Levels of Organisation

Cell

Example: Red blood cell
The smallest unit.

Tissue

Example: Muscle Tissue
Tissue is made up of many cells

Organ

An organ is made up of many tissues.

System

A group of organs working together

Organism
BODY SYSTEMS

A **system** is a group of organs working together to perform a particular function.

The human body is made up of a number of inter-related systems

The seven major systems in the body that we will focus on are:

1. Digestive system
2. Circulatory system
3. Respiratory system
4. Musculoskeletal system
5. Excretory system
6. Nervous system
7. Reproductive system
1. THE DIGESTIVE SYSTEM

A) FUNCTION:

The digestive system breaks down food into dissolved nutrients that can be absorbed into the blood stream and transported to cells throughout the body.

B) ORGANS (COMPONENTS):

This system consists of a continuous tube starting from the mouth and ending at the anus called the alimentary canal. The main organs are the mouth, oesophagus, stomach and intestines as well as the liver and the pancreas that produce or store digestive chemicals. All these organs together perform a common function – the digestion of food.
C) MAIN PROCESSES:

- **INGESTION** – Intake of food through the mouth by biting, chewing and swallowing
- **DIGESTION** – The breakdown of large food particles into small soluble food molecules that can be carried in the bloodstream.
- **ABSORPTION** – The movement of digested, soluble food molecules through the wall of the intestines and into the blood.
- **EGESTION** – The passing out of undigested food (faeces) through the anus.

D) HEALTH ISSUES:

- **Ulcers** – An ulcer is an open wound that can form in the *duodenum* i.e. the stomach wall or upper parts of the small intestine. They can be formed by bacterial infections in the stomach, by certain medications or excessive alcohol abuse.
- **Anorexia nervosa** – A type of eating disorder involving the limiting of the amount of food intake due to the fear of gaining weight.
- **Diarrhoea** – Occurs when a person has multiple bowel movements consisting of watery faeces. Many factors can cause it, eg bacterial infection, food allergies, or just certain types of food.
- **Liver cirrhosis** – Incurable damage to the liver tissue caused by excessive drinking of alcohol.

What is the function of the salivary glands?

What is Peristalsis?
TASK 1:

1) Name the processes that occur in the:
   a) mouth – __________________________
   b) stomach – ________________________
   c) small intestine – __________________
   d) large intestine – __________________
   e) anus – __________________________

2) State 3 glands in the digestive system and state their functions.
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

3) Obesity is a medical condition that is growing in western society.
   a) Define obesity. ____________________________________________

   b) Explain how this condition could be prevented.
   __________________________________________________________
   __________________________________________________________

   c) What is BMI and how can it be calculated?
   __________________________________________________________
2. CIRCULATORY SYSTEM

A) FUNCTION

The circulatory system consists of blood tissue (plasma, white and red blood corpuscles) which transport oxygen and vital nutrients (amino acids, hormones, etc) to the cells of the body through a network of tubes called the veins, arteries and capillaries. The blood never leaves this network. It maintains a stable body temperature, pH balance and homeostasis in the human body. Blood also transports carbon dioxide and waste products from the cells to be given off by the body.

B) ORGANS

The main organs are:

- **HEART** – About the size of a clenched fist, this organ is a muscle that pumps the blood throughout the body. It is divided vertically into two halves by a thick wall called a **Septum**. The one half pumps oxygenated blood to the cells of the body, while the other half pumps deoxygenated blood to the lungs. There are four chambers. The upper chambers are called the **atria**, while the lower chambers are called the **ventricles**. Between the atria and ventricles are **valves** that ensure that the blood flows in the direct direction in the heart.
- **ARTERIES** – Blood vessels transporting oxygenated blood away from the heart.
- **VEINS** – Blood vessels transporting de-oxygenated blood towards the heart.
- **CAPILLARIES** – The smallest blood vessels that make contact with the body cells.

![Diagram showing the circulatory system of the body](https://example.com/circulatory_system.png)

The circulation of blood in the body
The Internal Structure of the Heart
C) MAIN PROCESSES

Double circulation of the blood occurs:

- Circulation between the heart and the lungs. Deoxygenated blood is carried to the lungs and blood rich in oxygen is returned to the heart.
- Circulation between the heart and the rest of the body. Oxygenated blood is pumped to the body and deoxygenated blood is returned to the heart.

D) HEALTH ISSUES

- **High blood pressure (hypertension)** – Refers to the constant high pressure of blood in the arteries walls that may damage them and also lead to a heart attack.
- **Heart attack** – A heart attack is caused when the flow of blood to the heart is blocked by a clot or too little blood being supplied to the heart. Bad diet, not exercising, being overweight and smoking can cause heart attacks, however most people who suffer heart attacks have inherited this from their families.
- **Stroke** – A stroke occurs when the blood supply to the brain is disturbed. It can be caused by a burst blood vessel or a blood clot. The brain cells die due to a lack of oxygen resulting in paralysis to one half of the body.
TASK 2:

1) The blood system is a closed system. Explain this statement.

______________________________________________________________________________________

2) Complete the table below by explaining the differences between the following terms:

<table>
<thead>
<tr>
<th>a) ARTERY</th>
<th>a) VEIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>b) OXYGENATED BLOOD</td>
<td>b) DEOXYGENATED BLOOD</td>
</tr>
<tr>
<td>c) ATRIUM</td>
<td>c) VENTRICLE</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>d) GASEOUS EXCHANGE</td>
<td>d) RESPIRATION</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>e) INHALATION</td>
<td>e) EXHALATION</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3) Use the internet to find out information concerning blood pressure.

a) What is the blood pressure reading of a healthy person?

______________________________________________________________________________________

b) What is high blood pressure?

______________________________________________________________________________________

______________________________________________________________________________________

c) What are the readings of someone with high blood pressure and low blood pressure?

______________________________________________________________________________________

d) Explain the causes and prevention of high blood pressure.

Causes -  

______________________________________________________________________________________

______________________________________________________________________________________

Prevention -  

______________________________________________________________________________________

______________________________________________________________________________________
3. The Respiratory System

B) ORGANS

Air from outside the body enters via the nose or mouth and travels through a vertical tube called the trachea, which branches to form two bronchi that lead into the two lungs. These branches into smaller tubes called bronchioles which lead to tiny air sacs called alveoli.

C) MAIN PROCESSES

- **Breathing** – this takes place because of air pressure differences between the air in the lungs and the air outside the body. Breathing consists of two processes:
  1) Inhalation – Oxygen is drawn into the body from the mouth or nostrils leading to the lungs.
  2) Exhalation – Carbon dioxide is drawn out of the body from the lungs through the mouth or nostrils.
- **Gaseous exchange** – Movement of oxygen and carbon dioxide between the alveoli of the lungs and the capillaries of the lungs. Gaseous exchange occurs by diffusion. Oxygen and carbon dioxide are exchanged between the blood and the lungs as well as between the blood and the cells.
• **Cellular respiration** – this is a chemical process in which glucose is broken down inside cells using oxygen. Energy stored inside the glucose is released and carbon dioxide is given off by the cells to be returned back to the lungs.

D) HEALTH ISSUES

• **Asthma** – is a disorder that causes the airways of the lungs to swell and narrow. This is caused by inflammation in the airways. This leads to wheezing, shortness of breath, chest tightness and coughing.

• **Lung cancer** – is a disease where the epithelial cells of the lung grow uncontrollably. These cells form a mass known as a tumour.

• **Bronchitis** – is inflammation or swelling of the bronchial tubes. People with bronchitis breathe in less air and oxygen into their lungs.

• **Asbestosis** – is a disease caused by asbestos fibres entering the lungs during inhalation. The fibres build up in the lungs and the lung tissue becomes stiff.

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**When You Have Asthma**

![Diagram of the effects of asthma on the lungs.](image)

- **Bronchial tube**
- **Muscles** - The bronchial tubes are wrapped with muscles
- **Bronchiole** - Smaller branches of the bronchial tubes
- **Mucus lines the bronchial tubes**
- **Inflamed airway**
- **Alveoli with trapped air**
- **Extra mucus**

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4. Musculoskeletal System

A) FUNCTION

The skeleton protects the body, provides support and keeps the body upright. Muscles are attached to bones and pull the bones to enable movement. Muscles and bones work together to create body movement.

B) ORGANS

The main components of the musculoskeletal system include muscles, bones, cartilage, tendons and ligaments. Cartilage prevents friction where bones meet and movement takes place. Tendons are tissues that attach muscles to bones. Ligaments are tissues that attach bones to bones.

C) MAIN PROCESSES

The main processes of the musculoskeletal system include:

- Body support and protection of internal organs
- Contraction and relaxation of the muscles
- Locomotion and movement

The muscles work in pairs to pull on the bones to allow for movement
C) HEALTH ISSUES

- **Rickets** is a disease that leads to the softening and weakening of the bones. It is caused by a lack of vitamin D and calcium in the diet.
- **Arthritis** – in older people, the cartilage at a joint may become worn away and the bones rub and grind against each other. This is called Osteoarthritis and it makes movement painful.
- **Osteoporosis** is a disease where bones become porous and brittle due to loss of bone tissue. This leads to an increased risk of bone fractures.
5. Excretory System

A) FUNCTION

This is the system where the harmful waste products are removed from the body.

B) ORGANS

The main organs include the kidneys, bladder, ureter and urethra.

- The **renal vein** carries cleaned blood away from the kidney
- The **renal artery** brings blood containing wastes to the kidney
- The **kidney** filters harmful wastes from the blood and forms urine.
- The **ureter** carries urine from the kidney to the bladder.
- The **bladder** stores urine.
- The **urethra** drains urine from the bladder.
- The **sphincter** is a ring of muscles that controls the release of urine from the bladder.
C) MAIN PROCESSES

The main processes include:

- **Filtration** – Blood with waste products enters the kidneys. The kidney acts as a filter to collect the waste products such as urea, unwanted salts and excess water (together called the filtrate).
- **Absorption** – Useful substances that are still in the filtrate, such as water, glucose and amino acids get absorbed from the kidney back into the blood.
- **Diffusion** – The movement of the waste products. The molecules of the waste products move from an area of high concentration to an area of low concentration until the concentration in both areas is the same.
- **Excretion** – The removal of chemical waste products from the body in the form of urine.

C) HEALTH ISSUES

- **Kidney failure** is the loss of the kidneys’ ability to remove wastes from the blood. Harmful wastes build up in your body, blood pressure may rise and, you retain excess fluid. Treatment includes dialysis or kidney transplant.
- **Bladder infections** are caused by bacteria that enter the urinary tract.
- **Kidney stones** are solid deposits of minerals and salts that form in the kidneys. Stones are formed when the urine is too concentrated with too little liquid in the urine.
6. Nervous System

A) FUNCTION

The nervous system receives stimuli and also helps the body react to stimuli. A **stimulus** is a change in the environment that causes a reaction (**response**) in a living organism.

B) ORGANS

The main organs include the brain, spinal cord, nerves and the sense organs (ears, nose, eyes, skin and tongue).

- **The brain** is the main organ that coordinates and controls nerve activity
- **The spinal cord** consists of nerve tissue that extends from the brain through the spinal column in which the nerve cells carry information from the body to the brain and back to the body.
- **Receptors** – Cells in sense organs which detect stimuli in the environment
- **Impulses** – These are signals that are transmitted along nerve cells (called **neurons**)

C) MAIN PROCESSES

The nervous system helps you to react to different stimuli. For example, if you feel a mosquito biting your hand the following chain of events happens:

- Sensory receptors in the skin on your hand detect the mosquito
- A message is sent along the nerves to the spinal cord
- A message is sent to the brain
- The brain receives the message and decides you need to scratch your hand
• A message is sent from the brain and along the spinal cord to the muscles in your hand
• You are now able to scratch your hand

C) HEALTH ISSUES

• Deafness can be caused by listening to loud sounds like loud music
• Blindness can be caused by diseases such as diabetes and glaucoma
• Short – sightedness is an eye condition that makes distant objects appear blurred while close objects can be seen clearly.
• Drugs and alcohol affect the transmission of impulses from sensory nerve cells to nerve cells in the brain
7. Reproductive System

A) FUNCTION

The reproductive system produces sex cells for the purpose of continuation of the human species.
The male sex cells are the sperm cells. The female sex cells are the egg cells. These cells need to fuse
to ensure that new babies are born.

B) ORGANS

The male reproductive organs are found outside the main body while the female reproductive
organs are found internally. Various hormones control the development and functioning of these
organs.
C) MAIN PROCESSES

Include cell division, growth, maturation, copulation, ejaculation, ovulation, menstruation, fertilization and implantation

C) HEALTH ISSUES

- **Infertility** means a person is unable to produce an offspring or baby
- **Foetal alcohol syndrome** is a birth defect caused by alcohol consumption during pregnancy
- **STDs are Sexually transmitted diseases** which involve the transmission of infectious organisms such as bacteria and viruses between sex partners.
Digestive System Glossary:

**abdomen** - the part of the body that contains the digestive organs. In human beings, this is between the diaphragm and the pelvis.

**alimentary canal** - the passage through which food passes, including the mouth, oesophagus, stomach, intestines, and anus.

**anus** - the opening at the end of the digestive system from which faeces (waste) exits the body.

**appendix** - a small sac located on the cecum.

**ascending colon** - the part of the large intestine that run upwards; it is located after the cecum.

**bile** - a digestive chemical that is produced in the liver, stored in the gall bladder, and secreted into the small intestine.

**cecum** - the first part of the large intestine; the appendix is connected to the cecum.

**chyme** - food in the stomach that is partly digested and mixed with stomach acids. Chyme goes on to the small intestine for further digestion.

**descending colon** - the part of the large intestine that run downwards after the transverse colon and before the sigmoid colon.

**digestive system** - (also called the gastrointestinal tract or GI tract) the system of the body that processes food and gets rid of waste.

**duodenum** - the first part of the small intestine; it is C-shaped and runs from the stomach to the jejunum.

**epiglottis** - the flap at the back of the tongue that keeps chewed food from going down the windpipe to the lungs. When you swallow, the epiglottis automatically closes. When you breathe, the epiglottis opens so that air can go in and out of the windpipe.

**oesophagus** - the long tube between the mouth and the stomach. It uses rhythmic muscle movements (called peristalsis) to force food from the throat into the stomach.

**gall bladder** - a small, sac-like organ located by the duodenum. It stores and releases bile (a digestive chemical which is produced in the liver) into the small intestine.

**gastrointestinal tract** - (also called the GI tract or digestive system) the system of the body that processes food and gets rid of waste.

**ileum** - the last part of the small intestine before the large intestine begins.
**intestines** - the part of the alimentary canal located between the stomach and the anus.

**jejenum** - the long, coiled mid-section of the small intestine; it is between the duodenum and the ileum.

**liver** - a large organ located above and in front of the stomach. It filters toxins from the blood, and makes bile (which breaks down fats) and some blood proteins.

**mouth** - the first part of the digestive system, where food enters the body. Chewing and salivary enzymes in the mouth are the beginning of the digestive process (breaking down the food).

**pancreas** - an enzyme-producing gland located below the stomach and above the intestines. Enzymes from the pancreas help in the digestion of carbohydrates, fats and proteins in the small intestine.

**peristalsis** - rhythmic muscle movements that force food in the esophagus from the throat into the stomach. Peristalsis is involuntary - you cannot control it. It is also what allows you to eat and drink while upside-down.

**rectum** - the lower part of the large intestine, where feces are stored before they are excreted.

**salivary glands** - glands located in the mouth that produce saliva. Saliva contains enzymes that break down carbohydrates (starch) into smaller molecules.

**sigmoid colon** - the part of the large intestine between the descending colon and the rectum.

**stomach** - a sack-like, muscular organ that is attached to the esophagus. Both chemical and mechanical digestion takes place in the stomach. When food enters the stomach, it is churned in a bath of acids and enzymes.

**transverse colon** - the part of the large intestine that runs horizontally across the abdomen.