Human Physiology

Homeostasis: Definition;

The human organism consists of trillions of cells and all working together for the maintenance of the entire organism. Maintaining a constant internal environment, the cell needs to survive for the well-being of individual cells and the well-being of the entire body. The various processes by which the body regulates its internal environment are collectively referred to as homeostasis.

Name organs involved in homeostasis;

Answer: Maintaining a stable internal environment requires constant monitoring and adjustments as conditions change. This adjusting of physiological systems within the body is called *homeostatic regulation*. Homeostatic regulation involves three parts or mechanisms: 1) the ***receptor***, 2) the ***control center*** and 3) the ***effector***.

Basic mechanism of homeostasis

Answer: The ***receptor*** receives information that something in the environment is changing. The ***control center*** or ***integration center*** receives and processes information from the ***receptor***, and lastly, the ***effector*** responds to the commands of the ***control center*** by either opposing or enhancing the stimulus. This is an ongoing process that continually works to restore and maintain homeostasis.

Example, in regulating body temperature there are temperature *receptors* in the skin, which communicate information to the brain, which is the *control center*, and the *effector* is our blood vessels and sweat glands in our skin.

Basic mechanism by which homeostasis is maintained-Feedback mechanism;

When a change of variable occurs, there are two main types of feedback to which the system reacts:

Negative feedback: a reaction in which the system responds in such a way as to reverse the direction of change. Since this tends to keep things constant, it allows the maintenance of homeostasis.

Examples 1: When the concentration of carbon dioxide in the human body increases, the lungs are signaled to increase their activity and expel more carbon dioxide.

Examples 2: Thermoregulation is another example of negative feedback. When body temperature rises, receptors in the skin and the hypothalamus sense a change, triggering a command from the brain. This command, in turn, affects the correct response, in this case a decrease in body temperature.

Positive feedback: a response is to amplify the change in the variable. This has a destabilizing effect, so does not result in homeostasis. Positive feedback is less common in naturally occurring systems than negative feedback, but it has its applications.

Example 1: in nerves, a threshold electric potential triggers the generation of a much larger action potential. Blood clotting in which the platelets process mechanisms to transform blood liquid to solidify is an example of positive feedback loop.

Example 2: Another example is the secretion of oxytocin which provides a pathway for the uterus to contract, leading to child birth.

Homeostasis : The ability of a system or living organism to adjust its internal environment to maintain a stable equilibrium, such as the ability of warm-blooded animals to maintain a constant body temperature.

Negative feedback :A feedback loop in which the output of a system reduces the activity that causes that output.

Positive feedback: A feedback loop in which the output of a system is increased by the mechanism's own influence on the system that creates that output.

Homeostatic control mechanisms have at least three interdependent components: a receptor, integrating center, and effector.

- The receptor senses environmental stimuli, sending the information to the integrating center.
- The integrating center, generally a region of the brain called the hypothalamus, signals an effector (e.g. muscles or an organ) to respond to the stimuli.
- Positive feedback enhances or accelerates output created by an activated stimulus. Platelet aggregation and accumulation in response to injury is an example of positive feedback.
- Negative feedback brings a system back to its level of normal functioning. Adjustments of blood pressure, metabolism, and body temperature are all negative feedback.

Name of regions of hypothalamus of brain responsible for the maintenance of different homeostatic, autonomic functions.

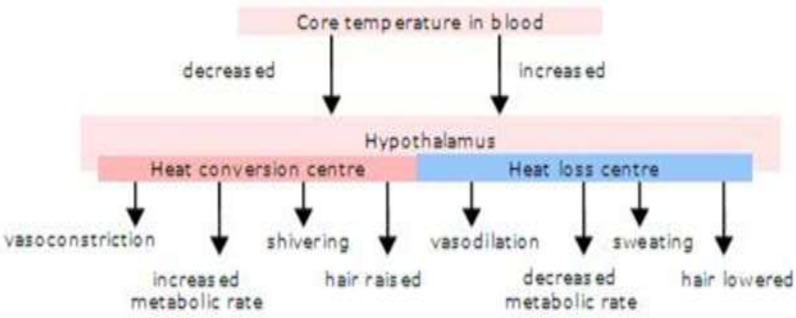
The **hypothalamus** is a section of the brain responsible for the production of many of the body's essential hormones, chemical substances that help control different cells and organs. The hormones from the hypothalamus govern physiologic functions such as temperature regulation, thirst, hunger, sleep, mood, sex drive, and the release of other hormones within the body. This area of the brain houses **the pituitary gland** and other glands in the body.

The hypothalamus' primary function is homeostasis, which is to maintain the body's status quo system-wide. Hypothalamic hormones include **thyrotropin-releasing, gonadotropin-releasing, growth hormone-releasing, corticotrophin-releasing, somatostatin, and dopamine** hormones. These hormones release into the blood via the capillaries (small vessels) and travel to the pituitary gland**. Oxytocin and vasopressin** are also hypothalamic hormones.

Temperature Homeostasis (thermoregulation)

One of the most important examples of homeostasis is the regulation of body temperature. Not all animals can do this physiologically. Animals that maintain a fairly constant body temperature (birds and mammals) are called **endotherms**, while those that have a variable body temperature (all others) are called **ectotherms**. Endotherms normally maintain their body temperatures at around 35 - 40°C, so are sometimes called **warm-blooded animals**, but in fact ectothermic animals can also have very warm blood during the day by basking in the sun, or by extended muscle activity 9e.g. bumble bees, tuna). The difference between the two groups is thus that endothermic animals use **internal** corrective mechanisms, whilst ectotherms use **behavioural** mechanisms (e.g. lying in the sun when cold, moving into shade when hot). Such mechanisms can be **very** effective, particularly when coupled with **internal** mechanisms to ensure that the temperature of the blood going to vital organs (brain, heart) is kept constant. We use **both!**

In humans, body temperature is controlled by the **thermoregulatory centre** in the **hypothalamus**. It receives input from **two sets** of **thermoreceptors**: **receptors in the hypothalamus** itself monitor the temperature of the blood as it passes through the brain (the **core temperature**), and **receptors in the skin** (especially on the trunk) monitor the **external temperature**. **Both** sets of information are needed so that the body can make appropriate adjustments. The thermoregulatory centre sends impulses to several different effectors to adjust body temperature:



Our first response to encountering hotter or colder condition is **voluntary -** if too hot, we may decide to take some clothes off, or to move into the shade; if too cold, we put extra clothes on - or turn the heating up! It is only **when these responses are not enough** that the **thermoregulatory centre** is stimulated. This is part of the **autonomic nervous system**, so the various responses are all **involuntary**.

When we get **too hot**, the **heat loss centre** in the hypothalamus is stimulated; when we get **too cold**, it is the **heat conservation centre** of the hypothalamus which is stimulated.

Note that some of the responses to low temperature actually **generate heat** (**thermogenesis**), whilst others just **conserve heat**. Similarly some of the responses to cold **actively cool the body down,** while others just **reduce heat production** or **transfer heat to the surface**. The body thus has a range of responses available, depending on the internal and external temperatures.

The exact responses to high and low temperatures are described in the table below:

Effector	Response to low temperature	Response to high temperature
Smooth muscles in arterioles in the skin.	Muscles contract causing **vasoconstriction**. **Less heat** is carried from the core to the surface of the body, maintaining core temperature. Extremities can turn **blue** and feel cold and can even be damaged (**frostbite**).	Muscles relax causing **vasodilation**. **More heat** is carried from the core to the surface, where it is lost by **convection** and **radiation (conduction** is generally low, except when in water). Skin turns **red**.
Sweat glands	No sweat produced.	Glands secrete sweat onto surface of skin, where it **evaporates**. Since water has a high **latent heat of evaporation**, it takes heat from the body. **High humidity**, and **tight clothing made of man-made fibres** reduce the ability of the sweat to evaporate and so make us uncomfortable in hot weather. **Transpiration** from trees has a dramatic cooling effect on the surrounding air temperature.
Erector pili muscles in skin *(attached to skin hairs)*	**Muscles contract**, raising skin hairs and **trapping an insulating layer of still, warm air** next to the skin. Not very effective in humans, just causing "goosebumps".	**Muscles relax**, lowering the skin hairs and allowing air to circulate over the skin, encouraging convection and evaporation.
Skeletal muscles	**Shivering**: Muscles contract and relax repeatedly, generating heat by friction and from metabolic reactions (respiration is only 40% efficient: 60% of increased respiration thus generates heat).	No shivering.
Adrenal and thyroid glands	**Glands secrete adrenaline** and **thyroxine** respectively, which **increases the metabolic rate in different tissues**, especially the liver, so generating heat.	**Glands stop secreting** adrenaline and thyroxine.
Behaviour	Curling up, huddling, finding shelter, putting on more clothes.	Stretching out, finding shade, swimming, removing clothes.

The thermoregulatory centre normally maintains a set point of 37.5 ± 0.5 °C in most mammals. However the set point can be altered in special circumstances:

- **Fever**. Chemicals called **pyrogens** released by white blood cells raise the set point of the thermoregulatory centre causing the whole body temperature to increase by 2-3 °C. This helps to kill bacteria, inhibits viruses, and explains why you shiver even though you are hot.
- **Hibernation**. Some mammals release hormones that reduce their set point to around 5°C while they hibernate. This drastically reduces their metabolic rate and so conserves their food reserves e.g. hedgehogs.
- **Torpor**. Bats and hummingbirds reduce their set point every day while they are inactive. They have a **high surface area/volume ratio**, so this reduces heat loss.

Responding organ: Skin

1. **Name three primary layers of skin; What are the three layers of skin and functions?**

Answer: The three layers skin is the fat layer, the dermis and the epidermis**.** The top most layers are the epidermis, and the bottom layer is the fat layer, also called the subcutis.

- The fatty layer serves as insulation, protection and energy storage for the body. It consists of fat cells in a matrix of fibrous tissue.
- The dermis features mainly tissues called collagen, elastin and fibrillin. Nerve endings, sweat glands, hair follicles and blood vessels also live in the dermis.
- The epidermis is a thin layer composed mainly of keratinocytes. It protects the body from foreign objects, such as bacteria, viruses and other substances. In the epidermis lies cells called Langerhans, which play a part in protecting the body against infection. Melanocytes also inhabit the epidermis. These cells secrete melanin, a pigment that protects the body from UV rays and gives skin its color.

Functions of skin; The skin performs a variety of functions:

- Protection is provided against biological invasion, physical damage, and ultraviolet radiation.
- Sensation is provided by nerve endings for touch, pain, and heat.
- Thermoregulation is supported through the sweating and regulation of blood flow through the skin.
- Synthesis of vitamin D occurs in the skin.
- Blood within the skin can be shunted to other parts of the body when needed.
- Excretion of salts and small amounts of wastes (ammonia and urea) occurs with the production of sweat.

Explain what happens at skin during heat homeostasis.		• Too cold: hair stands up (goose bumps), vasoconstriction decreases blood supply at skin (less heat loss). • Too hot: sweat (evaporative cooling), vasodilation increases blood supply at skin (more heat loss).
What is the function of the skin during water homeostasis?		Water homeostasis: Insulates body against water loss.
What happens during osmoregulation?		Osmoregulation: sweat excretes salts and nitrogenous wastes (urea, uric acid, ammonia)
How does the skin protect against UV radiation?		protect against UV radiation by making melanin (absorbs UV)
What does the skin make upon exposure to sunlight?		makes vitamin D upon exposure to sunlight.
What happens during vasoconstriction in skin?		The skin system acts as a blood reservoir. Vasoconstriction in skin shunts blood to other organs.

<u>Circulatory system</u>

The circulatory system is a body-wide network of blood, blood vessels, and lymph. Powered by the heart, it is the body's distribution system to organs with oxygen, hormones and essential nutrients that helps it function properly.

Definition : The circulatory system is made up of vessels and muscles that help control the flow of blood around the body - this is called circulation. The main parts of the system are the arteries, capillaries, heart and veins. As the blood begins to circulate, it leaves the heart from the left ventricle and it passes to the aorta. The aorta is the largest artery in the body. The blood the leaves the aorta is full of oxygen. It is important for the cells in the brain and body to do their work. On its way back to the heart, blood travels through a system of veins, as it reaches the lungs, carbon dioxide is removed from the blood and replaced by the oxygen that we have inhaled through our lungs.

Functions:

Combined with the cardiovascular system, the circulatory system helps to fight off disease, helps the body maintain a normal body temperature, and provides the right chemical balance to provide the body's homeostasis, or state of balance among all its systems.

The circulatory system consists of four major components:

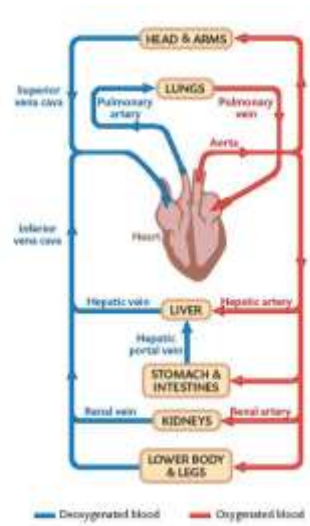
The Heart: About the size of two adult hands held together, the heart rests near the center of the chest. Thanks to consistent pumping, the heart keeps the circulatory system working at all times.

Arteries: Arteries carry oxygen-rich blood away from the heart and where it needs to go.

Veins: Veins carry deoxygenated blood to the lungs where they receive oxygen.

Blood: Blood is the transport media of nearly everything within the body. It transports hormones, nutrients, oxygen, antibodies, and other important things needed to keep the body healthy.

The body circulation systems



Oxygen enters the bloodstream through tiny membranes in the lungs that absorb oxygen as it is inhaled. As the body uses the oxygen and processes nutrients, it creates carbon dioxide, which your lungs expel as you exhale. A similar process occurs with the digestive system to transport nutrients, as well as hormones in the endocrine system. These hormones are taken from where they are produced to the organs they affect.

The circulatory system works thanks to constant pressure from the heart and valves throughout the body. This pressure ensures that veins carry blood to the heart and arteries transport it away from the heart. (Hint: to remember which one does which, remember that that "artery" and "away" both begin with the letter A.)

There are three different types of circulation that occur regularly in the body:

Pulmonary circulation: This part of the cycle carries oxygen-depleted blood away from the heart, to the lungs, and back to the heart.

Systemic circulation: This is the part that carries oxygenated blood away from the heart and to other parts of the body.

Coronary circulation: This type of circulation provides the heart with oxygenated blood so it can function properly.

Blood vessels: blood vessels are connected to the heart; these vessels are all around in our body. These vessels help us transporting blood to different organs and provide them with needed nutrients. There are **5 different types of blood vessels**: Aorta, Arteries, Capillary, Venule, Veins.

- **Arteries:** the arteries is directly connected to the heart, it is responsible for carrying oxygenated blood from the heart to the other organs of the body
- **Arterioles:** the arterioles are basically the arteries but further away from the heart, and as further they are from the heart the smaller they get. Therefore these small arteries are called arterioles. They share many similar features with the arteries, like thick walls for their size, strong and high percentage of smooth muscle.
- **Capillaries:** The capillaries are extremely small blood vessel; they are so small that red blood can only travel through them in single file. The capillaries are located within the tissue of the body, it transports blood from arteries to vein.
- **Venules:** blood vessels that carry deoxygenated blood from the capillaries back to the vein
- **Veins:** the veins are elastic blood vessels that transport blood from various regions back to the heart.

<u>The Blood:</u>

Blood is a fluid consisting of plasma, red blood cells, white blood cells, and platelets that is circulated by the heart through the vertebrate vascular system, carrying oxygen and nutrients to and waste materials away from all body tissues. Average adults have about 5 dm^3 of blood in our body.

	Main Function	**Their structure & characteristics**
Plasma	Plasma carries cells, gases, and dissolved nutrients around the whole body.	- It's thin liquid helps their function by making cells, gases, and dissolved nutrients flow through tubes easily
Red blood cells (Erythrocytes)	Red blood cells transport oxygen and carbon dioxide between lungs and tissues so that our body can use the it to function.	- Its surfaces are covered by iron containing: hemoglobin (picks up and lets go of oxygen) and pigment.- Red blood cells don't have nucleus and that creates more space for hemoglobin- Red blood cells are small and flexible, so they fit into capillaries more easily
White blood cells (lymphocytes)	White blood cells (lymphocytes) Produce antibodies that help defense against diseases and viruses.	- White blood cells have large nucleus which can produce lots of copies of genes to make antibodies
White blood cells (Phagocytes)	White blood cells eat invading micro-organisms (e.g. viruses, bacteria etc) by the process off phagocytosis to protect the cell.	- White blood cells are flexible so they can grow around invaders- White blood cells have cytoplasm that have enzymes to digest microorganisms/invaders- White blood cells detect microorganisms with their sensitive cell surface membrane
Platelets	Platelets are cell fragments which are involved in blood clotting. Blood clotting is a process by which the blood coagulates to form solid masses, or clots to form 'plugs' in blood vessel opening.	- Platelets are able to release blood clotting enzymes

Heart diseases & Prevention

Heart: Components; Function; Illustration on how heart pumps blood and discuss; Illustration and discussion on heart disease and stroke can be developed; Preventive measures to avoid heart disease in terms of life and food styles.

Heart: The heart is the key organ in the circulatory system. As a hollow, muscular pump, its main function is to propel blood throughout the body. It usually beats from 60 to 100 times per minute, but can go much faster when necessary. It beats about 100,000 times a day, more than 30 million times per year, and about 2.5 billion times in a 70-year lifetime.

What the Heart and Circulatory System Do

The circulatory system works closely with other systems in our bodies. It supplies oxygen and nutrients to our bodies by working with the respiratory system. At the same time, the circulatory system helps carry waste and carbon dioxide out of the body.

Hormones — produced by the endocrine system — are also transported through the blood in the circulatory system. As the body's chemical messengers, hormones transfer information and instructions from one set of cells to another. For example, one of the hormones produced by the heart helps control the kidneys' release of salt from the body.

What causes a heart attack?

Coronary heart disease (CHD) is the leading cause of heart attacks. CHD is a condition in which coronary arteries (the major blood vessels that supply blood to the heart) get clogged up with deposits of cholesterol. These deposits are called plaques.

Before a heart attack, one of the plaques ruptures (bursts), causing a blood clot to develop at the site of the rupture. The clot may then block the supply of blood running through the coronary artery, triggering a heart attack.

Risk of developing CHD is increased by: Smoking, a high-fat diet, diabetes, high cholesterol, high blood pressure, being overweight or obese

Recovery

The time it takes to recover from a heart attack will depend on the amount of damage to the heart muscle. Some people are well enough to return to work after two weeks. Other people may take several months to recover. The recovery process aims to:

- reduce your risk of another heart attack through a combination of lifestyle changes, such as eating a healthy diet, and medications, such as statins (which help lower blood cholesterol levels)
- gradually restore your physical fitness so you can resume normal activities (known as cardiac rehabilitation)

Who is affected

Heart attacks are one of the most common reasons why a person requires emergency medical treatment. Men are more likely to have a heart attack than women. A British survey estimates that around 50,000 men and 32,000 women have a heart attack each year in England. Most heart attacks occur in people aged over 45.

Complications

Complications of heart attacks can be serious and possibly life-threatening. These include:

- arrhythmia – this is an abnormal heartbeat, where the heart begins beating faster and faster, then stops beating (cardiac arrest)
- cardiogenic shock – where the heart's muscles are severely damaged and can no longer contract properly to supply enough blood to maintain many body functions
- heart rupture – where the heart's muscles, walls or valves split apart (rupture)

These complications can occur quickly after a heart attack and are a leading cause of death. Many people will die suddenly from a complication of a heart attack before reaching hospital.

Outlook

The outlook for people who have had a heart attack can be highly variable, depending on:

- their age – the older you are, the more likely you are to experience serious complications
- the severity of the heart attack – specifically, how much of the heart's muscle has been damaged during the attack
- how long it took before a person received treatment – the longer the delay, the worse the outlook tends to be

In general, around one third of people who have a heart attack die as a result. These deaths often occur before a person reaches hospital or, alternatively, within the first 28 days after the heart attack. If a person survives for 28 days after having a heart attack, their outlook improves dramatically and most people will go on to live for many years.

Reducing risk of a heart attack

There are five main steps that can reduce risk of having a heart attack (or having another heart attack):

- Quit smoking
- Lose weight if overweight or obese
- Do regular exercise – adults should do at least 150 minutes (2 hours and 30 minutes) of moderate-intensity aerobic activity each week, unless advised otherwise by the doctor in charge of your care
- eat a low-fat, high-fibre diet, including whole grains and plenty of fresh fruit and vegetables (at least five portions a day)
- Reduce alcohol consumption

Respiratory System: (Function and Diseases)

The human respiratory system is a series of organs responsible for taking in oxygen and expelling carbon dioxide. The primary organs of the respiratory system are lungs, which carry out this exchange of gases as we breathe.

Red blood cells collect the oxygen from the lungs and carry it to the parts of the body where it is needed. During the process, the red blood cells collect the carbon dioxide and transport it back to the lungs, where it leaves the body when we exhale.

The human body needs oxygen to sustain itself. A decrease in oxygen is known as hypoxia and a complete lack of oxygen is known as anoxia. These conditions can be fatal; after about four minutes without oxygen, brain cells begin dying, which can lead to brain damage and ultimately death.

How system works:

Blood passes through the capillaries. The pulmonary artery carries blood containing carbon dioxide to the air sacs, where the gas moves from the blood to the air, according to the NHLBI. Oxygenated blood goes to the heart through the pulmonary vein, and the heart pumps it throughout the body.

Diseases of the respiratory system

Diseases and conditions of the respiratory system fall into two categories: Viruses such as influenza, bacterial pneumonia and the new enterovirus respiratory virus that has been diagnosed in children; and chronic diseases, such as asthma and chronic obstructive pulmonary disease (COPD).

<u>Excretory system & Its diseases:</u>

Excretion means the removal of waste products from cells. There are five important excretory organs in humans:

Skin: excretes sweat, containing water, ions and urea
Lung: excrete carbon dioxide and water
Liver: excretes bile, containing bile pigments, cholesterol and mineral ions
Gut: excretes mucosa cells, water and bile in faeces. (The bulk of faeces comprises plant fibre and bacterial cells, which have never been absorbed into the body, so are not excreted but egested.)
Kidney: excrete urine, containing urea, mineral ions, water and other “foreign” chemicals from the blood.

This section is mainly concerned with the excretion of nitrogenous waste as urea. The body cannot store protein in the way it can store carbohydrate and fat, so it cannot keep excess amino acids. The “carbon skeleton” of the amino acids can be used in respiration, but the nitrogenous amino group must be excreted.

Diseases

There are a couple of diseases that affect the excretory system that have really bad outcomes.

Kidney Stones- This disease is when uric acid form crystals that bundle up in the kidneys, this prevents the kidneys to function correctly and causes the host pain. The 2 cures are to let the stones "pass" through or by surgery.

Urethritis- This disease is an inflammation of the urethra caused by bacterial/viral infection. Treatments of Urethritis are anti-viral / pain mediction.

Pyelonephritis- This is a type of urinary tract infection that travels from the urethra to the kidneys. There are only medication that can help calm down the infection.

As the **excretory system** helps to remove liquid waste from the body. Any failure of this **system** causes the waste products to circulate throughout the body, creating complications for the whole body.

Digestive System

The human digestive system consists of the gastrointestinal tract plus the accessory organs of digestion (the tongue, salivary glands, pancreas, liver, and gallbladder). In this system, the process of digestion has many stages, the first of which starts in the mouth (oral cavity). Digestion involves the breakdown of food into smaller and smaller components, until they can be absorbed and assimilated into the body. The secretion of saliva helps to produce a bolus which can be swallowed to pass down the esophagus and into the stomach.

Component:
There are several organs and other components involved in the digestion of food. The organs known as the **accessory digestive glands** are the liver, gall bladder and pancreas. Other components include the mouth, salivary glands, tongue, teeth and epiglottis.
The largest structure of the digestive system is the gastrointestinal tract (GI tract). This starts at the mouth and ends at the anus, covering a distance of about nine (9) metres.

Mouth: The mouth is the first processes of digestion, consisting of salivary glands, teeth and the tongue. The mouth consists of two regions, the vestibule and the oral cavity proper. The vestibule is the area between the teeth, lips and cheeks, the rest are oral cavity.

Salivary gland: The 2^{nd} step is in the salivary gland which contain saliva and the saliva helps in moisten and soften food into the formation of a bolus. The bolus is further helped by the lubrication provided by the saliva in its passage from the mouth into the esophagus.

Esophagus: The esophagus commonly known as the gullet, is an organ which consists of a muscular tube through which food passes from the pharynx to the stomach. The esophagus has a mucous membrane of epithelium which has a protective function as well as providing a smooth surface for the passage of food.

Stomach : The stomach is a major organ of the gastrointestinal tract and digestive system. It is a consistently J-shaped organ joined to the esophagus at its upper end and to the duodenum at its lower end. Gastric acid (informally gastric juice), produced in the stomach plays a vital role in the digestive process, and mainly contains hydrochloric acid and sodium chloride. A peptide hormone, gastrin, produced by G cells in the gastric glands, stimulates the production of gastric juice which activates the digestive enzymes.

Liver: The liver is the second largest organ (after the skin) and is an accessory digestive gland which plays a role in the body's metabolism. The liver has many functions some of which are important to digestion. The liver can detoxify various metabolites; synthesise proteins and produce biochemicals needed for digestion. It regulates the storage of glycogen which it can form from glucose (glycogenesis).

Pancreas: The pancreas is a major organ functioning as an accessory digestive gland in the digestive system. It is both an endocrine gland and an exocrine gland. The endocrine part secretes insulin when the blood sugar becomes high; insulin moves glucose from the blood into the muscles and other tissues for use as energy.

Small intestine: The lower gastrointestinal tract (GI), includes the small intestine and all of the large intestine.[30] The intestine is also called the bowel or the gut. The lower GI starts at the pyloric sphincter of the stomach and finishes at the anus. The small intestine is subdivided into the duodenum, the jejunum and the ileum. The cecum marks the division between the small and large intestine. The large intestine includes the rectum and anal canal. Food starts to arrive in the small intestine one hour after it is eaten, and after two hours the stomach has emptied. Until this time the food is termed a bolus. It then becomes the partially digested semi-liquid termed chyme.

Large intestine

In the large intestine,[2] the passage of the digesting food in the colon is a lot slower, taking from 12 to 50 hours until it is removed by defecation. The colon mainly serves as a site for the fermentation of digestible matter by the gut flora.

Role of Bile Acids In Digestion

The common **bile** duct originates in the **liver** and the **gallbladder** and produces another important **digestive** juice called **bile**. The **pancreatic** juices and **bile** that are released into the duodenum, help the body to digest fats, carbohydrates, and proteins.

Bile is a complex fluid containing water, electrolytes and a battery of organic molecules including bile acids, cholesterol, phospholipids and bilirubin that flows through the biliary tract into the small intestine.

Secretion of Bile: Initially, hepatocytes secrete bile into canaliculi, from which it flows into bile ducts. This hepatic bile contains large quantities of bile acids, cholesterol and other organic molecules. Secretion into bile is a major route for eliminating cholesterol. Free cholesterol is virtually insoluble in aqueous solutions, but in bile, it is made soluble by bile acids and lipids like lecithin.

Gallstones, most of which are composed predominantly of cholesterol, result from processes that allow cholesterol to precipitate from solution in bile.

Digestive diseases

The digestive system made up of the gastrointestinal tract (GI), liver, pancreas, and gallbladder helps the body digest food. Digestion is important for breaking down food into nutrients, which your body uses for energy, growth, and cell repair.

Some digestive diseases and conditions are acute, lasting only a short time, while others are chronic, or long-lasting.
Other digestive diseases include:

- Gallstones, cholecystitis, and cholangitis
- Rectal problems, such as anal fissure, hemorrhoids, proctitis, and rectal prolapse
- Esophagus problems, such as stricture (narrowing) and achalasia
- Liver problems, such as hepatitis B or hepatitis C, cirrhosis, liver failure, and autoimmune and alcoholic hepatitis
- Pancreatitis and pancreatic pseudocyst
- Intestinal problems, such as polyps and cancer, infections, celiac disease, Crohn disease, ulcerative colitis, diverticulitis, malabsorption, short bowel syndrome, and intestinal ischemia
- Gastroesophageal reflux disease (GERD), peptic ulcer disease, and hiatal hernia

Tests for digestive problems can include colonoscopy, upper GI endoscopy, capsule endoscopy, endoscopic retrograde cholangiopancreatography (ERCP), and endoscopic ultrasound.

Many surgical procedures are performed on the digestive tract. These include procedures done using endoscopy, laparoscopy, and open surgery. Organ transplants can be performed on the liver, pancreas, and small intestine.

What is the main functions of liver & Kidney?

The **kidneys** are two bean-shaped organs that extract waste from blood, balance body fluids, form urine, and aid in other **important functions** of the body. They reside against the back muscles in the upper abdominal cavity. ... Urea is synthesized in the **liver** and transported through the blood to the **kidneys** for removal.

----------------------------------END--------------------------------------