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Photocopy Master Sheets

Years 7-8

Plant & Animal Systems

Disk filename = "08.LifeSystems"

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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

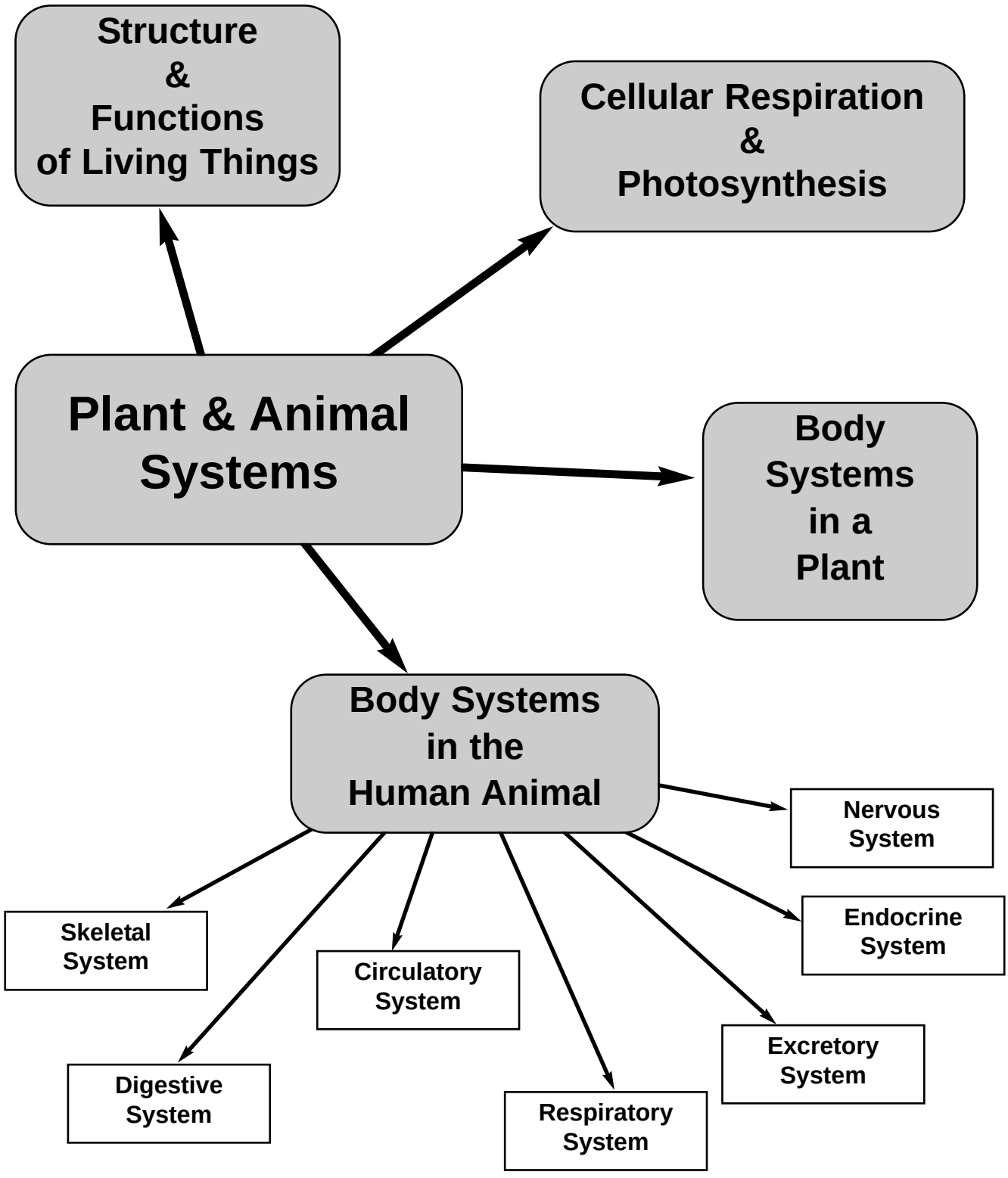
All Topics Available as PHOTOCOPY MASTERS and/or KCiC

Photocopy Masters (PDF files)
Black & White, A4 portrait-orientation
for clear, economical photocopying.

KCiC = Key Concepts in Colour
Full colour, formatted for on-screen study
and data projection. PDF + Powerpoint®

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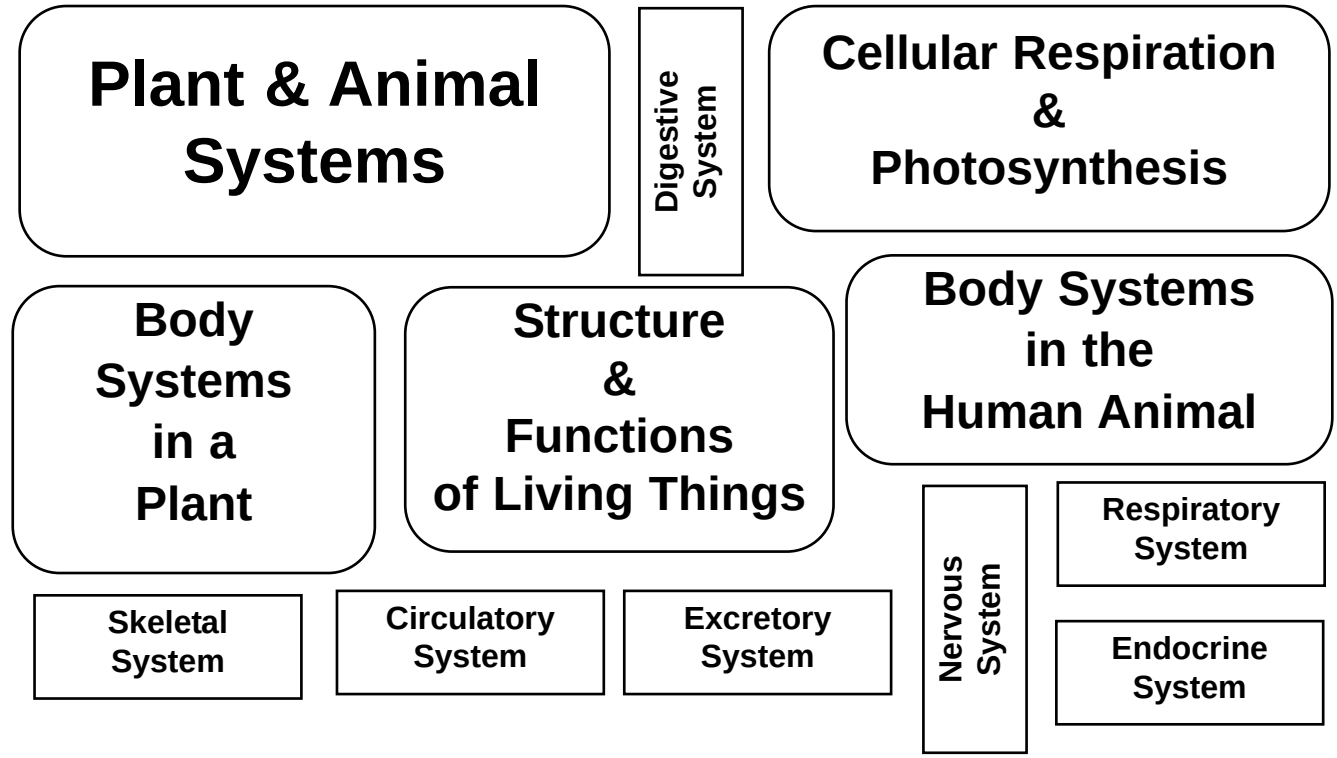
Make your own "Mind-Map" TITLE PAGE.
Cut out the boxes. Sort them into an appropriate lay-out on a page of your workbook, then glue them down. Add connecting arrows and colour in.



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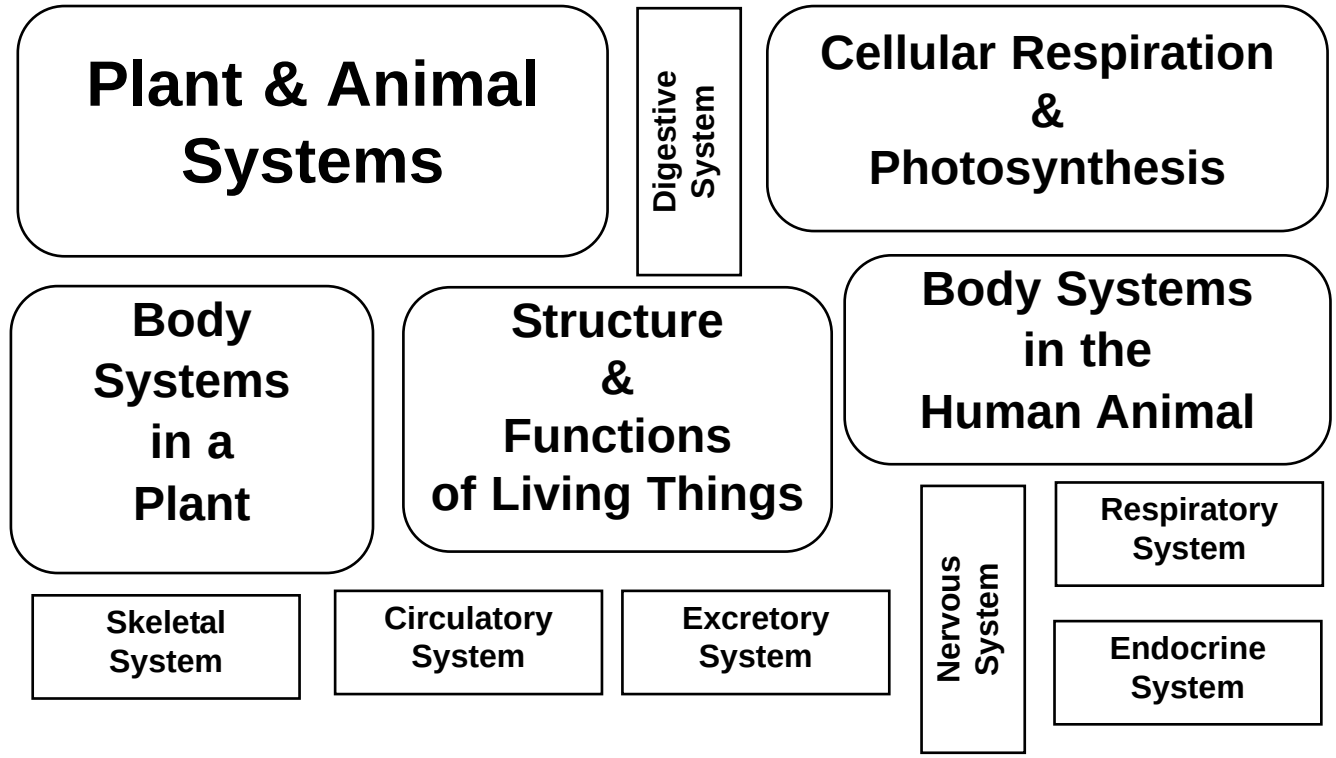

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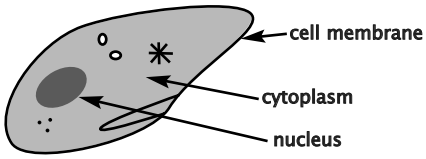
The Structure & Function of Living Things

The Structure of Life: CELLS

You may have already studied living cells. Cells give us a structural way to define what a living thing is.

"All living things are composed of cells, or are the product of cells".

This statement is called "The Cell Theory".



Some living things are unicellular... they are composed of one, single cell.

All the familiar plants and animals are multicellular... they are composed of many cells, usually billions.

The Functions of Life

All living things carry out certain, basic "life functions".

All living things:

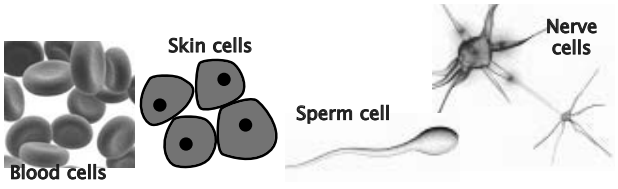
- take in substances from their surroundings, and assimilate them.
  (Things taken in include food, water & oxygen. "Assimilation" means that the substances taken in are used to build new cells and grow body parts... they become part of the organism.)
- extract energy from their food.
- excrete their wastes.
- grow.
- reproduce their own kind.
- respond to things that happen.

Body Structure of Multicellular Organisms

Plants and animals are made of many cells, but each organism is not just a jumble of cells living and growing in a big lump. There is always an organised structure to the way their bodies are built.

Different Cells

Firstly, not all the cells in a multicellular organism are the same. They are differentiated into many shapes and sizes.



Each cell type does a different "job" in the body, and has the shape, size and ability to match that function.

Tissues

A cell does not work alone. Thousands of cells of the same type band together to form a "tissue", such as muscle tissue, nerve tissue, bone tissue, and so on.

Organs

At the next level of organisation, a number of tissues are combined to form an organ, such as a heart, a kidney, a shin bone or an eye.

With muscle tissues, nerve tissues, connective tissues, etc, all working together, the organ carries out a particular function. e.g. the heart pumps blood, the eye senses light.

Organ Systems

A number of organs work with each other to carry out an overall task. For example, the heart, arteries, veins and capillary organs all connect to form the circulatory system which distributes substances around the body.
Other systems include the digestive system, the nervous system and so on.

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Why Have Tissues, Organs and Systems?

Every Cell Needs Things

Every living cell needs food, water and oxygen. Each cell must be able to get rid of its waste products.

In a multicellular organism most of the cells are deep inside the body. They cannot get food, water or oxygen unless it is carried to them.

The major body systems carry out the tasks of getting food, water and oxygen and transporting them around so that every cell gets what it needs.

Specialisation = Better Performance

If every cell in your body had to carry out every function for itself, it would have a very low ability.

For example, if every cell had to see, breathe, talk, jump and think then each cell would not be able to do any one thing very well. Each cell would be a "jack-of-all-trades, master of none". By itself, each cell would not see much, nor jump very far.

By having specialised tissues, organs and systems, your body can do each task very well. Your eye is excellent for seeing things, but useless for jumping. That's OK, because your muscles and bones can do all the jumping.

Co-ordination = Efficiency

Once an organism has the capability (for example) to see things and to jump, then it will all work best if the 2 tasks are co-ordinated, so you can see where to jump. Plants and animals have specialised systems to co-ordinate all their body functions. If you need food, your eyes locate it, your muscles and bones move to eat it, your digestive system absorbs it into the blood, and your heart and blood vessels transport it to all your cells.

You are a co-ordinated, multicellular organism.
Specialised tissues, organs and organ systems give you many amazing capabilities, which you carry out with great efficiency.

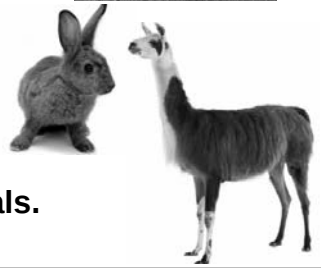
Food & Energy for Living Things

The most fundamental requirement of all living things is food. Why?
Food provides the energy that every cell needs to carry out all its functions.

Cellular Respiration

Every living cell needs energy. To get that energy, every living cell needs food.

Cellular respiration is a chemical process that releases the energy from food.



Cellular Respiration occurs in every living cell in both Plants and Animals.

Photosynthesis

Plants (and some microbes) are autotrophic.

They make their own food from water, carbon dioxide gas and the energy of sunlight.

The process of making food using energy from sunlight is called photosynthesis. It occurs in the chloroplasts of plant cells.

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Cellular Respiration

Every living cell needs energy.
Cellular respiration is the process which releases energy from food.
It occurs in every living cell as a series of chemical reactions.

The process can be summarised as a chemical equation:

Glucose + Oxygen → Carbon Dioxide + Water + Energy

Glucose is a sugar. All living things get glucose from their food.

Oxygen is a gas in the air. We breathe to take in oxygen.

Carbon Dioxide is a gas we breathe out.

Normally we drink to get water. Some is made in our body as we process our food for energy.

Energy is the main product of the process.

The Respiratory Gases

Oxygen and carbon dioxide are called "respiratory gases" because they are involved with cellular respiration. These gases are so important that you need to know more about them.

Oxygen

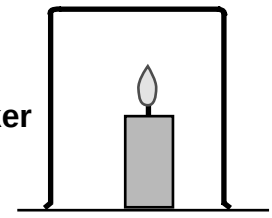
Oxygen makes up about $^1/_5$ of the air. We breathe so that we can take in oxygen. Without it, a human will die within a few minutes.

Oxygen is a chemical element. Its chemical symbol is "O", but it normally exists as 2 atoms joined together, so we write its chemical formula as O_2.

Oxygen is needed for things to burn.

Try this experiment:

Place glass jar or beaker over a lit candle.



Soon, the candle goes out.
Why?
Because all the oxygen in the air inside the beaker has been used up. Without oxygen, the burning cannot continue.

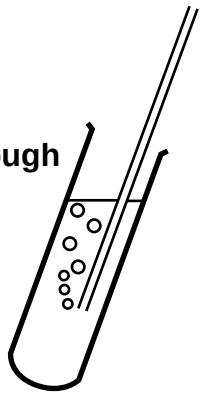
Cellular respiration is (chemically) the same as burning the glucose. It must have oxygen to continue.

Carbon Dioxide

Carbon dioxide makes up only a tiny fraction of the air, about 0.04%. Its chemical formula is CO_2, which means it is made of molecules containing 1 carbon atom and 2 oxygen atoms.

CO_2 can be identified by its reaction with limewater.

Try this:
Use a drinking straw to gently blow bubbles through a test tube of limewater.



Soon, the limewater becomes cloudy as it reacts with the CO_2 in your breath.

CO_2 is the only gas which reacts with limewater this way, so this test can be used to identify this important gas.

	Air We Breathe In	Air We Breathe Out
Oxygen	20 %	16 %
Carbon Dioxide	0.04 %	4 %

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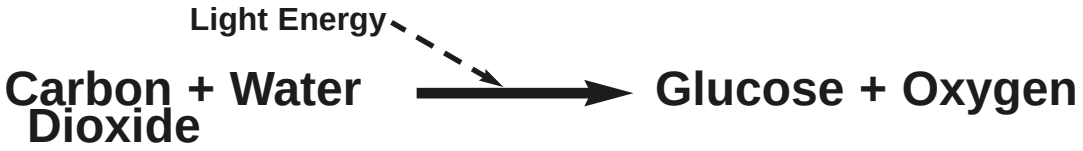
Photosynthesis

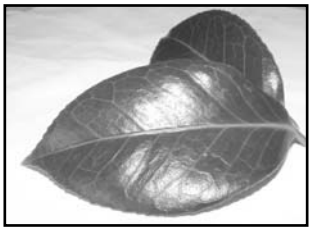
photo = "light", synthesis = "to make things"
Plants are autotrophic. This means they make their own food.
The process of making food needs the light energy of the Sun.

Photosynthesis can be summarised as a chemical equation:



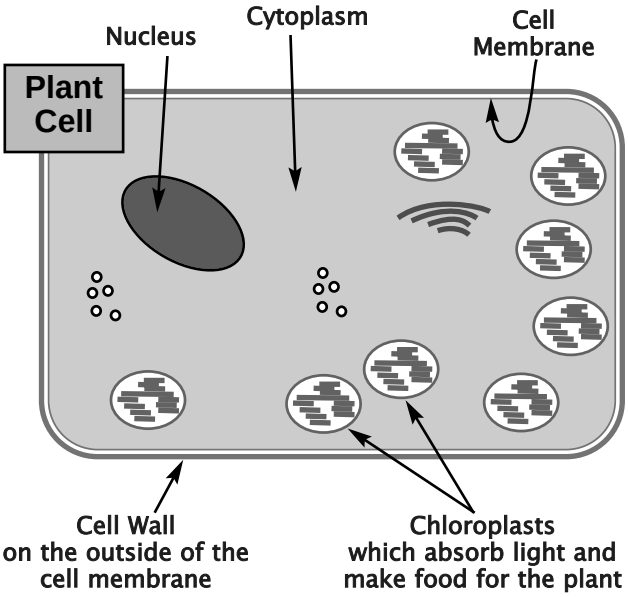
Leaf & Chloroplast

Photosynthesis takes place mainly in the leaves of plants.



Leaves are green in colour because the cells in the leaf are packed full of chloroplasts.

If you have already studied plant cells, you will know that chloroplasts are organelles which contain the green pigment chlorophyll.



Chlorophyll absorbs the energy of light so that the plant can turn the simple chemicals H_2O and CO_2 into the high-energy food glucose.

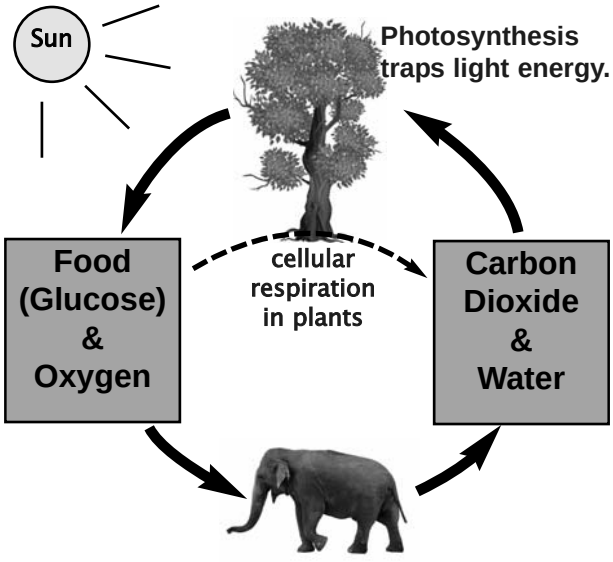
Later, the plant cells can use Cellular Respiration to release the energy again, for growing and other life functions.

The Great Cycle

You might notice that the equation for photosynthesis is the exact opposite of the equation for cellular respiration.

However, these processes are not simple opposites. They involve totally different chemical pathways, and the energy absorbed by one is NOT the same as the energy released by the other.

Together, photosynthesis and cellular respiration form a great cycle of nature.



Cellular respiration releases energy from food to power all life processes.

What is really happening is that the energy of the Sun is powering all living things. The O_2, CO_2, H_2O simply get re-cycled. Food (containing glucose) is made, destroyed and re-made over and over. Photosynthesis makes all the food and oxygen on Earth.

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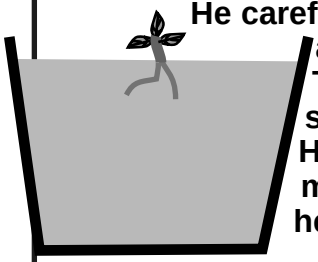
Scientific Conclusions Depend on Knowledge

Although the methods of Science are based on <u>facts</u> observed in Nature or in experiments, sometimes progress is limited by the understanding of the scientists.

Understanding Photosynthesis

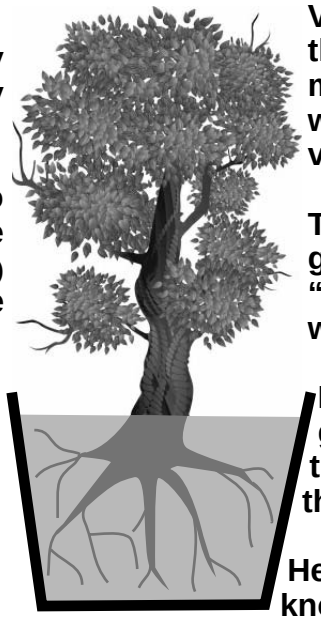
From ancient times, people generally thought that plants eat the soil they grow in.

About 400 years ago, one man tried to test this idea by experiment. His name was <u>Jan van Helmont</u> (Belgian 1580-1644) and he was one of the first true scientists.



He carefully dried and weighed a large tub of soil. Then he planted a tree seedling and watered it. He grew it for 5 years, measuring all the water he used.

After 5 years he carefully collected all the soil, dried it and weighed it again. He weighed the tree to measure growth.



Van Helmont found that the tree had gained many, many kilograms while the soil was virtually unchanged.

This proved that the general belief that "plants eat soil" was wrong. Good Science.

He concluded that the gain in weight of the tree must come from the water he added.

He was wrong! We now know that the plant growth is mainly from the CO_2 from the air. Van Helmont had little knowledge of gases, so drew the wrong conclusion.

How We Know All About Photosynthesis

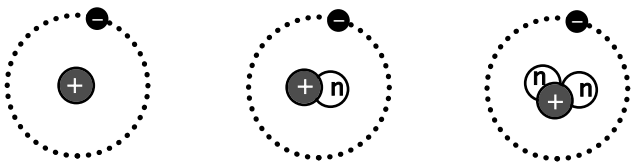
We can summarise photosynthesis by the chemical equation:

$$CO_2 + H_2O \longrightarrow \text{glucose} + \text{oxygen}$$

Furthermore, we know all the details of the multi-step chemical pathway involved. We know, for example, that the oxygen released from photosynthesis is the oxygen atoms that start out in the water molecules, <u>not</u> the ones in the CO_2.

Isotopes

Not all the atoms of an element are exactly the same. Every atom of (say) hydrogen has 1 proton and 1 electron, but the number of neutrons can vary.



These are <u>isotopes</u>. The atoms are the same element, but have different weights, and some isotopes give off radiation.

Chemical Tracers

By using isotopes of different elements, scientists can "trace" the pathway of individual atoms through a series of chemical reactions.

For example, there is a <u>radio-active isotope</u> of carbon, called "carbon-14". If CO_2 containing C-14 is absorbed by a growing plant, all of the radio-activity is soon found to be in glucose sugar (or other chemicals made from glucose).

If a heavy isotope of oxygen is included in the CO_2 the result is the same; all of that isotope ends up in glucose.

However, if the oxygen isotope is included in the water (H_2O), the isotope ends up in the air as the oxygen gas released from the plant.

This "chemical tracer" technique is widely used in many fields of Science.

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Worksheet 1

Structure & Functions of Living Things

Student Name.....

Fill in the blank spaces.

All living things are composed of a)..... Some have only 1 cell (b "....."), but the familiar plants and animals are all c)....., which means they are made up of many cells.

All living things carry out the same "life functions".

They all take in food, water, etc and d)..... it into their body.

They extract e)..... from their food and f)..... their wastes.

All living things g)..... (get bigger) and h)..... (make babies). Living things i)..... to the things that happen around them.

A multicellular organism is not just a pile of cells, but has an organised body structure:

The cells are j)..... into different types. Many cells of the same type form a k)..... An l)..... is a structure made of various tissues working together. A number of organs work together as a m)..... which carries out a major task in the body.

Worksheet 2

Respiration & Photosynthesis

Student Name.....

1. Fill in the blank spaces to summarise Cellular Respiration as a chemical equation.

..... + ... → ..... + ... + energy

2. (multiple choice) Which group(s) of living things carry out cellular respiration?

A. Plants only B. Animals only C. Plants and Animals

3. Which "respiratory gas":

a) makes up about 20% ($^1/_5$) of the air? .....

b) is needed for things to burn? .....

c) turns limewater "milky", or cloudy? .....

d) is needed for photosynthesis? .....

4. Fill in the blank spaces to summarise Photosynthesis as a chemical equation.

.....(energy)

..... + ... → ..... + ...

5.

a) In which organelle of a plant cell does photosynthesis occur? .....

b) What is the name of the green pigment that absorbs light? .....

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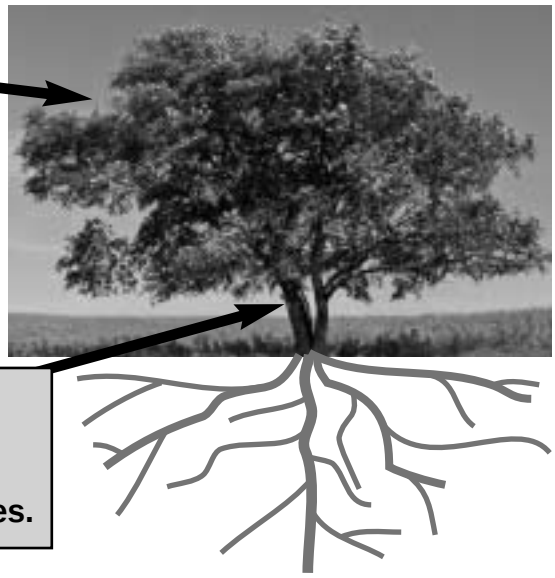
Body Systems in a Plant

Leaves

The leaves of a plant have only one function... photosynthesis.
Leaves are flat and thin so they can absorb maximum light to make food.
They have microscopic holes so that CO_2 can enter, and O_2 can escape into the air.
The cells are packed full of chloroplasts.



Stem, Trunk & Branch

The stem system of a plant has 2 functions:
1. To hold the leaves up in the light.
2. To carry water from the roots up to the leaves.

Other Systems

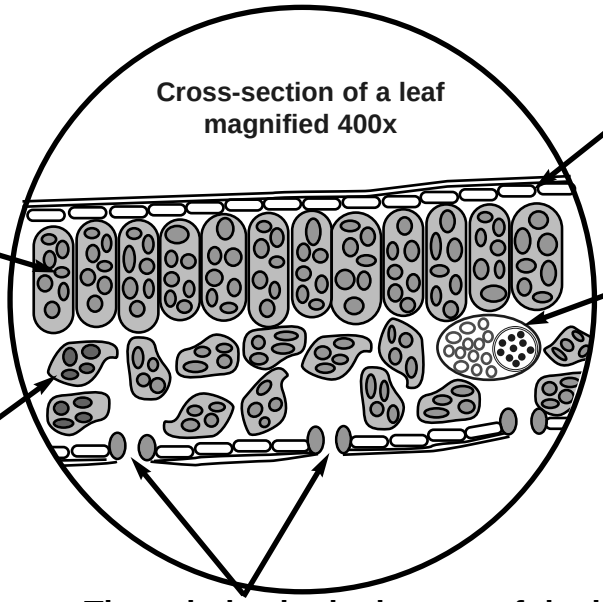
Flowers: for reproduction.
Buds: for growth. Buds are growth points for new leaves, new roots, or for flowers.
"Veins": for transport of substances inside the plant.

The Roots

The root system also has 2 functions:
1. To anchor the plant in the soil.
2. To absorb water from the soil, so it can be used by the leaves.

Leaves Under the Microscope

You might examine a plant leaf through a microscope



These cells are tightly packed together, and each one contains many chloroplasts. This is where most of the photosynthesis occurs.

These cells are loosely packed. The spaces around them allow CO_2, O_2 and water to circulate in the leaf.

These cells are transparent to let light through.

This structure is a "vein". Its tubes bring water up from the roots, and carry food (made in the leaf) away to other parts of the plant.

These holes in the bottom of the leaf are called "stomates". They allow CO_2 and O_2 gases in and out of the leaf.

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Plant Veins... Transport Tubes

The "veins", or vascular tubes, of a plant form a system for transporting substances around the body of the plant. In fact there are two systems of tubes. They run parallel to each other, but are separate, and have totally different functions.

Xylem Tubes (pronounced Zy-lem)

Xylem tubes carry mostly water.

The water has been absorbed from the soil by the roots. Xylem tubes carry it upwards from the roots to the leaves.

Dissolved in the water are soil minerals which plants need to remain healthy.

A lot of the water simply evaporates from the leaves, through the leaf openings, or "stomates".

In very dry conditions, the plant may close the stomates to conserve water and avoid withering and dying.

Phloem Tubes (pron. Flow-em)

Phloem carries food (mostly sugars) dissolved in some water.

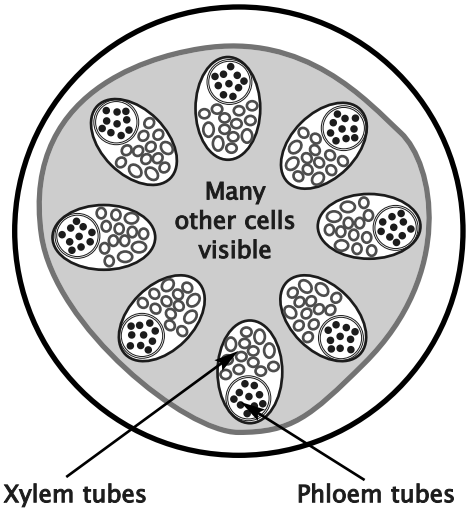
The sugar has been made by photosynthesis in the leaves. Phloem tubes carry the sugars away from the leaves to feed the parts of the plant that cannot make food. The roots, for example, are underground and cannot get light to make food.

A lot of the sugar ends up being converted into starch or oil, which is stored in the roots, stem or fruits of the plant. It is these food-storage organs which we often use for food. e.g. potato, carrot (roots), apple, rice, wheat (fruits).

Plant Veins Through the Microscope

You may get a chance to use a microscope to look at cross-sections through a plant stem or root. The most obvious structures you will see are the "veins". Prepared slides are usually stained with coloured dyes to make the different tissues more obvious.

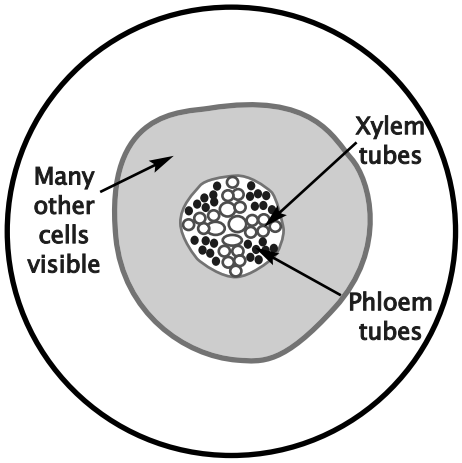
Cross-section of a stem magnified 100x



Xylem & phloem tubes are usually grouped together to form a "vein" or vascular bundle.

Exact shapes, sizes and arrangements vary from plant to plant.

Cross-section of a root magnified 100x



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Worksheet 3

Plant Systems

Student Name.....

1.

a) What is the main function of leaves?

.....

b) Give 2 functions of a plant stem.

.....

and

.....

c) Give 2 functions of plant roots.

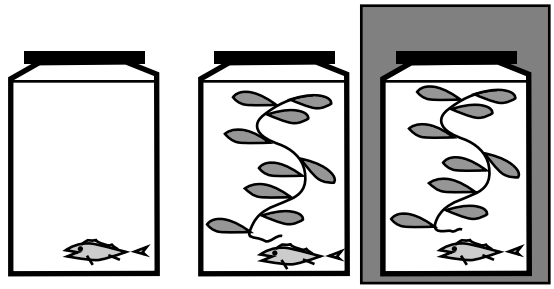
.....

and

.....

2. In a cruel experiment, 3 <u>sealed</u> jars of water were set up, with a fish, water plants and different lighting as shown.

A	B	C
Fish only Good light	Fish & Plant Good light	Fish & Plant In dark



Result after 2 days:
<u>Jar A</u>: fish died of suffocation.
Explain why.

.....

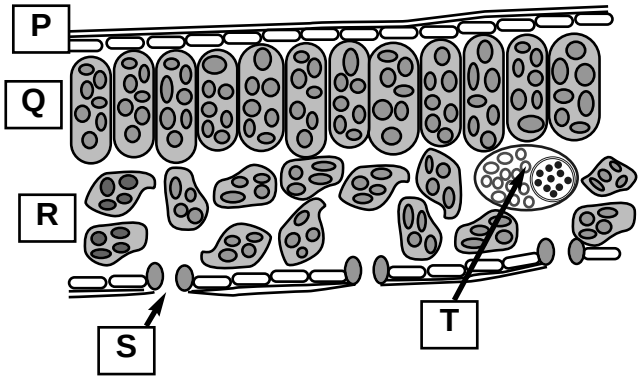
<u>Jar B</u>: fish alive and well.
Explain why.

.....

<u>Jar C</u>: fish died of suffocation.
Explain why.

.....

3. The diagram shows a magnified cross-section through a leaf.
Answer the questions below.



a) What feature of cell layer "P" helps the leaf carry out its main function?

.....

b) What feature of cell layer "R" helps the leaf carry out its main function?

.....

c) Which part (P,Q,R,S or T) is the main site for photosynthesis? .....

d) What is structure "T"? .....

e) What is the purpose of structure "S"?

.....

4.
Plants have 2 different sets of tubes to carry substances around.
Name each kind of tube, and what substance it carries.

<u>Tube Name</u>	<u>What it carries</u>
.....	.....
.....	.....

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Body Systems in the Human Animal

Your body is made up of many organ systems, each with its own special functions. Here is a quick summary of some important systems. A more detailed study of each system is on the following pages.

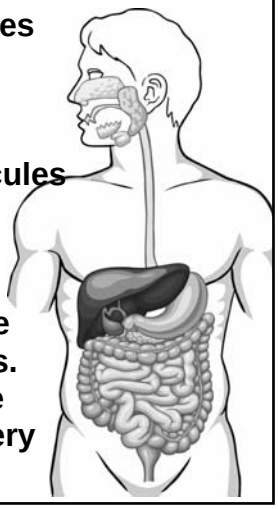
The Skeletal System

The skeleton is your system of bones. It has 3 main purposes:

- **Protection of vital organs, such as the skull around the brain.**
- **To support the body, such as the backbone holding you upright.**
- **To allow movement. Your skeleton has many joints which allows your muscles to move your arms, legs, etc., for walking, swimming, and so on.**

The Digestive System

As you know from studying living cells, every cell in your body needs food. The food chemicals must be able to enter each cell through the cell membrane, and this is only possible if the food molecules are very small.

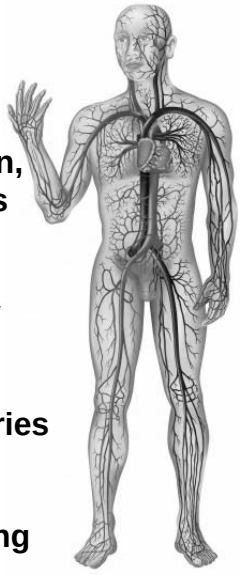


However, most of the food we eat is made up of huge molecules which cannot enter a cell.

The purpose of the digestive system is to chemically break the food molecules into smaller parts. These are then absorbed into the blood stream to be carried to every part of the body.

The Circulatory System

This is the system of blood circulation, including the heart, and many arteries and veins which carry the blood.

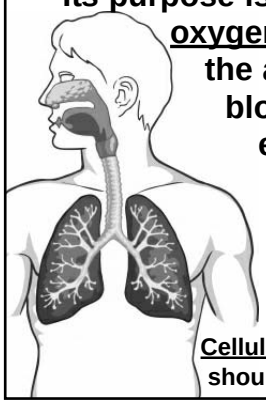


The purpose of the system is to carry food and oxygen to every cell in your body. The blood also collects waste chemicals (such as CO_2 gas) and carries it away from the cells for excretion.

The blood is also involved in defending your body against disease.

Respiratory System

This is the lungs and associated air passages.



Its purpose is to absorb <u>oxygen</u> gas from the air into the blood, and to excrete the waste gas <u>carbon dioxide</u>.

The link to <u>Cellular Respiration</u> should be obvious.

The Excretory System (Urinary System)

"Excretion" means to remove waste materials from the body.

The left-over wastes from digestion are eliminated from your lower bowel. The waste gas CO_2 is excreted from your lungs. However, there are other wastes which accumulate in your blood stream and must be removed.

This is the job of your <u>kidneys</u>. They filter the blood and separate the wastes as <u>urine</u>, which is stored in the bladder until it is convenient to pass it.

The Skeletal System

Skull

Protects your brain within a solid casing of bone. Also houses most of your sense organs (eyes, ears, sense of smell and taste)

Rib Cage

Protects the lungs and heart in a bony cage. Ribs also move to allow you to breathe.

Backbone

The backbone is a column of separate bones called vertebrae. All "vertebrate" animals have this structure. The backbone supports the body, and also protects the delicate nerves of the spinal chord which run through the hollow column of bones.

Hip Girdle

The massive bones of the hips form a strong platform or base for the backbone and internal organs. The "ball-and-socket" joints connect the leg bones and allow for movement, while carrying the body weight.

Limb Bones

The "long bones" of the arms and legs allow for walking, climbing, swimming, etc. The many joints allow for a full range of movements, from scratching your back, to writing with a pen, throwing a ball or climbing a ladder.

Making Blood

Bones also have another vital function; blood cells are made in the bone marrow inside the large bones of the hips and limbs.

The Muscle System

No study of the skeleton is complete without also considering the muscles.

Muscles cause movements by contracting and pulling on the bones. Muscles can only pull, never push, so there are always pairs of muscles surrounding a joint... one to move the joint one way and the other to move it in the opposite direction.

Muscles are attached to the bones with tendons.

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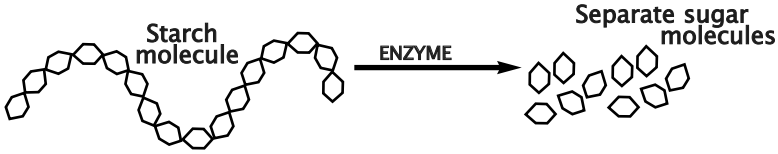
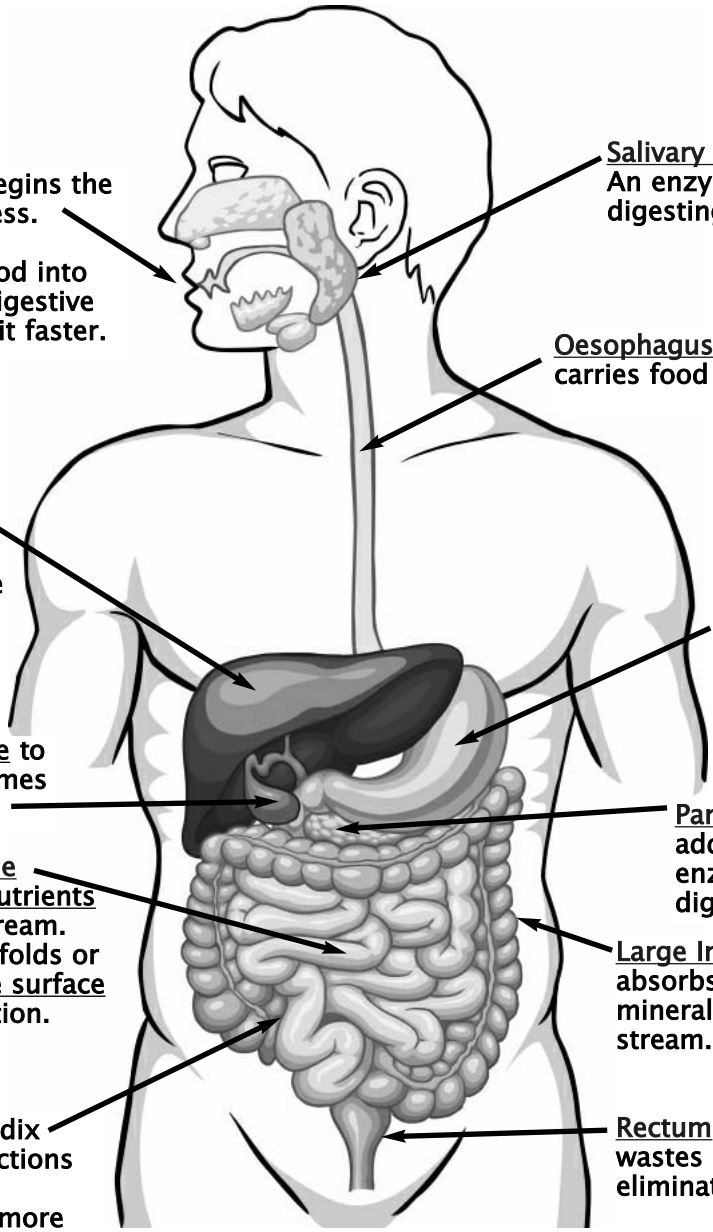
The Digestive System

The food we eat contains many nutrients such as starch, protein and fat, which are made of very large molecules. These are too big to be carried in the blood stream, and too large to get through a cell membrane into your cells.
The purpose of digestion is to break these molecules into smaller parts.

For example, starch molecules are huge, but can be broken up into many sugar molecules which are much smaller.



This is achieved by special chemicals called "enzymes" which are made by various organs in your digestive system.



Chewing the food begins the digestion process.

Chewing breaks food into smaller pieces so digestive enzymes can attack it faster.

Salivary Glands.
An enzyme in saliva begins digesting starch.

Oesophagus
carries food to the stomach.

Liver
processes digested nutrients after they are absorbed into the blood stream.

Stomach
churns food with acid. Enzymes digest proteins in food.

Gall bladder adds bile to dissolve fats so enzymes can digest them.

Pancreas
adds a cocktail of enzymes to further digest the food.

Small Intestine
absorbs digested nutrients into the blood stream. Inside, it has many folds or "villi" which increase surface area for absorption.

Large Intestine
absorbs water, vitamins & minerals into the blood stream.

Caecum & Appendix have no special functions in humans, but are larger and more important in other animals.

Rectum stores undigested wastes (faeces) for later elimination.

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Worksheet 4
Skeletal System

Student Name.....

Fill in the blank spaces.

Different parts of the skeleton have different functions or purposes.

One purpose is to a)..... vital organs. For example, the brain is encased in the b).....

Another purpose is to c)..... the body. The d)..... is a column of bones called e) "....." which both f)..... the body and also protect the nerve fibres of the g)..... chord.

The third function of bones is to allow h)..... The skeleton has many i)..... to allow walking, climbing, etc.

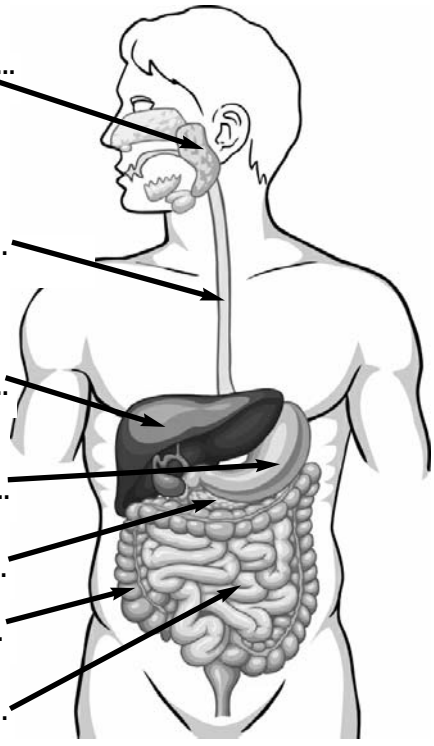
Movement is actually caused by the j)....., which are attached to the bones by k)..... Muscles always work by l)..... and can never m)..... They always work in pairs around each joint.

As well as the 3 main purposes of protection, n)..... and movement, the bones are also the place where o)..... cells are made.

Worksheet 5
Digestive System

Student Name.....

1. Name the organs of the digestive system indicated below.



a).....

b).....

c).....

d).....

e).....

f).....

g).....

2. Explain why digestion is necessary.

3. What do digestive "enzymes" do to food chemicals, such as starch or protein?

4. Indicate three organs which produce digestive enzymes. Use letters (a,b,c...g) from the diagram at left.

..... and ..... and .....

5. From which organ is digested food mostly absorbed into the blood stream?

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The Circulatory System

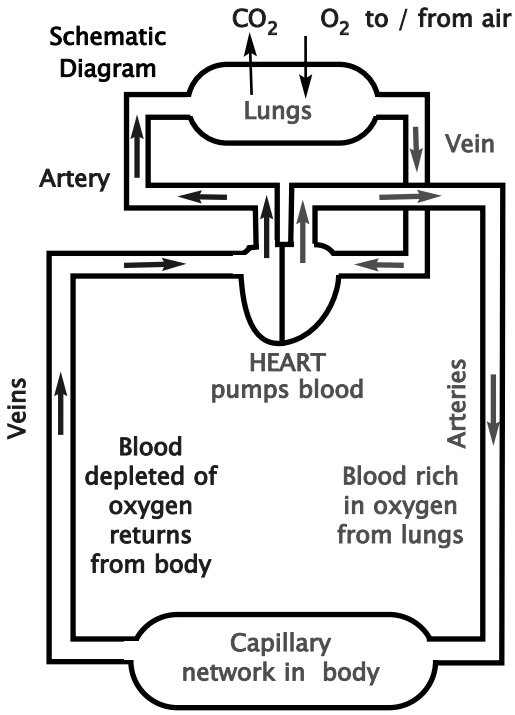
The circulation of the blood is vital to carry food, respiratory gases, wastes, heat, water and various other things around your body.

The heart is a pump. Its muscles contract and squirt blood into the arteries. Valves prevent blood flowing backwards.

Arteries divide into smaller and smaller tubes, carrying blood to every part of the body.

In body tissues the smallest blood vessels are called capillaries. Here the food nutrients and oxygen move from blood into the body cells, while wastes move into the blood.

Blood from the capillaries flows into veins, which return the blood to the heart.



Double Circulation Pattern

The flow of blood is like a "figure-8", with 2 connected loops.

The blood returning to the heart from the body is depleted of oxygen and rich in CO_2. It is pumped immediately to the lungs, where gas exchange occurs.

A vein carries "oxygenated" blood from the lungs back to the heart, so it can be pumped back out to the body again.

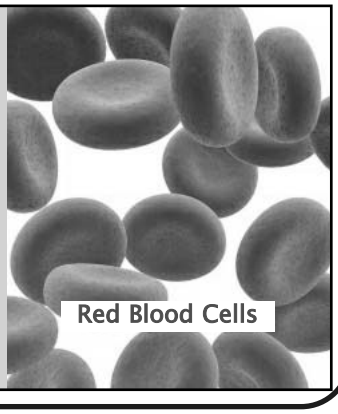
The 2 sides of the heart pump at the same time, but the blood in one side never mixes with blood on the other side.

Depending on which part of the body it goes to, a blood cell can go around the "figure-8" in just a few minutes.

What is Blood?

Blood is made of a liquid part called "plasma" with many blood cells suspended in it.

Food nutrients and waste materials are carried in the plasma. Oxygen is carried by the many red blood cells, which contain a red-coloured chemical called haemoglobin. There are also white blood cells, which help defend your body against disease germs.



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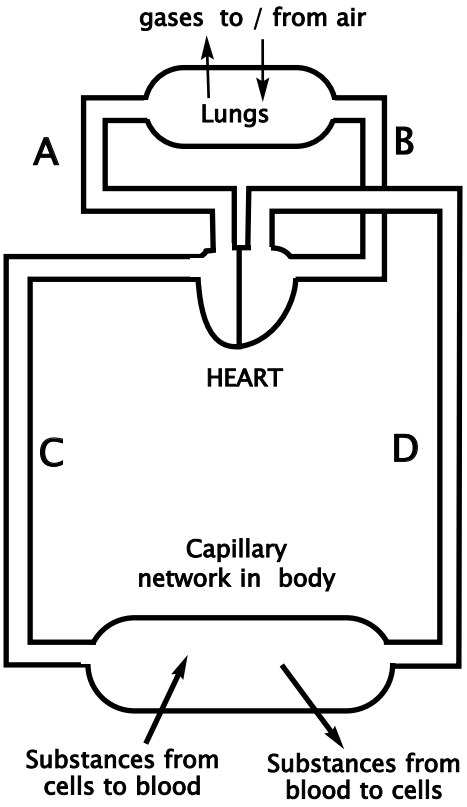
Worksheet 6

Circulatory System

Student Name.....

1.
On the schematic diagram below, clearly place arrows to show the direction of blood flow in the blood vessels at points A, B, C and D.



2.
For each blood vessel A-D, state if it is a vein or an artery.

A = ... B = ...

C = ... D = ...

3.
Which two blood vessels (A-D) carry blood which contains:
a) a lot of O_2 ..... and .....

b) a lot of CO_2 ..... and .....

c) Apart from gases, name a substance which <u>leaves the blood</u> between points C and D in the diagram.

4. Fill in the blank spaces.

The purpose of the circulatory system is to a)..... Substances carried <u>to</u> the body cells include b)..... and ....., while a substance carried <u>away from</u> body cells is c).....

The heart acts as a d)..... When its muscles contract, blood is squeezed out through a/an e)..... These blood vessel divide into smaller and smaller tubes until they become f)..... which run close to every living cell.

The blood circulates around the body, then returns to the heart in a/an g).....

There are 2 connected loops of circulation. One goes to all the body cells, the other goes through the h)..... to get a fresh supply of i)..... gas, and get rid of the waste gas j)..... .....

Blood itself is made of a liquid part (called k).....) and many blood cells. The most common blood cells are coloured l)..... because they contain the chemical called m)..... This chemical carries n)..... gas very efficiently.

The blood also contains o)..... blood cells, which help defend your body against p).....

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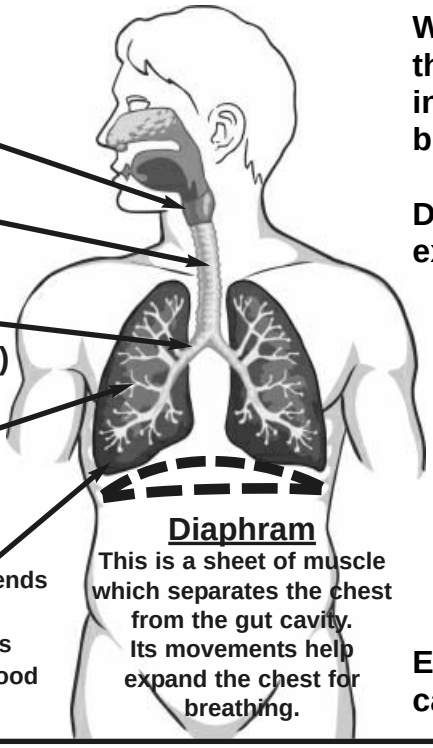
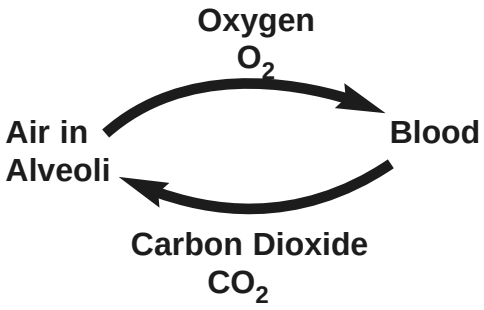
The Respiratory System

This system includes the lungs and the air pasageways through which you breathe.
The purpose of breathing is gas exchange.
Oxygen is absorbed into the blood, while carbon dioxide is excreted.



When the rib cage moves up and out, and the diaphram moves down, air is sucked into the lungs via the trachea, bronchi and bronchioles.

Down in the tiny alveoli air sacs, gases are exchanged between the air and the blood.

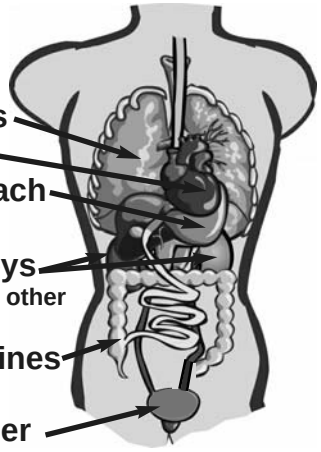


Each alveolus is surrounded by blood capillaries to make gas exchange efficient.

The Excretory (Urinary) System

Your body excretes CO_2 gas from the lungs, and digestive wastes are eliminated from the rectum. Your cells also produce other wastes, especially a chemical called urea.
It is your kidneys which collect urea and other wastes from the blood, and concentrate them in a small amount of water. This is urine. It is stored in the urinary bladder until passed.

Location of Urinary System



Every drop of your blood is filtered by a kidney about 20 times per day.

How the System Works

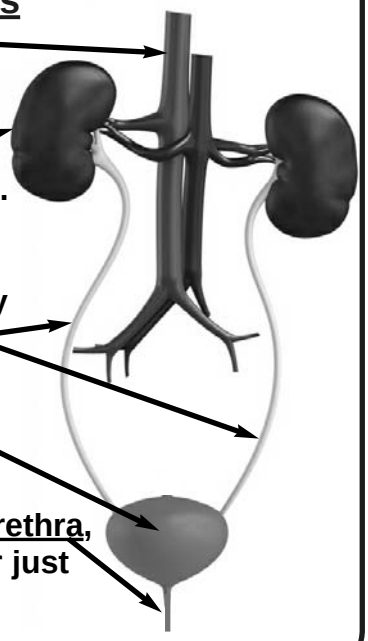
Major blood vessels supply the kidneys.

Each kidney acts as a filter, collecting urea and other wastes.

The wastes, dissolved in a small amount of water, seep constantly down these tubes, the ureters.

Slowly, the urinary bladder fills with urine and expands.

The bladder is emptied via the urethra, which runs through the penis, or just in front of the vagina.



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Worksheet 7

Respiratory System

Student Name.....

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

Description	List Item
a) Main breathing tube in throat.	.....
b) Gas absorbed into blood in lungs.	.....
c) Sheet of muscle which helps you breathe.	.....
d) Tiny air sac at the end of each bronchiole.	.....
e) Two main branches from the trachea.	.....

List Items (not all will be used)

A. oxygen	D. diaphram
B. carbon dioxide	E. trachea
C. alveolus	F. bronchi

2. Fill in the blank spaces.

The purpose of the respiratory system is to absorb a)..... gas into the body, and to excrete the waste gas b).....

When the chest is expanded, air is sucked down the c)..... (tube). This divides into the d)..... to each lung. These sub-divide into smaller air tubes called e)..... At the end of each tube the air reaches an f)..... which is surrounded by blood g).....

This is where gas h)..... occurs between the air and the blood.

Worksheet 8

Excretory System

Student Name.....

1. Label the organs indicated.

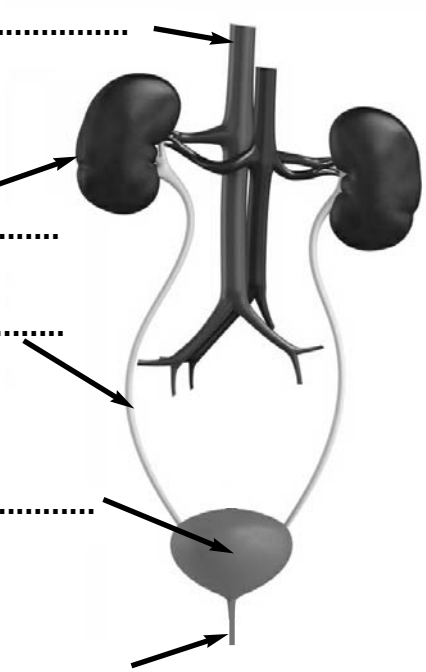
a).....

b).....

c).....

d).....

e).....



2. Fill in the blank spaces.

The excretory system is also known as the a) "..... system". Its job is to remove b)..... from the blood stream. The main waste is a chemical called c).....

The d)..... act as filters of the blood. They collect wastes and concentrate it in a small amount of e)..... This liquid is called f).....

This liquid constantly seeps down the g)..... tubes from each kidney into the h)..... As it fills up it expands.

When convenient, you pass the urine through the i)..... tube.

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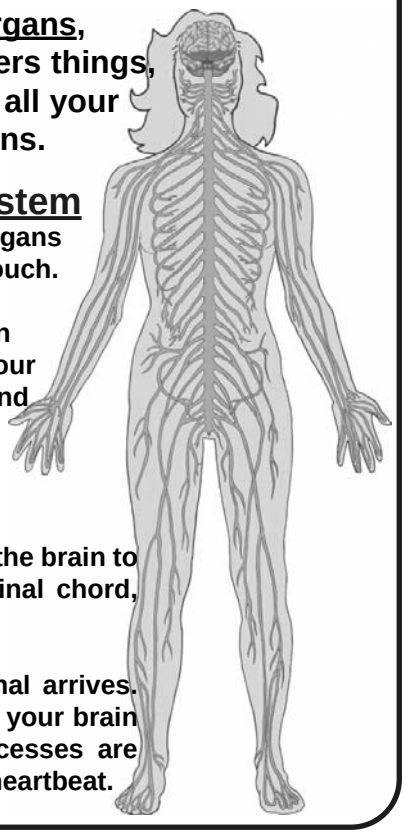
The Nervous System

The Nervous System's central organ is the brain.
Your brain receives information from your sensory organs, processes that information to decide what to do, remembers things, and sends out nerve signals to control and co-ordinate all your actions, and most body functions.



Sensory Organs

You probably think that you see with your eyes.

Actually, all your eyes do is detect light energy and send information to your brain. Your brain interprets the information so that you "see" things and recognise them.

Similarly with hearing, smell, taste and touch: you have sensory organs which detect energy or chemicals and send nerve signals to the brain. It is in your brain you really see, hear, smell, taste & feel things.

Parts & Functioning of the System

Sensory Nerves carry signals from sensory organs to the brain so you can see or hear or feel a touch.

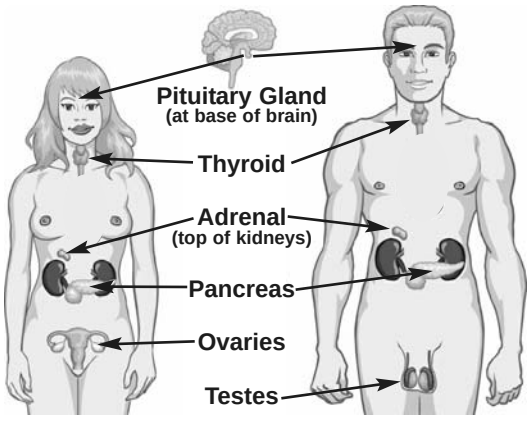
The Central Nervous System (CNS) is the brain and spinal chord. The spinal chord controls your reflex actions, but the brain does the seeing and hearing (etc), the thinking, remembering and deciding. As well, the brain is the seat of your emotions, instincts and personality.

Motor Nerves carry command messages from the brain to the muscles. These nerves run down the spinal chord, then branch out to every part of the body.

The muscles contract when a command signal arrives. This is how you walk, talk or turn your head... your brain commands, and the muscles act. Many processes are controlled unconsciously, like breathing and heartbeat.

The Endocrine System

The Nervous System does most of the controlling and co-ordinating of your body activities and functions. However, there is also a system of glands which release special chemicals called hormones into the blood stream. Each hormone has the effect of controlling a process or function in the body.



"Growth Hormone" from the pituitary gland controls your growth during childhood.

"Thyroxin" from the thyroid gland controls how fast all the chemical reactions in all your cells run.

"Insulin" from the pancreas controls your blood sugar levels.

After puberty, the male hormone "Testosterone" controls sperm production, and causes the development of a deeper voice, facial hair, and other "male secondary sex characteristics".

The female hormones, oestrogen & progesterone control the menstrual cycle of egg production. Progesterone is also vital during pregnancy, while oestrogen controls development of "female secondary sex characteristics" such as breast growth and hip shape.

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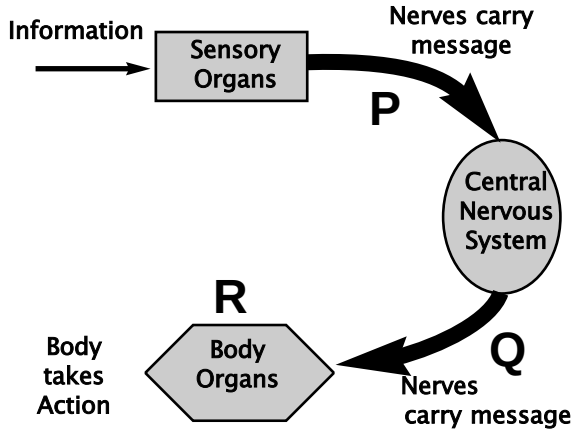
Worksheet 9

Control & Co-ordination

Student Name.....

This schematic diagram shows how the Nervous System works.
Answer the questions below.



1. List your 5 senses.

....

....

.....

2.
a) What are the nerves at "P" called? .....
b) What <u>two</u> organs make up the "central nervous system"?

..... **and** .....
c) What are the nerves at "Q" called? .....
d) Which body organs are most commonly involved at "R"? .....

3.
As well as receiving and interpreting information from your sensory organs, list 3 other things that go on in your brain.

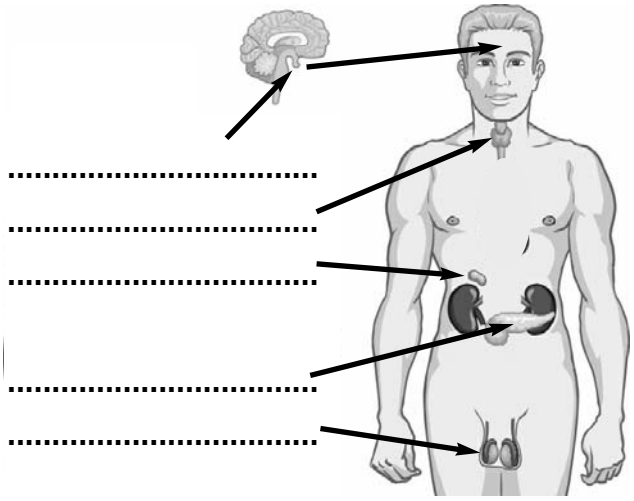
.....

.....

.....

4.
As well as the system of nerves, there is also a system of chemicals to control and co-ordinate body functions.
a) What is this chemical control system called? .....
b) What are the chemicals released called? .....
c) How do these chemicals get to different parts of the body?

.....
d) Identify as many of the glands of the system as you can.



.....

.....

.....

.....

.....

5.
Complete this table to summarize the details for 2 specific hormones.

Hormone	from Gland	What it Controls

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Topic Test
Living Systems

Student Name..... Score = /55

Answer all questions in the spaces provided.

1. (10 marks)

True or False?	**T or F**
a) Many cells of the same type, working together is called a "tissue".	**.....**
b) Oxygen gas can turn limewater cloudy.	**.....**
c) Photosynthesis occurs in the cytoplasm of a cell.	**.....**
d) Oxygen is a starting material for photosynthesis.	**.....**
e) Gases move in & out of leaves through stomates.	**.....**
f) Xylem tubes carry water up from the roots.	**.....**
g) The skull's main function is to support the head.	**.....**
h) During digestion, food does not go through the pancreas	**.....**
i) In the blood, oxygen is carried by white blood cells.	**.....**
j) Kidneys and bladder are connected by ureters.	**.....**

2. (5 marks)
List 5 "basic life functions" which all living things carry out.

.....

.....

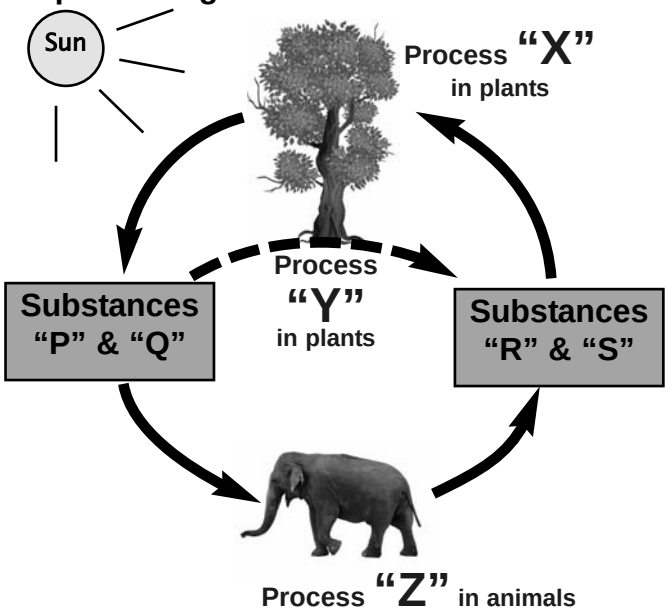
.....

.....

.....

3. (5 marks)
Write a chemical equation (in words) to summarise cellular respiration.

4. (5 marks)
This diagram represents one of the cycles of nature, with the tree representing all plants and the elephant representing all animals.



a) Identify the processes X, Y and Z.

X = ...

Y = ...

Z = ...

b) identify the substances P, Q, R & S.

P & Q = ... & .....

R & S = ... & .....

5. (5 marks)
In a plant, what is/are the main function(s) of the:

a) leaves. .....

b) stem. (2) .....

and .....

c) roots. (2) .....

and .....

6. (6 marks)
Complete the table to compare the tubes in plants which carry substances around.

Tube	Main substance carried	Carried to/from

7. (5 marks)
Refer to the list below.
Which system of the human body...

a) ...carries substances around the body?

.....

b) ...makes certain chemicals smaller, then absorbs them into the blood?

.....

c) ...carries out "gas exchange"?

.....

d) ...releases chemicals which control certain body functions?

.....

e) ... "filters" the blood?

.....

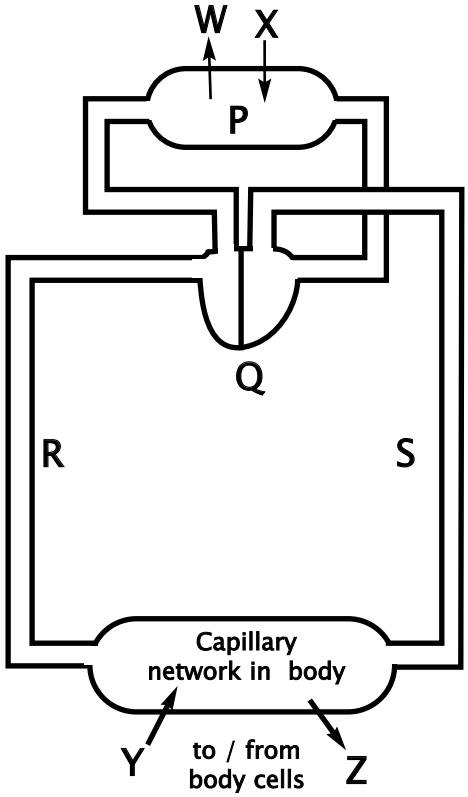
List to choose from (not all will be used)
Skeletal, Digestive, Circulatory, Respiratory, Excretory, Nervous, Endocrine.

8. (4 marks)
Re-arrange these organs so they are in the order in which food passes through them. stomach, large intestine, oesophagus, rectum, small intestine.

1..... 2..... 3.....

4..... 5.....

9. (10 marks)
The diagram represents the human circulatory system.
P & Q are body organs.
R & S are types of blood vessel.
W, X, Y & Z are chemical substances.



a) Name organs P and Q

P = ... Q = ...
b) Clearly mark on the diagram the direction of blood flow near label "R".
c) What type of blood vessel is "R"?

.....
d) Clearly mark on the diagram the direction of blood flow near label "S".
e) What type of blood vessel is "S"?

.....
f) Name chemical substances W and X.

W = ... X = ...
g) What other types of chemicals (not the same as W & X) might Y & Z be?

Y = ... Z = ...

Answer Section

Worksheet 1

a) cells
b) unicellular
c) multicellular
d) assimilate
e) energy
f) excrete
g) grow
h) reproduce
i) respond
j) differentiated
k) tissue
l) organ
m) system

Worksheet 2

1. Glucose (sugar) + oxygen
⟶ carbon dioxide + water + energy
2. C (plants and animals)
3.
a) oxygen
b) oxygen
c) carbon dioxide
d) carbon dioxide
4. (energy is light)
Carbon dioxide + water
⟶ glucose + oxygen
5.
a) chloroplast
b) chlorophyll

Worksheet 3

1.
a) to make food by photosynthesis
b) Holds the leaves up to catch light.
Has tubes to carry water, food, etc
c) Absorb water from soil.
Anchor the plant so it stays upright.
2.
A. Fish used up all available oxygen in cellular respiration.
B. Plant photosynthesised. This makes oxygen, so fish had enough to breathe.
C. No photosynthesis in dark, so no oxygen production.

3.
a) Cells are transparent to allow light into leaf cells.
b) Many open spaces allow easy circulation of water and gases in leaf.
c) Q
d) Vein, or vascular bundle.
e) (Stomate) allows gases in/out of leaf.
4.
Xylem carries water (& minerals)
Phloem carries food

Worksheet 4

a) protect
b) skull
c) support
d) backbone
e) vertebrae
f) support
g) spinal
h) movement
i) joints
j) muscles
k) tendons
l) pulling
m) push
n) support
o) blood

Worksheet 5

1.
a) salivary glands
b) oesophagus
c) liver
d) stomach
e) pancreas
f) large intestine
g small intestine
2.
Food molecules are too large to be absorbed into blood or cells. Digestion breaks food nutrients into smaller chemical molecules.
3.
Enzymes break the larger molecules into smaller units.
4.
any 3 of a, d, e, g
5.
small intestine

Worksheet 6

1.
A ↑ B ↓ C ↑ D ↓
2.
A artery B vein
C vein D artery
3.
a) B & D
b) A & C
c) food nutrients, e.g. sugar
4.
a) transport substances around the body
b) oxygen, food
c) carbon dioxide
d) pump
e) artery
f) capillaries
g) vein
h) lungs
i) oxygen
j) carbon dioxide
k) plasma
l) red
m) haemoglobin
n) oxygen
o) white
p) disease / germs

Worksheet 7

1.

a) E b) A c) D d) C e) F

2.

a) oxygen	**b) carbon dioxide**
c) trachea	**d) bronchi**
e) bronchioles	**f) alveolus**
g) capillaries	**h) exchange**

Worksheet 8

a) Blood vessels (artery and vein)
b) kidney
c) ureter
d) urinary bladder
e) urethra

2.

a) urinary	**b) wastes**
c) urea	**d) kidneys**
e) water	**f) urine**
g) ureter	**h) bladder**
i) urethra	

Worksheet 9

1.

sight, hearing, taste, smell, touch

2.

a) sensory nerves
b) brain & spinal chord
c) motor nerves
d) muscles

3.

any 3 of memory, thinking, deciding, emotions, instincts, personality

4.

a) Endocrine system
b) hormones
c) in bloodstream
d) pituitary, thyroid, adrenal, pancreas, testes

5.

Insulin	**Pancreas**	**controls blood sugar levels**
Growth hormone	**Pituitary**	**controls rate of growth**

(many other possible answers)

Topic Test

1.

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

2. (any 5)
Take in substances and assimilate.
Extract energy from food
Excrete wastes
Grow
Reproduce
Respond

3.

glucose + oxygen ⟶ carbon dioxide + water + energy

4.

a) X = photosynthesis
Y and Z = cellular respiration
b) P&Q = glucose & oxygen
R & S = carbon dioxide & water

5.

a) make food by photosynthesis.
b) hold leaves up to get light, and carry water, food, etc around.
c) absorb water, and anchor plant in soil.

6.

Xylem	**water**	**roots to leaves**
Phloem	**food**	**from leaves to fruits, roots,etc**

7.

a) circulatory	**d) endocrine**
b) digestive	**e) excretory**
c) respiratory	

8.

oesophagus, stomach, small intest., large intest., rectum

9.

a) P = lungs Q = heart
b) upwards at R
c) vein
d) downwards at S
e) artery
f) W = carbon dioxide X = oxygen
g) Y = wastes (urea) Z = food nutrients