related to the lesson

Maths in Biology

Artificial polymer
In daily life we use plastic bags: polyethylene. Which is also a polymer of ethylene. Polyethylene is used for the packaging of many products: all sorts of drinks, household chemical goods and cosmetic products. Polyethylene usage needs recycling. Because decomposition of plastics takes minimum 700 years and it pollutes environment.

Interdisciplinary links

Literacy

1. Active cells or cells which need lots of energy have more mitochondria in them. Write 3 human cells with big amounts of mitochondria in them.
2. Plant cells have special plastids called chloroplasts, they do photosynthesis. Plant root cells do not have chloroplasts. Explain why.

Career

Ophthalmologist

Ophthalmologist is a medically trained doctor who is an expert in diagnosing, treating and preventing eye diseases.

Profession introduction

Terminology

pupil - қарашық / зрачок
lens - көз бұршағы / линза
iris - нұрлы қабық / радужная оболочка
complicated - күрделі / сложный
transparent - мөлдір / прозрачный
blink - жыпылықтау / моргать
well-lit - жақсы жарықтандырылған / хорошо освещенный
retina - торлы қабық / сетчатка
sclera - ақ қабықша / склера, белковая оболочка
outermost - ең сыртқы / самый внешний

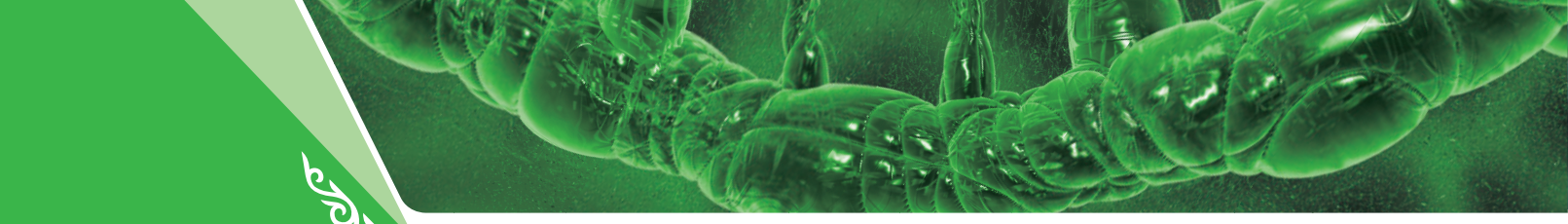
New terms of the chapter

CONTENTS

CHAPTER 1.0
Cell biology

1. Cell structure and types
2. Plant and animal tissues

Yellow coloured spheres are Staphylococcus aureus bacteria cells.



1.1

CELL STRUCTURE AND TYPES

You will:

- compare structures of different types of cells.

A human body has an average of 75 trillion cells. More than 75 million bacteria are living in and on our body. How is this possible that we have more bacterial cells than our own cells?

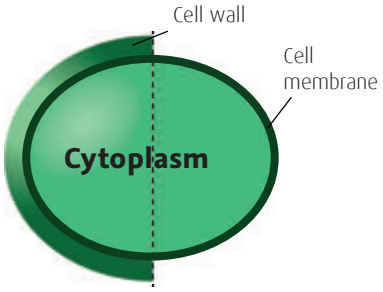
Key terms

Organelles *are parts of the cell which has its own function;*
Prokaryotic cell *(pro-before, karyon-nucleus) is cell without a nucleus;*
Eukaryotic cell *(eu-true, karyon-nucleus) is a cell with a nucleus.*

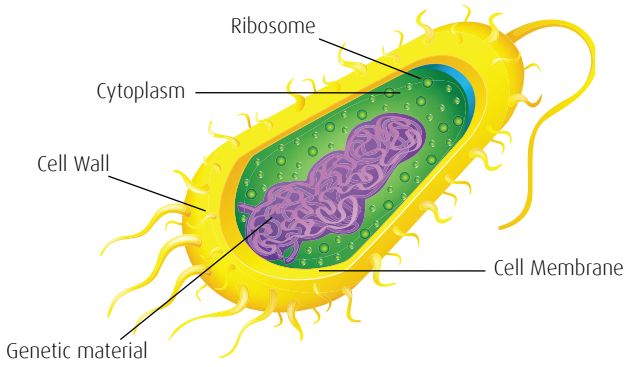
A **cell** is a basic unit of life. All living organisms are made of one or more cells. There are two types of cells: prokaryotic cell and eukaryotic cell.

Prokaryotic cells are bacterial cells. They have a cell wall, cell membrane, cytoplasm, ribosome and genetic material in the cytoplasm. The genetic material is not covered by a membrane in prokaryotic cells, so they do not have a nucleus.

Eukaryotic cells are protists, fungi, plant and animals cells. Eukaryotic cells have a cell membrane, cytoplasm with many organelles and nucleus. Eukaryotic cells are 20-100 times bigger than prokaryotic cells.



Cytoplasm, cell membrane and cell wall. Some cells have cell wall, some cells do not.



Prokaryotic cell structure

Structure of eukaryotic cell

Cell membrane covers the cell. It controls transport of materials in or out of the cell. Plant, fungi and some protists cells have a **cell wall** outside the cell membrane. It is hard and protects the cell.

Inside cell is filled with **cytoplasm**. Cytoplasm includes liquid part and cell organelles. Every organelle has its own function. Those organelles are:

-**Ribosomes**: tiny organelles which produce proteins;

-**Mitochondria**: produce energy for the cell activities;

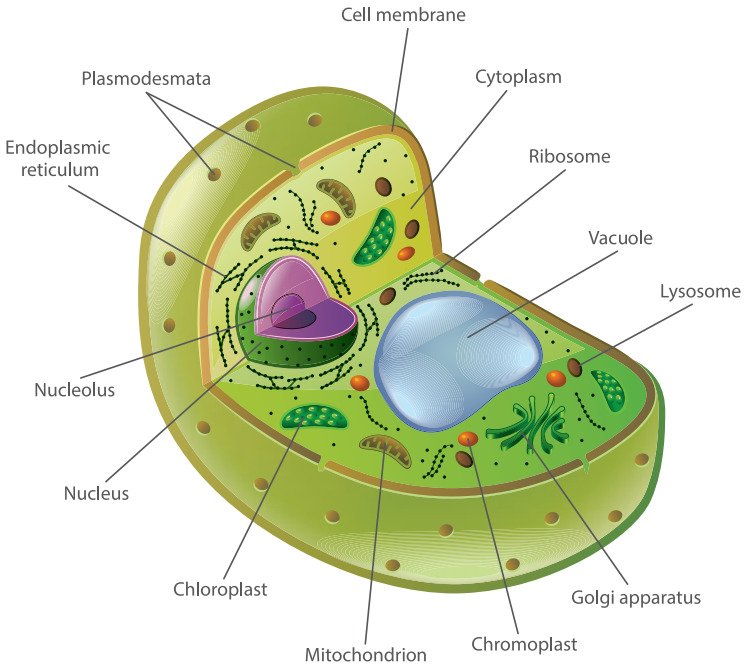
-**Chloroplast**: plant organelle which makes photosynthesis;

-**Endoplasmic reticulum**: makes and transports materials like proteins and lipids within the cell;

-**Golgi apparatus**: receives, modifies and packs materials produced by endoplasmic reticulum; then these materials are transported to the cytoplasm or outside of the cell;

-**Lysosomes**: small sack like organelles with digestive enzymes inside, makes intracellular digestion;

-**Vacuole**: storage organelle, covered by a thin membrane.



Eukaryotic cell structure

Career

Microbiologist

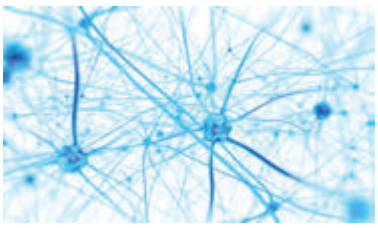
Bacteria can be useful and harmful. Microbiologists study these bacteria. They use good things from bacteria; they can make food or pharmaceuticals. Some bacteria can cause illnesses. Microbiologists study them and help people not to be ill.

Facts

Record-breaker cells

The smallest Bacteria is Mycoplasma diameter of about 0.2-0.4μm (1mm=1000μm, micrometer).

The longest is Blue whale's nerve cell is 10-30 meter long.



"Sociable" cell is nerve cell, which can connect up to 10000 cells.

Activity

You are the mayor of the city called Cellorda (Cell Orda). Tell us about your city and citizens!

1. Who lives in Cell Orda?
2. Some enemies want to attack Cell Orda. Soldiers protect the city. Who are they?
3. Now you have problems with energy supply. Who will find the energy needed for Cell Orda
4. Work in groups. Show your city's life by roleplaying with your group.

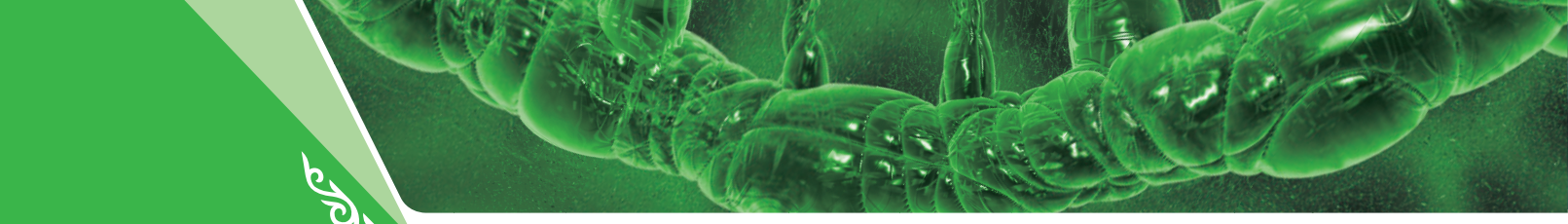
Literacy

1. Active cells or cells which need lots of energy have more mitochondria in them. Write three human cells with large numbers of mitochondria in them.

2. A chloroplast is a kind of plastid; some plant cells have chloroplasts, some do not. Guess which plant cells do not have chloroplast.

Terminology

cell membrane - жасуша мембранасы / клеточная мембрана;
cell wall - жасуша қабықшасы / клеточная стенка;
chloroplast - хлоропласт
eukaryotic cell - эукариотты жасуша / эукариотическая клетка;
genetic material - генетикалық материал / генетический материал
mitochondria - митохондрия;
nucleus - ядро;
organelle - органелла;
prokaryotic cell - прокариотты жасуша / прокариотическая клетка;
ribosome - рибосома;
vacuole - вакуоль.



1.2

PLANT AND ANIMAL TISSUES

You will:

- be able to classify animals and plant tissues.

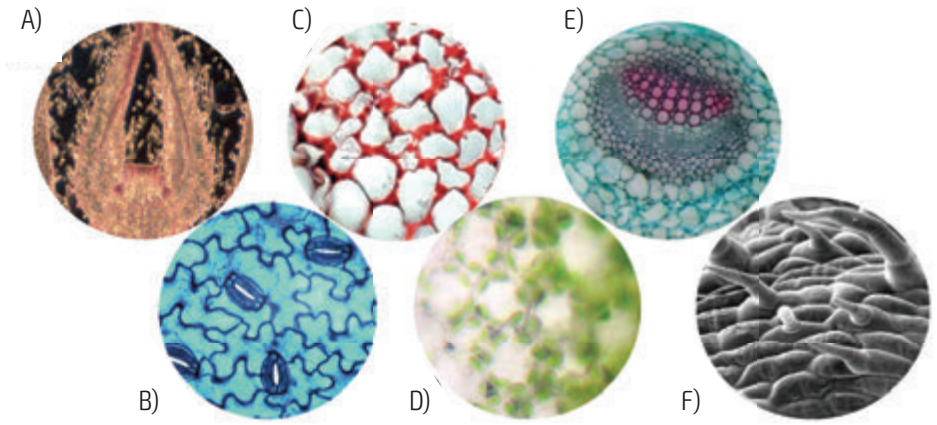
Key terms

Cell *- the smallest functional and structural unit of life;*
Tissue *- group of similar cells which do the same function;*
Microscope *- a tool for observing small objects;*
Fixed slides *- prepared microscope slides.*

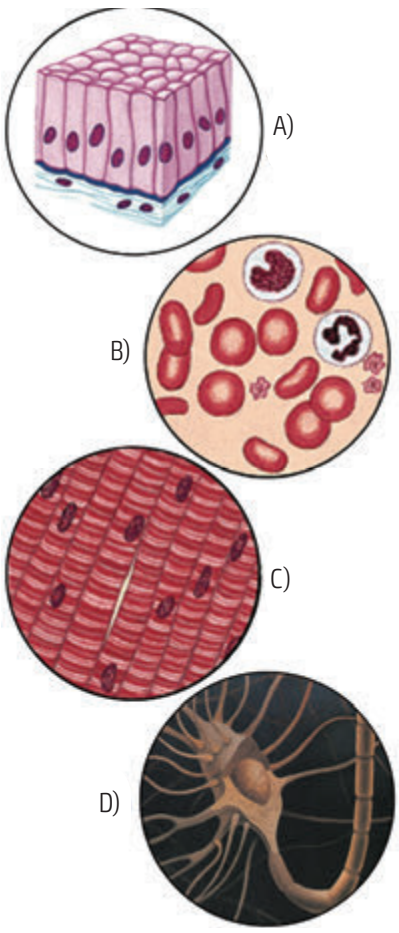
Cells with the same form and function make tissues. Animals and plants have different types of tissues.

Plant tissues

Tissues	Functions
Meristematic tissue	Has rapidly dividing cells that help in plant growth
Dermal tissue	Covers and protects plant body
Mechanical tissue	Gives hardness to plants and prevents from breaking
Ground tissue	Does photosynthesis, stores food and useful materials
Vascular tissue	Transports materials inside plant organism
Secretory tissue	Produces flower nectar, smell



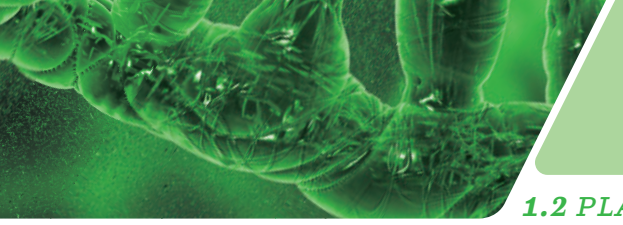
Plant tissues
A) Meristematic tissue (tip of a branch); B) Dermal tissue (epidermis of a leaf); C) Mechanical tissue (collenchyma); D) Ground tissue (palisade mesophyll of a leaf);
E) Vascular tissue (leaf vein); F) Secretory tissue on a leaf



Animal tissues
A) Epithelial tissue (inner lining of intestine); B) Connective tissue (blood); C) Muscular tissue (skeletal muscle); D) Nervous tissue

Animal tissues

Tissues	Functions
Epithelial tissue	Covers and protects the body and internal organs
Connective tissue	Connects organs, gives hardness and protection, and helps in transportation of materials in the animal body
Muscular tissue	Movement of the animal body and body organs
Nervous tissue	Controls all body processes by nerve impulses. It makes up brain and nerves.



Lab works

Structure of different tissues

Pre-lab questions:
1. There are many types of tissues. What makes them similar to each other?
2. Which of the plant and animal tissues do the same work?
3. Guess where muscular tissues work in the body.

Methods and Materials:
Microscope, prepared fixed slides of plant and animal tissues.

Procedures:
1. Observe fixed slides under low magnification
2. Observe fixed slides under high magnification and draw what you see.
3. Compare different tissues and discuss it with your friends.

Results:

Plant tissue name	Picture

Animal tissue name	Picture

Safety precautions:
1. Before using microscope read instructions.
2. Call teacher if you break microscope slide, do not touch it.

Post-lab questions:
1. Explain the structure of the animal muscular tissue.
2. Explain the structure of plant meristematic tissue.
3. How is the structure of muscular tissue connected with its functions? Explain your answers.

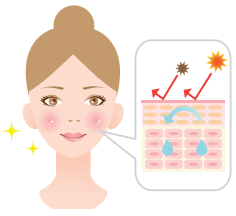
Maths in Biology

To find how many times you magnified an object using a microscope, use the following formula:
Total magnification = ocular lens x objective lens
Find the magnifications of an object with an ocular marked 10X and objectives marked 5X, 15X, 30X and 60X.

Light microscope

Facts

Some tissues contain dead cells, But still these cells are very useful: in plant tissues they transport water, in human skin they protect cells from harmful ultraviolet lights.



Terminology

connective tissue - дәнекер ұлпа / соединительная ткань;
dermal tissue - жабын ұлпа / покровная ткань;
epithelial tissue - эпителий ұлпасы / эпителиальная ткань;
function - қызметі / функция;
ground tissue - негізгі ұлпа / основная ткань;
meristematic tissue - түзуші ұлпа / образовательная ткань;
muscular tissue - бұлшықет ұлпасы / мышечная ткань;
nervous tissue - жүйке ұлпасы / нервная ткань;
secretory tissue - бөлуші ұлпа / выделительная ткань;
vascular tissue - өткізуші ұлпа / проводящая ткань;
to magnify - үлкейту / увеличивать.

Cell Biology

Test questions with one right answer

1. Which type of tissue makes photosynthesis and stores materials?
A) Connective tissue B) Mechanical tissue
C) Muscular tissue D) Ground tissue
E) Epithelial tissue

2. Which type of tissue protects from harmful ultraviolet light?
A) Nerve tissue B) Secretory tissue
C) Muscular tissue D) Ground tissue
E) Epithelial tissue

3. Most organelles are found inside the cell membrane. Which cell part is located outside of the cell membrane?
A) Cytoplasm B) Cell wall
C) Nucleus D) Mitochondria
E) Plastids

4. Not found in bacterial cells:
A) Cell membrane B) Cell wall
C) Nucleus D) Ribosome
E) Cytoplasm

Test questions with several (max 3) right answers

1. Types of connective tissue:
A) Brain B) Blood
C) Root D) Heart
E) Skeletal muscle F) Tissue of bones
G) Stem H) Leaves

2. Tissues which have dead cells:
A) Meristematic tissue B) Epithelial tissue
C) Nervous tissue D) Connective tissue
E) Vascular tissue F) Muscular tissue
G) Secretory tissue H) Dead tissue

3. Organelles of a prokaryotic cell:
A) Cell membrane B) Cell wall
C) Plastids D) Vacuole
E) Mitochondria F) Ribosome
G) Nucleus H) Chloroplast

Matching

1. Match tissues with function:

1. Meristematic tissue	A) Helps plant to grow.
2. Dermal tissue	B) Protects plant.
3. Ground tissue	C) Produces nectar.
	D) Makes photosynthesis.
	E) Transports materials.
	F) Stores food.

2. Match organelles with function:

1. Mitochondria	A) Transport materials
2. Ribosomes	B) Make protein
3. Plastids	C) Produce energy
	D) Store carbohydrates
	E) Do photosynthesis
	G) Control processes in the cell

Classic questions

1. Put the following words in correct place. Do not use one term more than once.
locations: *spinal cord, skin, cover of inner organs, blood, bone, brain, biceps*
functions: *movement, protection, receive and send impulses, transport of materials, connection between organs.*

	Nervous tissue	Epithelial tissue	Connective tissue	Muscular tissue
location				
function				

2. Put ticks on cell parts of following cells, which cell parts these cells have.

Cell parts	**Bacteria cell**	**Plant cell**	**Animal cell**
cell membrane			
cell wall			
mitochondrion			
ribosome			
nucleus			
cytoplasm			
vacuole			
chloroplast			