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Photocopy Master Sheets

Years 7-8

Living Cells

Disk filename = “06.Cells”

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Topics Available

Year 7-8 General Science

Disk Filename	Topic Name
01.Energy	Energy
02.Forces	Forces
03.Matter	Solids, Liquids & Gases
04.Mixtures	Separating Mixtures
05.Elements	Elements & Compounds
06.Cells	Living Cells
07.Life	Living Things
08.LifeSystems	Plant & Animal Systems
09.Astronomy	Astronomy
10.Earth	The Earth
11.Ecosystems	Ecosystems

Year 9-10 General Science

Disk Filename	Topic Name
12.Waves	Wave Energy (inc. Light)
13.Motion	Forces & Motion
14.Electricity	Electricity
15.Atoms	Atoms & Elements
16.Reactions	Compounds & Reactions
17.DNA	Cell Division & DNA
18.Evolution	Evolution of Life
19.Health	Health & Reproduction
20.Universe	The Universe
21.EarthScience	Earth Science
22.Resources	Resources & Technology

Year 11-12 Science Courses

Biology

Preliminary Core
Local Ecosystem
Patterns in Nature
Life on Earth
Evolution Aust. Biota
HSC Core
Maintain. a Balance
Blueprint of Life
Search for Better Health
Options
Communication
Genetics:Code Broken?

Chemistry

Preliminary Core
Chemical Earth
Metals
Water
Energy
HSC Core
Production of Materials
Acidic Environment
Chem.Monit.&Mngment
Options
Shipwrecks, Corrosion...
Industrial Chemistry

Earth & Envir. Science

Preliminary Core
Planet Earth...
Local Environment
Water Issues
Dynamic Earth
HSC Core
Tectonic Impacts
Environs thru Time
Caring for the Country
Option
Introduced Species

Physics

Preliminary Core
World Communicates
Electrical Energy...
Moving About
Cosmic Engine
HSC Core
Space
Motors & Generators
Ideas to Implementation
Options
Quanta to Quarks
Astrophysics

All Topics Available as PHOTOCOPY MASTERS and/or KCiC

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KCiC = Key Concepts in Colour
Full colour, formatted for on-screen study and data projection. PDF + Powerpoint®
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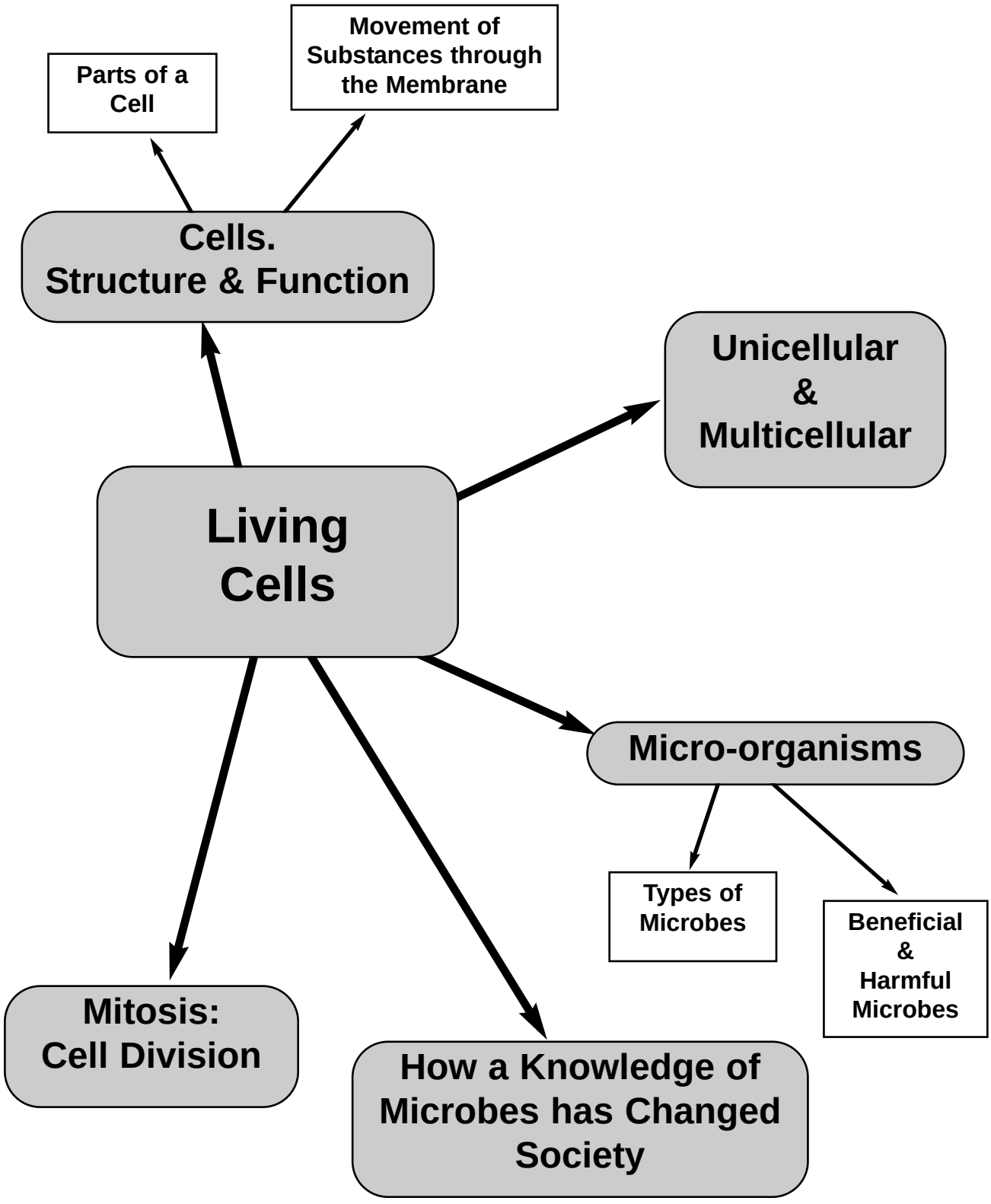
"Mind-Map" Outline of Topic

This topic belongs to the branch of Science called "Biology", the study of living things. Biology has many aspects, from studying the variety of life forms and how they evolved over the history of the Earth, to their body structures and functions, to how they feed, grow and reproduce.



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Make your own "Mind-Map" TITLE PAGE.
Cut out the boxes. Sort them into an appropriate lay-out on a page of your workbook, then glue them down. Add connecting arrows and colour in.

Living Cells

Parts of a Cell

How a Knowledge of Microbes has Changed Society

Cells. Structure & Function

Movement of Substances through the Membrane

Beneficial & Harmful Microbes

Mitosis: Cell Division

Unicellular & Multicellular

Types of Microbes

Micro-organisms

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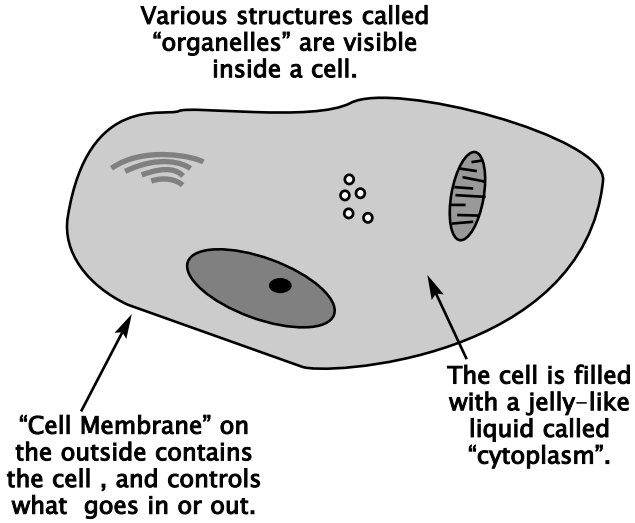
Cells - the Units of Life

All Living Things are Made of Cells

Every living organism that has ever been examined with a microscope has been found to be made up of tiny little "bags" of living matter that we call "cells".

Each cell is alive. Some living things are made up of just one cell. All the familiar living things are made up of many, many cells. Your body contains at least 200 billion cells. (200,000,000,000 cells)

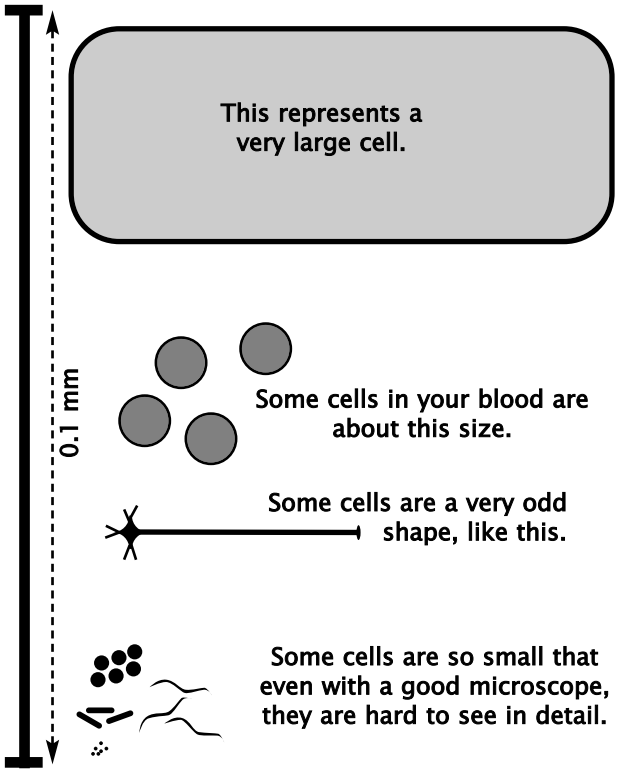
DIAGRAM OF A LIVING CELL



How Big is a Cell?

Obviously, cells are very small and you need a microscope to see them.

Cells vary a lot in their shape and size. In the diagrams below, the vertical scale bar represents 0.1mm ($^1/_{10}$ of a millimeter).

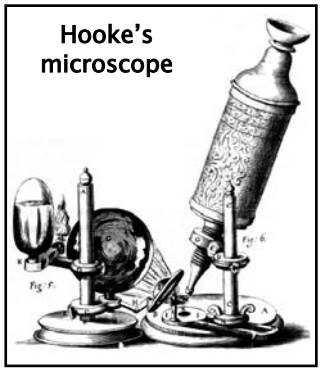


A Little History

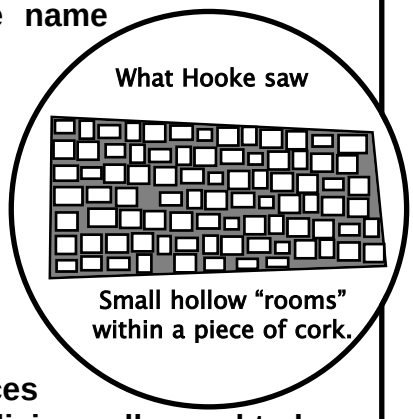
The Discovery of Cells

By about the1500's, people had begun using glass lenses to make spectacles and "magnifying glasses". Soon, the telescope was invented, and later some experimenting was done to construct microscopes to look at very small things.

In 1665, Robert Hooke, an English scientist, used a primitive microscope to look at a piece of cork.



He saw that the cork was made up of rows and rows of hollow little boxes, like rows of small rooms in a gaol or monastery. He described them as "cells" and the name stuck.



We now understand that these cells were hollow because cork is the dead bark of a tree.

The hollow spaces were where the living cells used to be when the bark was growing.

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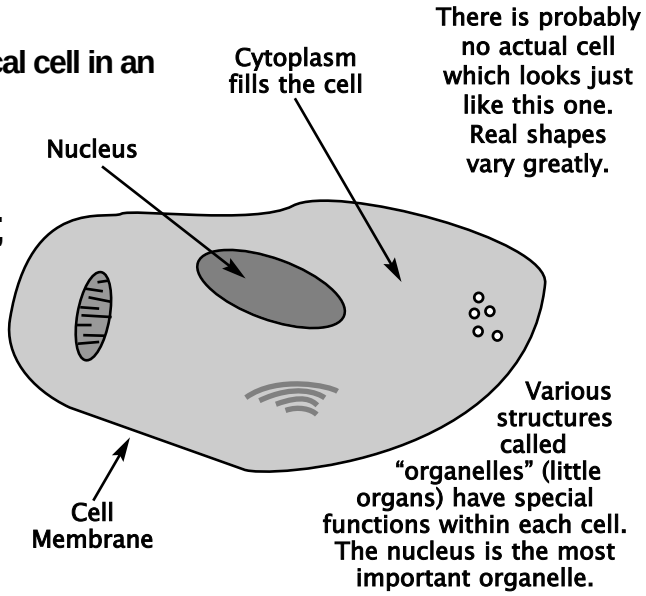
Parts of a Cell

Each living cell is a very complicated structure.
Some of the most important parts are described below. Essential learning!

Animal Cells

The diagram shows the main features of a typical cell in an animal.



Nucleus
This organelle is the "control centre" of the cell. The nucleus sends out "chemical messengers" to every part of the cell, to control all the cell processes.

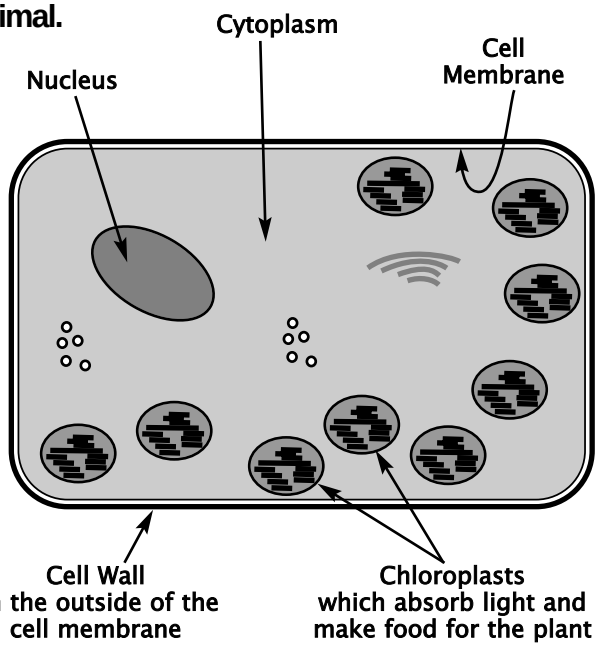
Cytoplasm
This a jelly-like liquid which completely fills the cell. It is mostly water, with thousands of different kinds of chemicals dissolved in it. Also suspended in the cytoplasm are many small structures called "organelles".

Many chemical reactions are constantly occurring in the cytoplasm solution, and within the organelles. "Life" is mostly a matter of chemistry.

Cell Membrane
Surrounding the cell, and containing it, is an extremely thin, flexible layer. This membrane not only holds all the cell parts together to form a little bag of life, but it controls all the chemicals which enter or leave a cell.

Plant Cells

Plant cells have all the same features of animal cells, but have 2 extra features that you need to know about. These are never present in an animal.



Chloroplasts
These are green-coloured organelles which absorb the energy of the Sun and use it to make food for the plant by the process of photosynthesis.

Not every plant cell has chloroplasts; only the leaves and sometimes the green stem.

Cell Wall
This is a tough, fibrous, non-living layer on the outside of the cell. It makes plant cells stronger and helps to maintain the stiffness and shape of thin leaves, petals and fragile roots.

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Movement of Substances Through the Cell Membrane

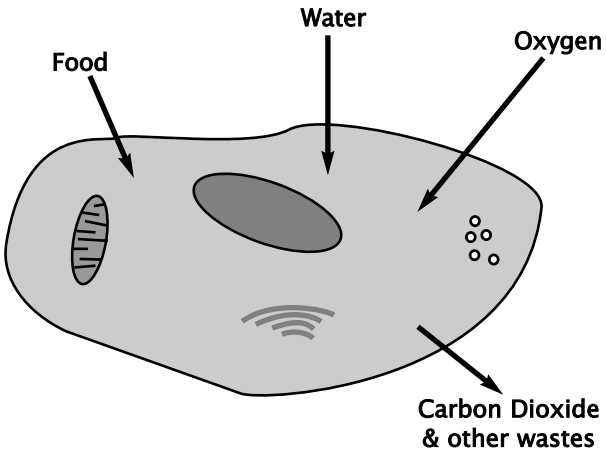
What Cells Need

Each cell is alive. This means it has all the requirements that you have. To stay alive you need to breathe, eat and drink, and so does a cell.

- **Food chemicals and water must get in.**
- **Oxygen gas (O_2) must get in.**
- **Waste products must get out. "Wastes" include the gas carbon dioxide (CO_2), plus other waste chemicals from processing food.**

For these substances to get in or out, they must move through the cell membrane.

The cell membrane does not have a "mouth" or any openings, so how is this possible?



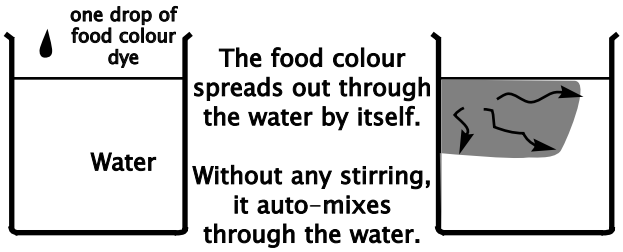
The cell membrane is a bit like using a plant hedge as the fence around a farmyard. A hedge will prevent the cows getting through, but a mouse or lizard will easily crawl and wriggle through.

Similarly, the cell membrane acts as a barrier to large chemicals and organelles, but small molecules (like water, O_2 & CO_2) can easily pass through.

The word "permeable" describes something that liquids can seep or soak through. The cell membrane is "semi-permeable" which means that some substances can move through it, but other things cannot.
Why the chemicals move is another matter.
You may have already studied "diffusion" in a previous topic. Diffusion is revised below.

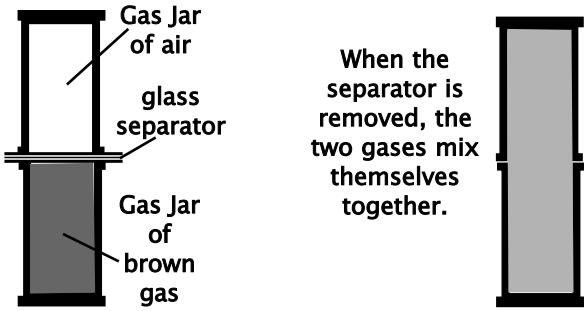
Diffusion

Fluids (liquids and gases) seem to be able to mix themselves together automatically.



This process is called "Diffusion".

The coloured solution can mix itself through the beaker of water. The brown gas can mix with the air without any help.



The explanation is in the Moving-Particle Model of matter. In liquids and gases, the particles are moving around. If 2 different gases or liquids are side-by-side, then the moving particles will automatically mix.

Some substances move through the cell membrane because of diffusion.

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Worksheet 1
Cells

Fill in the blanks

Student Name.....

Every living thing is made of a)..... Each one is alive. To see cells you need to use a b).....

Some living things are composed entirely of c)..... cell, but all familiar life-forms are made up of d)..... of them. Cells are generally less than e)..... (fraction) of a millimetre in size, and many are much smaller still.

Cells were first seen (and named) by f)..... in 1665

The main parts of a cell are:
• the g)....., which is the control centre for each cell.
• h)....., a jelly-like liquid which fills the cell. In it are also many small structures called i).....
• the j)....., which surrounds the cell. It also controls k)..... of the cell.

Plant cells have 2 additional features:
• a tough l)..... on the outside of the cell membrane.
• m)....., which absorb n)..... energy to make food by the process of o).....

Each cell needs to get food and p)..... (gas) in, and to remove wastes such as q)..... (gas) These must all move through the r)..... which can let some things through, while blocking others. It is said to be "s).....-.....". Small molecules like water can easily move through by the process of t).....

Worksheet 2
Cell Structure & Function

Match the lists.
Write the letter (A,B,C, etc) of the list item which matches each description.

Student Name.....

Descriptions	List Item
1. Magnifying device used to view cells.	.....
2. Man who first saw cells.	.....
3. Part of a plant cell which is green and makes food.	.....
4. Organelle which controls all cell functions.	.....
5. Cell membrane is like this.	.....
6. Cells are full of this.	.....
7. Process by which small molecules can move through a membrane.	.....
8. A gas which cells need to get in from the outside.	.....
9. What cytoplasm is mostly made from.	.....
10. Found on the outside of plant cells only.	.....

List Items (not all will be used)

A. water	G. chloroplast
B. A.Einstein	H. semi-permeable
C. cytoplasm	I. microscope
D. oxygen	J. diffusion
E. R.Hooke	K. cell wall
F. nitrogen	L. nucleus

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Worksheet 3

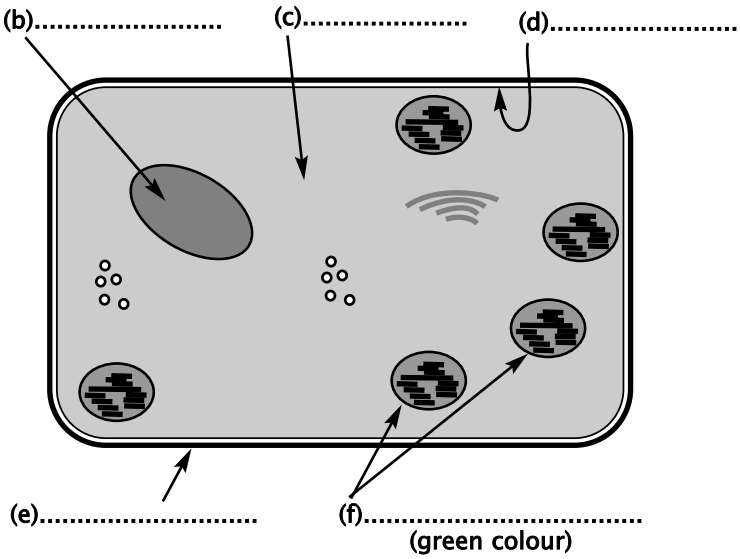
Identifying Cell Parts

Label all the diagrams

Student Name.....

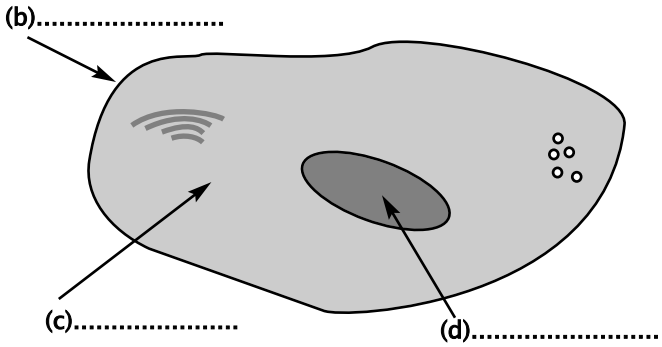
1.

a) Is this a plant or animal cell? .....



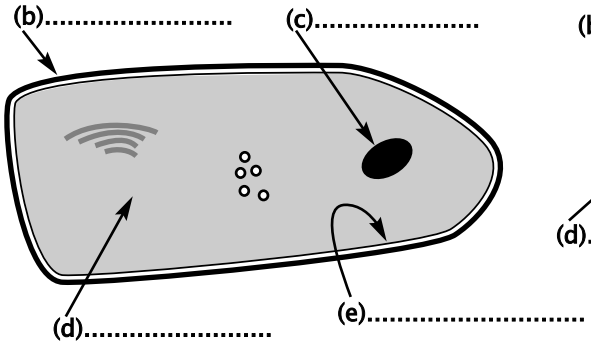
2.

a) Is this a plant or animal cell? .....



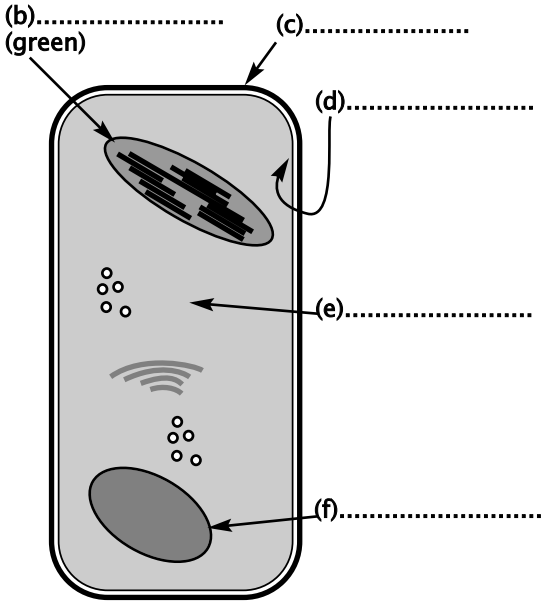
3.

a) Is this a plant or animal cell? .....



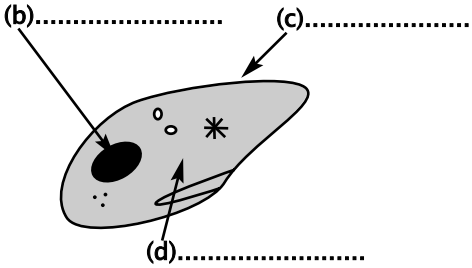
4.

a) Is this a plant or animal cell? .....



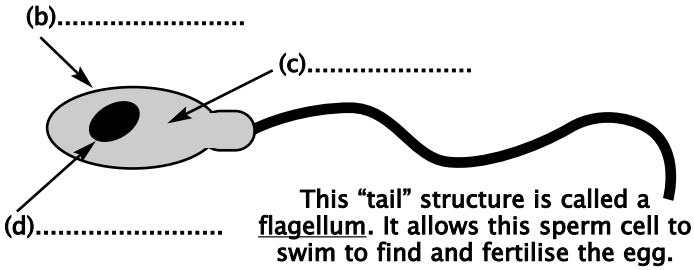
5.

a) Is this a plant or animal cell? .....



6.

a) Is this a plant or animal cell? .....



This "tail" structure is called a flagellum. It allows this sperm cell to swim to find and fertilise the egg.

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Unicellular & Multicellular Organisms

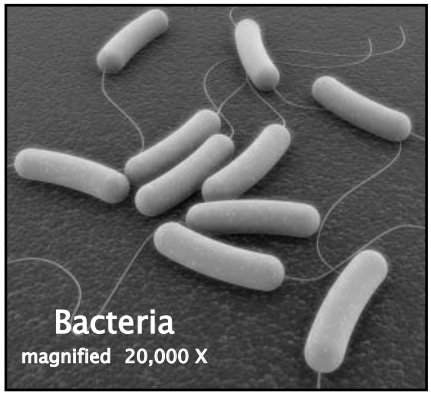
"Uni-" = one. "Multi-" = many. "cellular" = made of cells.

Unicellular Organisms

There are many types of living things which are composed of just one, single cell.

Obviously, they are very small, and in some cases there may be millions of them living in a single drop of pond water.

One of the most common types is the bacteria.



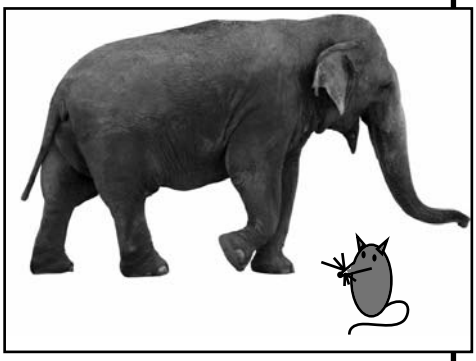
Bacteria live in every place you can imagine. They live in water & soil, and on and inside other living things.

You have millions of bacteria on your skin, in your mouth and throughout your gut.

Bacterial cells are very small, often only about $^{1}/_{1,000}$ mm long.

Multicellular Organisms

All the familiar plants and animals are multicellular... they are made up of billions of cells.



The cells are all pretty much the same size. For example, the cells in a mouse are exactly the same size as the cells in an elephant... the elephant simply has a lot more cells.

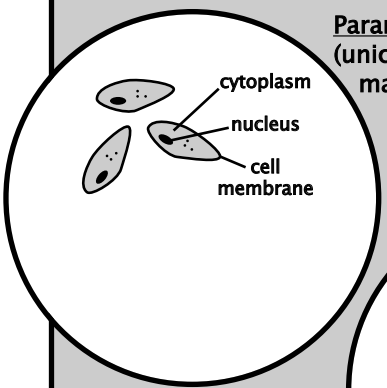
The single cell of a unicellular life-form must be able to do everything.

In a multi-cellular creature, however, each part of the body is specialised to do a particular job, and usually has many different specialist cells. For example, muscle cells are different to nerve cells, and blood cells are different again.

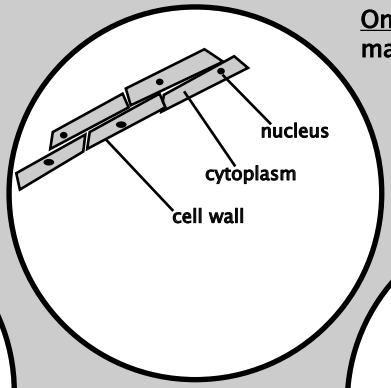
Through the Microscope

You will probably learn how to use a microscope and look at some cells through it.
You probably will NOT view bacteria (too small), but might see the following examples.
Try to identify all the visible cell parts that you see.

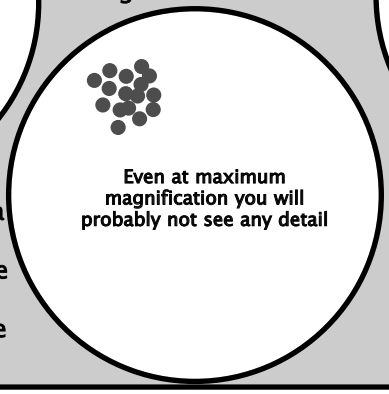
Paramecium
(unicellular organism)
magnified 100X



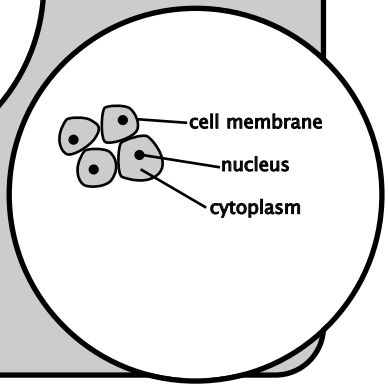
Onion skin
magnified 100X



Human Blood
magnified 400X



Human Cheek Cells
magnified 400X



Learn to sketch inside a circle which represents the "field of view" of the microscope.
Sketch only a few of the cells, to scale.

Always label your sketches

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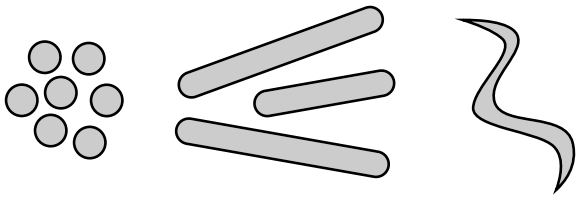
Micro-organisms

**These are organisms that are only visible through a microscope.
Most are unicellular. Many are beneficial to the environment or to other life-forms.
However, some are dangerous and can cause diseases.**

The Types of Micro-organisms

There are a number of different kinds of living things which are microscopically small.

Bacteria have already been mentioned. Bacteria are all unicellular, and have very small cells in a variety of shapes.

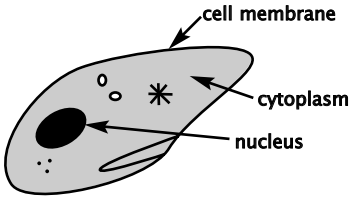


Some are round. Some are rod-shaped. Spirals

Bacterial cells are quite different to either plants or animals.

Protozoa

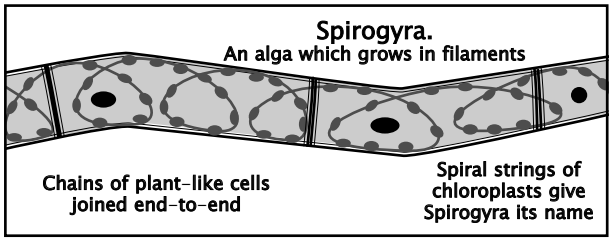
Protozoa are unicellular and have animal-like cells.



Microscopic Algae

These have cells which are plant-like. They have chloroplasts and a cell wall on the outside.

Some are unicellular, while others grow in long, thin threads of cells joined end-to-end.



Fungi

The fungi are a type of living thing that includes mushrooms and "toadstools", which, of course, are not microscopic.

However, some fungi are unicellular micro-organisms. These are known as "yeasts".

Fungi were once thought to be a type of plant. However, we now recognise that their cells are neither plant-like, nor animal-like. In a later topic you will learn more.

Viruses

Viruses are the smallest of all, and are non-cellular... they are not made of cells at all.

Does this mean they are not really living things?

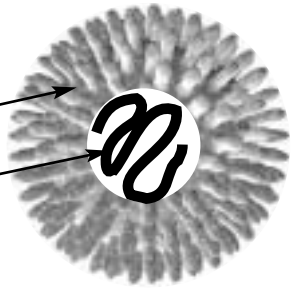
Actually, they ARE considered living things, even though they do not have cells. This is because they are always made by living cells, and are composed of chemicals which are typical of living things.

**The modern scientific definition of a living thing is usually stated this way:
"All living things are composed of cells, or are the product of cells"**

By this definition, viruses ARE living things.

So, if viruses are not cellular, what are they?

Each virus is a tiny capsule of protein, with some genetic material inside. (DNA or RNA)



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Microbes Good and Bad

Beneficial Micro-organisms

Human Food Production

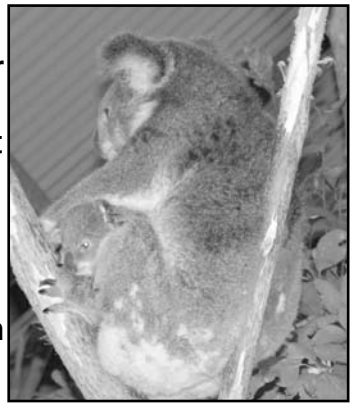
The unicellular fungus called yeast is vital for the production of bread, beer & wine.

The living yeast makes the dough rise so that, when baked, the bread has its open, soft texture, and delicious taste.

Yeast causes fermentation to make the alcohol in beer and wine. It is vital to the production of ethanol for adding to petrol.

Microbes Help Digestion

Most plant-eating animals have bacteria living in their gut which help them to digest tough, plant fibres.



A mother koala will feed her joey with some of her stomach contents so it gets the helpful bacteria it will need to digest tough gum leaves.

Clean-Up & Recycle

Probably the greatest benefit of micro-organisms is how they decompose all the dead leaves, animal wastes and dead materials in the environment.

There are zillions of bacteria and fungi which live in the soil or in the mud under lakes and oceans. They feed on all the wastes and dead remains and cause it to rot away.

This not only cleans up the environment, but it recycles vital chemicals back into the soil so plants can continue growing.

Dangerous Micro-organisms

The vast majority of micro-organisms are "good-guys". Many are very helpful, as described on the left. Many others are simply harmless, and go about their lives without doing any damage.

Some, however, are our enemies.

Microbes Cause Diseases

All infectious diseases (those you can catch) are caused by "germs". Germs are really micro-organisms which infect our bodies and make us sick.

Virus diseases include measles, 'flu and A.I.D.S. In fact, every virus causes disease in some living thing. Even bacteria suffer from virus diseases.

The best protection against viral disease is immunisation, which is when our bodies are "primed" to recognise and destroy an invading virus.

Bacterial Diseases

Many of the great killer-diseases of history are caused by bacteria. The "black death" killed about $^1/_3$ of the entire population of Europe in the Middle Ages.

Today, most bacterial diseases are controlled by immunisation and/or by using antibiotic drugs.

Protozoa & Fungi

A few diseases are caused by protozoa. The most important is malaria, which kills millions of people each year in Africa and Asia. Despite 100 years of effort, we still cannot control malaria in some tropical areas.

A few diseases are caused by fungi. These are mostly skin infections (e.g. tinea) and are rarely life-threatening. Fungal disease can usually be cured by anti-fungal drugs.

keep it simple science

Worksheet 4
Microbes
Fill in the blanks

Student Name.....

"Unicellular" means a living thing which is made up of a)..... All unicellular organisms are "microbes", which means they can only be seen with a b).....

All the familiar plants and animals are c)..... organisms. They are made up of d)..... of cells. They contain many different types of cells, each e)..... to do a particular task in their body.

There are many different types of micro-organisms:

f)....., which have very small cells in various shapes.

Protozoa, which have g).....-like cells.

Microscopic h)....., which have plant-like cells.

i)....., which are single-celled fungi.

j)..... These are non-cellular, and consist of a tiny capsule of protein with some k)..... inside.

Many microbes are beneficial, such as l)..... which is used to make bread, and to brew m)..... and .....

Other microbes live in the gut of animals and help them to n)..... .....

Many o)..... and ..... live in the soil and cause p)..... to rot away. This not only cleans up the environment, but q)..... many important chemicals back into the soil.

Some microbes causes r)..... Every s)..... causes a disease in some living thing. The best protection against viral disease is t).....

Many other diseases are caused by u)..... including many of the great killer-diseases of history.

Not many protozoa cause disease, but one notable example is v)..... which kills millions of people each year.

Worksheet 5

Student Name.....

Which Type of Microbe...

a) has animal-like cells? .....

b) is non-cellular? .....

c) is important for cleaning up the environment by decomposing dead and waste matter? (2 answers)

..... and .....

d) is the cause of malaria? .....

e) has plant-like cells? .....

f) often lives in the gut of plant-eaters and helps them digest food? .....

g) caused most of the epidemic diseases in history? .....

keep it simple science

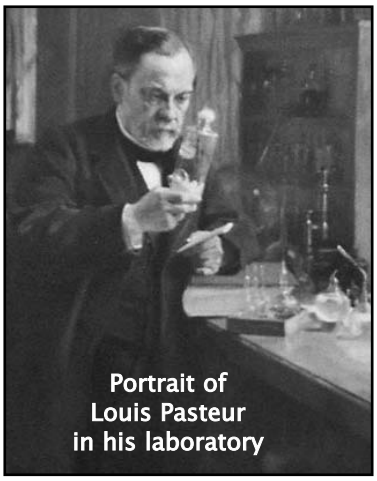
How Knowledge of Microbes Has Changed Society

For most of human history, people believed that diseases were due to evil curses or spirits, or were punishments from God, or other supernatural events.

Many children died young. Epidemics of disease killed millions. Many minor injuries led to fatal infections. The average life expectancy was only about 40 years. (Today it is about 80 years.)

It was the great French scientist Louis Pasteur (1822-95) who led the way to a greater understanding.

He proved that some diseases were caused by microscopic "germs". Soon, many more were identified.



Portrait of Louis Pasteur in his laboratory

He also led the way to developing the process of immunisation as a way to protect against infectious disease.

People and governments came to realise the importance of clean water, personal hygiene and sanitary sewerage and garbage disposal.

Mass immunisation and antibiotic drugs have reduced the impacts of infectious diseases dramatically. Smallpox, a virus disease which once killed millions, has been eliminated world-wide.

In developed countries like Australia, cases of serious infectious diseases are now quite rare, and a death from an infection is considered a failure of the health system.

People know about "germs" and the importance of keeping clean. Parents get their children immunised to prevent them getting diseases.

All these wonderful changes can be attributed to scientific knowledge. Without the advances in the Health Sciences over the last 150 years you might already be dead!

People Make Choices

Attitudes to Immunisation

Unfortunately, there is an "urban myth" that sometimes being immunised actually causes disease. For example, it is widely believed that "Fluvax" (the vaccine used to immunise against infuenza) can give you a 'flu infection.

In fact, the scientific evidence is that this is totally false.

In other cases, there actually is a slight risk to being immunised. In a very, very small number of cases, the vaccine for a disease can cause a reaction in a child which is fatal, or causes permanent brain damage.

This scares many people, who then decide not to have their children immunised.

What Happens Next?

Although it is tragic when a child is harmed by a reaction to a vaccine, what happens when people make a decision not to immunise is even more tragic.

If everyone in a community is immunised then the disease basically ceases to exist because there is no "reservoir" of infected people to pass the disease on.

However, when enough people choose not to have their children immunised, then the disease continues to infect people.

The health risk of not being immunised is actually much higher than the risk of a reaction to the vaccine, but some people continue to make that choice.

keep it simple science

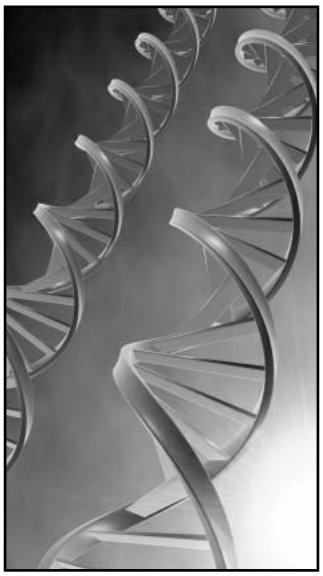
How Unicellular Organisms Reproduce

Genetic Information

Every type of living thing must reproduce. Mice have baby mice, gum trees make seeds which grow into new gum trees, and bacteria make more bacteria.

Each living thing carries information on how to make offspring of its own type. Mice never make gum tree seeds, and horses do not give birth to cats.

The information needed to accurately reproduce the same type of living thing is located in the nucleus of every living cell.



Information is stored in a chemical known as **DNA**. DNA molecules are the largest known and carry a "code" within their helix-shape structure.

It is the DNA inside every cell nucleus which controls the cell and all its functions.

The key to reproduction is to make copies of the DNA and pass it on to the next generation.

Cell Division

Unicellular organisms reproduce by simply dividing in two. This is called "Mitosis".

Each cell first makes a duplicate copy of its DNA. Then the 2 sets of genetic information are separated. At this point it is as if the cell has 2 nuclei (plural of nucleus).

Then the cell itself divides into 2 smaller cells. Each new cell is only half-size but has a complete nucleus with a full copy of the genetic information in its DNA.

Finally, each cell can then grow to full size before the whole process starts again.

Mitosis cell division is the way that unicellular organisms reproduce. Under ideal conditions, some bacteria can go through the whole cycle in about 30 minutes.

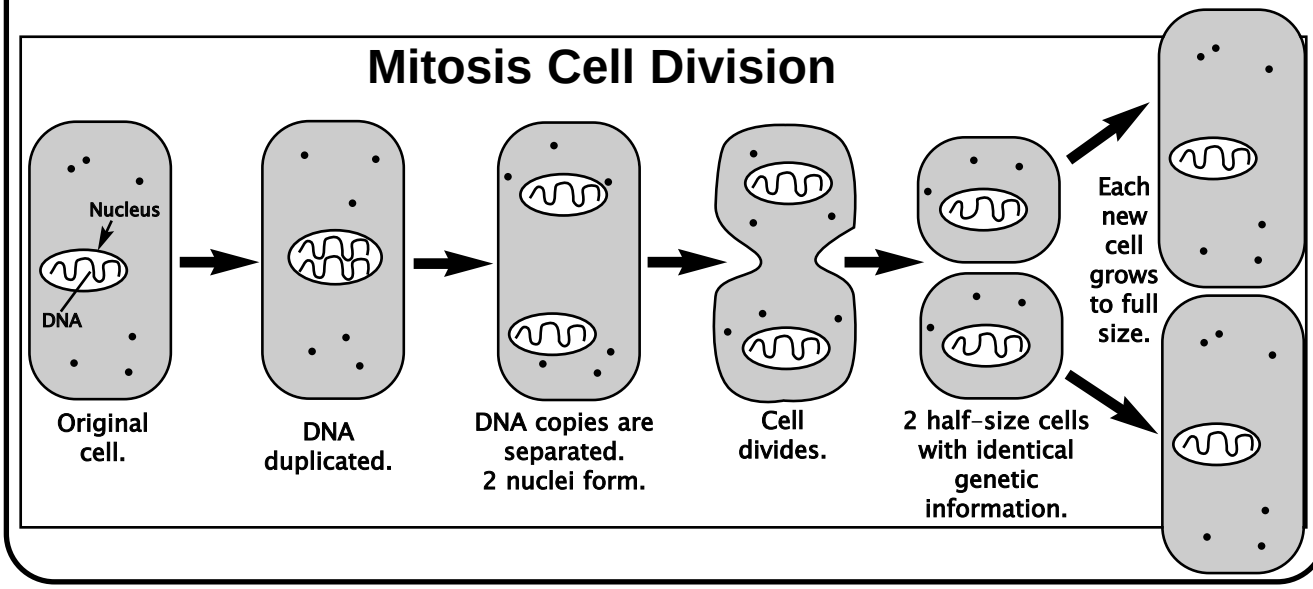
If you started with 1 bacterial cell, and it divided in two every hour, how many would there be after 1 day?

Time (hours) >	0	1	2	3	4	5
No. of Bacteria	1	2	4	8	16	32

If you continue this calculation to 24 hours, you will have over 16 million cells!

In multicellular organisms, mitosis is how new cells are made for growth. You started out as 1 single cell, but now have billions. Each cell has the complete genetic information (DNA) that makes you, you.

Mitosis Cell Division



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Worksheet 6
Cell Division

Student Name.....

Fill in the blank spaces

Genetic information is stored in the a)..... (organelle) in every living cell in the form of the chemical called b)..... For reproduction to occur, the information must be c)..... and passed onto the next generation.

Unicellular organisms reproduce by simply d)..... This cell division is called e).....

The first step is to f)..... the DNA. Then the 2 copies are separated so the cell really has 2 g).....

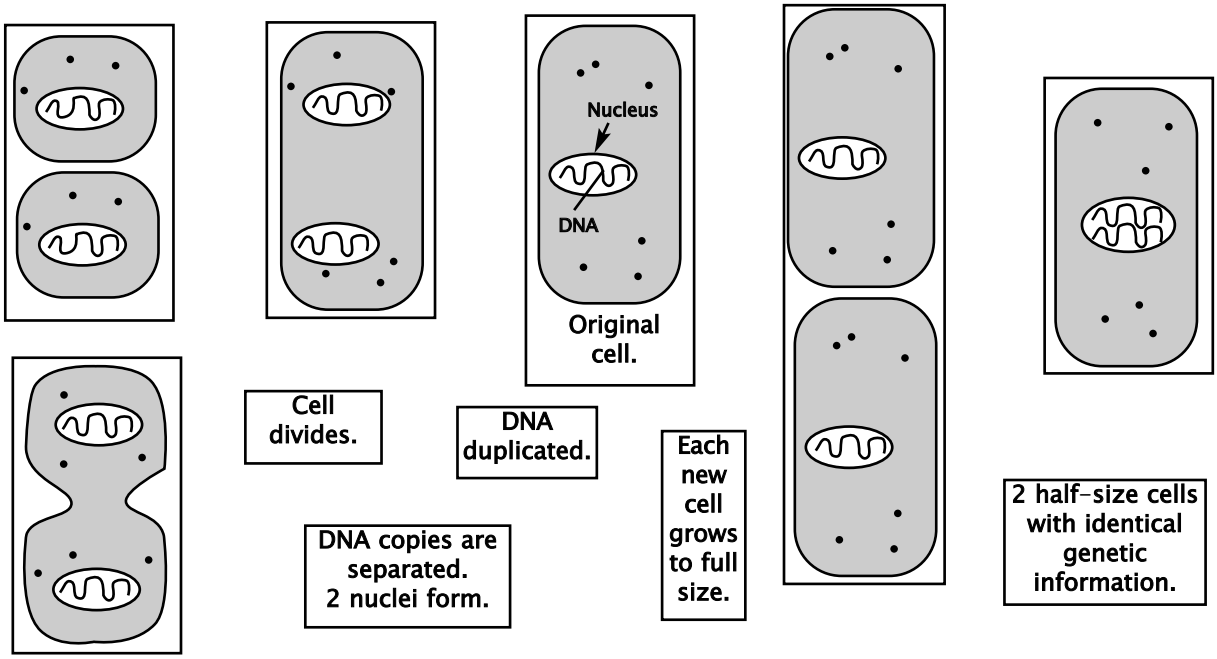
Next, the cell splits into two cells. Each one is only h).....-size, but each has a complete copy of the i).....

Each new cell now j)..... to full size, and then the process can start again.

In multicellular organisms, cell division is used for k)..... Each living thing begins with l)..... cell. This becomes billions by repeated m)..... Each cell has a complete copy of the n).....

Worksheet 7 Mitosis

The process of cell division by Mitosis is all jumbled up in these diagrams and captions. Cut them out and re-arrange into correct order. Connect with arrows.



Topic Test - Living Cells

Answer all questions in the spaces provided.

Student Name.....

Score /25

1. (10 marks)

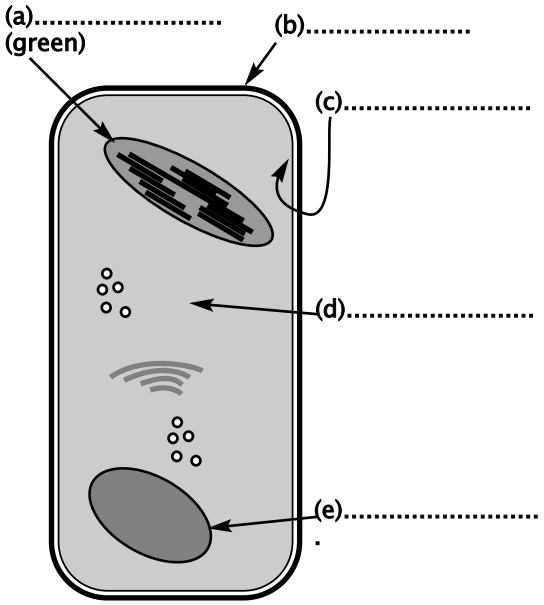
True or False?	**T or F**
a) Most cells can be seen with the naked eye.	**.....**
b) All cells have a cell wall.	**.....**
c) All cells have a cell membrane.....	
d) The nucleus controls all the functions of a cell.	**.....**
e) The cells in a large animal are the same size as the cells in a small animal.	**.....**
f) Protozoa are unicellular, with plant-like cells.	**.....**
g) A virus has no cells.	**.....**
h) The first man to see cells was Louis Pasteur.	**.....**
i) Yeast is a disease-causing virus.	**.....**
j) DNA is copied before cell division.	**.....**

2. (4 marks)
For each pair of items, state clearly what is the difference between them?

a) unicellular and multicellular

b) cell membrane and cell wall

3. (5 marks)
Label the parts of this cell.



f) Is this cell plant or animal?.....

4. (2 marks)
The cell membrane is described as "semi-permeable".
Briefly, what does this mean?

5. (3 marks)
The cells that are formed by mitosis are referred to as "daughter cells". The original cell before mitosis can be called the "parent cell".

a) How does the size of a daughter cell (immediately after mitosis) compare to the parent cell?

b) How does the DNA content of a daughter cell compare to the parent cell?

c) What is the vital first step before a cell begins to divide?

Answer Section

Worksheet 1

a) cells
b) microscope
c) one
d) many / billions
e) 1/10 (0.1)
f) Robert Hooke
g) nucleus
h) cytoplasm
i) organelles
j) cell membrane
k) what moves in or out
l) cell wall
m) chloroplasts
n) light
o) photosynthesis
p) oxygen
q) carbon dioxide
r) cell membrane
s) semi-permeable
t) diffusion

Worksheet 2

1. I
2. E
3. G
4. L
5. H
6. C
7. J
8. D
9. A
10. K

Worksheet 3

1.
a) plant
b) nucleus
c) cytoplasm
d) cell membrane
e) cell wall
f) chloroplast
2.
a) animal
b) cell membrane
c) cytoplasm
d) nucleus
3.
a)plant
b) cell wall
c) nucleus
d) cytoplasm
e) cell membrane
4.
a) plant
b) chloroplast
c) cell wall
d) cell membrane
e) cytoplasm
f) nucleus
5.
a) animal
b) nucleus
c) cell membrane
d) cytoplasm
6.
a) animal
b) cell membrane
c) cytoplasm
d) nucleus

Worksheet 4

a)one single cell
b) microscope
c) multicellular
d) many / billions
e) specialised
f) bacteria
g) animal-like
h) algae
i) yeasts
j) viruses
k) genetic information / DNA
l) yeast
m) beer & wine
n) digest their food
o) bacteria & fungi
p) wastes / dead matter
q) recycles
r) diseases
s) virus
t) immunisation
u) bacteria
v) malaria

Worksheet 5

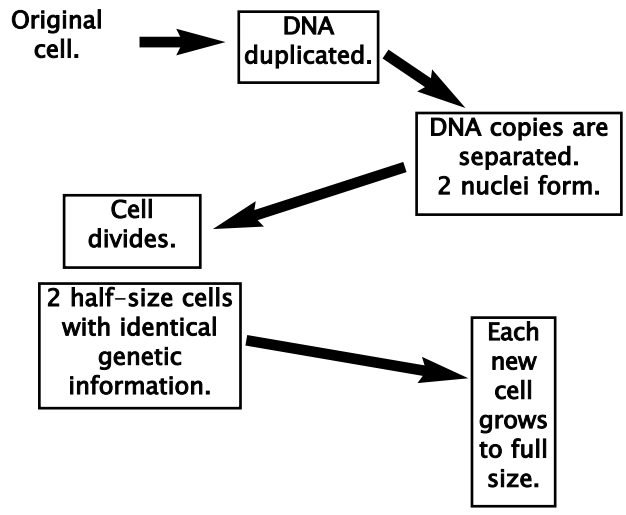
a) protozoa
b) viruses
c) bacteria & fungi
d) protozoa
e) microscopic algae
f) bacteria
g) bacteria

Worksheet 6

a) nucleus
b) DNA
c) copied / duplicated
d) dividing in 2
e) mitosis
f) copy
g) nuclei
h) half-size
i) DNA
j) grows
k) growth
l) one
m) cell divisions
n) DNA

Worksheet 7

see diagram page 15



Topic Test Answers

1.

a) F b) F c) T d) T e) T
f) F g) T h) F i) F j) T

2.

a) unicellular = made up of only 1 cell.
multicellular = made of many cells

b) Cell membrane surrounds all cells, and controls what goes in and out.
Cell wall is a tough layer which surrounds plant cells (not animal cells).

3.

a) chloroplast
b) cell wall
c) cell membrane
d) cytoplasm
e) nucleus
f) plant

4. Semi-permeable means that some substances can move through it easily, while others cannot get through.

5.

a) half-size
b) identical
c) copy the DNA