

Organ Systems in Animals

Learning Objectives

After completing this lesson, student will be able to:

- define the terms digestion, excretion and reproduction.
- understand the various parts of the alimentary canal and the process of digestion.
- understand the role of enzymes in the process of digestion.
- know the organs involved in the process of excretion.
- understand the role of skin in excretion.
- understand the parts and functions of excretory system.
- learn the functions of male and female human reproductive system.



Introduction

Living organisms are evolved from the simplest form to complex level of organization. Cells are the basic fundamental units of an organism. These are grouped to form tissues, the tissues into organs and the organs form the organ systems forming an entire organism. The different organs and organ systems of an organism function by depending on one another with harmonious coordination. When we ride a bicycle, our muscular system and skeletal system work together to move our arms for steering and legs for pedalling. Our nervous system directs our arms and legs to work. Simultaneously, respiratory, digestive and circulatory systems work to provide energy to the muscles. All the systems work together

in coordination to maintain the body in a homeostatic condition of an organism.

Organ and organ systems have appeared first in the Phylum platyhelminthes and continues till mammals. Similar groups of cells form tissues like muscle tissue, nervous tissue, etc. Tissues are organised to form organs like heart, brain, etc. Two or more organs together form organ systems and perform common functions like digestion, circulation, nerve impulse transmission in co-ordination via digestive system, circulatory system, nervous system respectively. Division of labour is found among the various organ systems.

In this chapter we shall learn about the structure and functions of various organ systems like digestive system, excretory system and reproductive system in human beings.

Table 20.1 Organ Systems in Animals

Organ Systems	Organs	Functions
Integumentary system	Skin and skin glands	Protection, Excretion, etc.
Skeletal system	Skull, Vertebral column, Sternum, Girdles and Limbs	Give support, shape and form to the body.
Muscular system	Muscle fibres	Contraction and relaxation resulting movement.
Nervous system	Brain, spinal cord and nerves.	Conduction of nerve impulse.
Circulatory system	Heart, blood and blood vessels	Transportation of respiratory gases, nutritive substances and waste products.
Respiratory system	Respiratory tract and Lungs	Breathing
Digestive system	Digestive tract and digestive glands	Digestion, Absorption, Egestion
Excretory system	Kidneys, ureters, urinary bladder and urethra.	Elimination of nitrogenous waste products.
Reproductive system	Testes and ovary	Gamete formation and development of secondary sexual characters.
Sensory system	Eyes, nose, ears, tongue and skin	Sight, smell, hearing, taste and touch.
Endocrine system	Pituitary, Thyroid, Parathyroid, Adrenals, Pancreas, Pineal body, Thymus, Reproductive glands, etc.	Co-ordinates the functions of all organ systems.

20.1 Human Digestive System

The food we eat contain not only simple substances like vitamins and minerals but also complex substances such as carbohydrates, proteins and fats. The body cannot use these complex substances unless they are converted into simple substances. The five stages of nutrition process include ingestion, digestion, absorption, assimilation and egestion.

The process of nutrition begins with intake of food, called **ingestion**. The breakdown of large complex insoluble food molecules into small, simpler soluble and diffusible particles by the action of digestive enzymes is called **digestion**. Parts of the body concerned with the digestion of food form the **digestive system**.

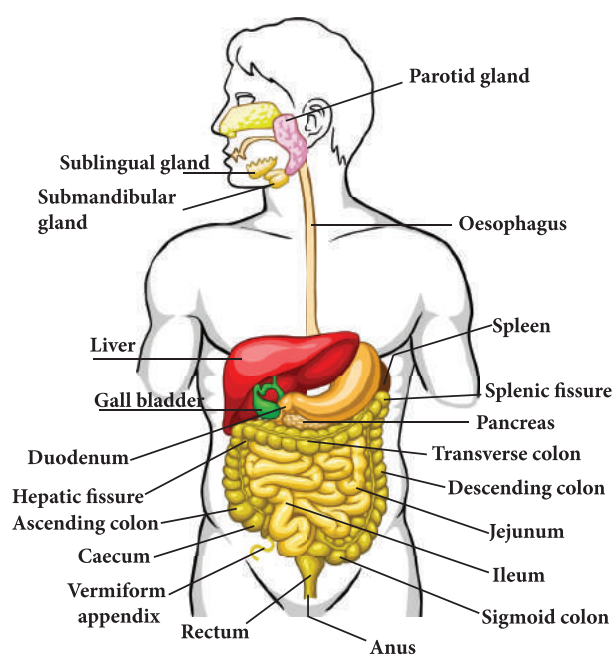


Figure 20.1 Parts of human digestive system

The digestive system consists of two sets of organs. They are as follows:

Alimentary canal (digestive tract/gastro-intestinal tract): It is a passage starting from the mouth and ending with the anus.

Digestive glands: Glands associated with the alimentary canal are the salivary glands, gastric glands, pancreas, liver and intestinal glands.

20.1.1 Structure of the Alimentary Canal

Alimentary canal is a muscular coiled, tubular structure. It consists of mouth, buccal cavity, pharynx, oesophagus, stomach, small intestine (consisting of duodenum, jejunum and ileum), large intestine (consisting of caecum, colon and rectum) and anus.

Mouth: The mouth leads into the buccal cavity. It is bound by two soft, movable upper and lower lips. The **buccal cavity** is a large space bound above by the palate (which separates the wind pipe and food tube), below by the throat and on the sides by the jaws. The jaws bear teeth.

Teeth: Teeth are hard structures meant for holding, cutting, grinding and crushing the food. In human beings two sets of teeth (**Diphyodont**) are developed in their life time. The first appearing set of 20 teeth called temporary or milk teeth are replaced by the second set of thirty two permanent teeth, sixteen in each jaw. Each tooth has a root fitted in the gum (**Thecodont**). Permanent teeth are of four types (**Heterodont**), according to their structure and function namely **incisors, canines, premolars** and **molars**.

Table 20.2 Types of teeth and their functions

Types of teeth	Number of teeth	Functions
Incisors	8	Cutting and biting
Canines	4	Tearing and piercing
Premolars	8	Crushing and grinding
Molars	12	Crushing, grinding and mastication

Dental formula represents the number of different type of teeth present in each half of a jaw (upper and lower jaw). The types of teeth are denoted as incisors (i), canine (c), premolars (pm) and molars (m). The dental formula is presented as:

For Milk teeth in each half of upper and lower jaw:

$$\frac{2, 1, 2}{2, 1, 2} = 10 \times 2 = 20$$

For Permanent teeth in each half of upper and lower jaw:

$$\frac{2, 1, 2, 3}{2, 1, 2, 3} = 16 \times 2 = 32$$

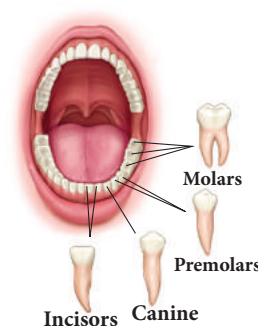


Figure 20.2 Different kinds of teeth

Activity 1

Look at the pictures given below and answer the questions that follow:



1. Are the teeth of animals similar to ours?
2. How is the shape of their teeth related to their food habit?

Salivary glands: Three pairs of salivary glands are present in the mouth cavity. They are: parotid glands, sublingual glands and submaxillary or submandibular glands

- a. **Parotid glands** are the largest salivary glands, which lie in the cheeks in front of the ears (in Greek Par - near ; otid - ear).



- b. **Sublingual glands** are the smallest glands and lie beneath the tongue.
- c. **Submaxillary or Submandibular glands** lie at the angles of the lower jaw.

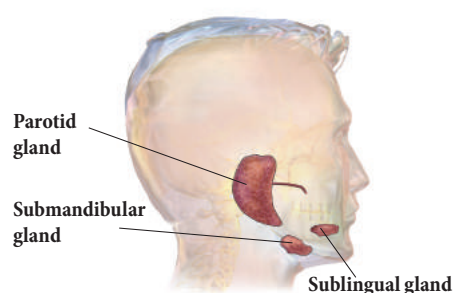


Figure 20.3 Salivary glands

The salivary glands secrete a viscous fluid called saliva, approximately 1.5 liters per day. It digests starch by the action of the enzyme **ptyalin** (amylase) in the saliva which converts starch (polysaccharide) into maltose (disaccharide). Saliva also contains an antibacterial enzyme called **lysozyme**.

Tongue: The tongue is a muscular, sensory organ which helps in mixing the food with the saliva. The taste buds on the tongue help to recognize the taste of food. The masticated food in the buccal cavity becomes a bolus which is rolled by the tongue and passed through pharynx into the oesophagus by swallowing. During swallowing, the epiglottis (a muscular flap-like structure at the tip of the glottis, beginning of trachea) closes and prevents the food from entering into trachea (wind pipe).

Pharynx: The pharynx is a membrane-lined cavity behind the nose and mouth, connecting them to the oesophagus. It serves as a pathway for the movement of food from mouth to oesophagus.

Oesophagus: Oesophagus or the food pipe is a muscular-membranous canal about 22 cm in length. It conducts food from pharynx to the stomach by peristalsis (wave-like movement) produced by the rhythmic contraction and relaxation of the muscular walls of alimentary canal.

Stomach: The stomach is a wide J-shaped muscular organ located between oesophagus and the small intestine. The gastric glands present in the inner walls of the stomach secrete gastric juice. The gastric juice is colourless, highly acidic, containing mucus, hydrochloric acid and enzymes rennin (in infants) and pepsin.

Inactive pepsinogen is converted to active **pepsin** which acts on the proteins in the ingested food. **Hydrochloric acid** kills the bacteria swallowed along with food and makes the medium acidic while the mucus protects the wall of the stomach. The action of the gastric juice and churning of food in the stomach convert the bolus into a semi-digested food called **chyme**. The chyme moves to the intestine slowly through the pylorus.

More to Know

- ❑ **Rennin:** Causes curdling of milk protein casein and increases digestion of proteins.
- ❑ **Renin:** Converts angiotensinogen to angiotensin and regulates the absorption of water and Na^+ from glomerular filtrate.

Small intestine: The small intestine is the longest part of the alimentary canal, which is a long coiled tube measuring about 5 – 7 m. It comprises three parts- duodenum, jejunum and ileum.

- a. **Duodenum** is C-shaped and receives the bile duct (from liver) and pancreatic duct (from pancreas).
- b. **Jejunum** is the middle part of the small intestine. It is a short region of the small intestine. The secretion of the small intestine is intestinal juice which contains the enzymes like **sucrase**, **maltase**, **lactase** and **lipase**.
- c. **Ileum** forms the lower part of the small intestine and opens into the large intestine. Ileum is the longest part of the small

intestine. It contains minute finger like projections called **villi** (one millimeter in length) where absorption of food takes place. They are approximately 4 million in number. Internally, each villus contains fine blood capillaries and lacteal tubes,

The small intestine serves both for digestion and absorption. It receives the bile from liver and the pancreatic juice from pancreas in the duodenum. The intestinal glands secrete the intestinal juices.



William Beaumont
(1785-1853)

William Beaumont was a surgeon who was known as the 'Father of Gastric Physiology'. Based on his observations he concluded that the stomach's strong hydrochloric acid played a key role in digestion.

Liver: It is the largest digestive gland of the body which is reddish brown in colour. It is divided into two main lobes, right and left lobes. The right lobe is larger than the left lobe. On the under surface of the liver, gall bladder is present. The liver cells secrete **bile** which is temporarily stored in the gall bladder. Bile is released into small intestine when food enters in it. It has **bile salts** (sodium glycolate and sodium tauraglycolate) and **bile pigments** (bilirubin and biliviridin). Bile salts help in the digestion of fats by bringing about their **emulsification** (conversion of large fat droplets into small ones).

Functions of Liver

- Controls blood sugar and amino acid levels.
- Synthesizes foetal red blood cells.
- Produces fibrinogen and prothrombin, used for clotting of blood.
- Destroys red blood cells.
- Stores iron, copper, vitamins A and D.

- Produces heparin (an anticoagulant).
- Excretes toxic and metallic poisons.
- Detoxifies substances including drugs and alcohol.

Pancreas: It is a lobed, leaf shaped gland situated between the stomach and duodenum. **Pancreas** acts both as an **exocrine gland** and as an **endocrine gland**. The exocrine part of the pancreatic gland secretes pancreatic juice which contains three enzymes- lipase, trypsin and amylase which acts on fats, proteins and starch respectively. The gland's upper surface bears the **islets of Langerhans** which have endocrine cells and secrete hormones in which **α (alpha) cells** secrete **glucagon** and **β (beta) cells** secrete **insulin**.

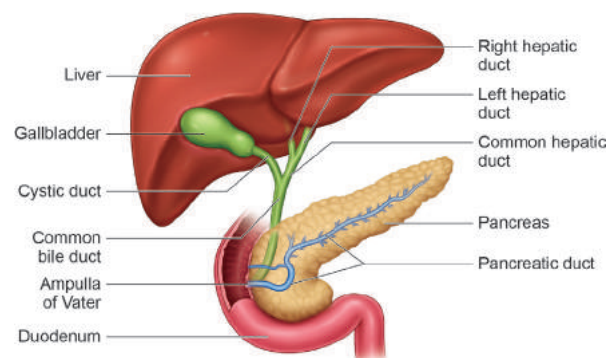


Figure 20.4 Bile duct and Pancreatic duct opening into duodenum

The intestinal glands secrete intestinal juice called **succus entericus** which contains enzymes like maltase, lactase, sucrase and lipase which act in an alkaline medium. From the duodenum the food is slowly moved down to ileum, where the digested food gets absorbed

a. Absorption of food: Absorption is the process by which nutrients obtained after digestion are absorbed by villi and circulated throughout the body by blood and lymph and supplied to all body cells according to their requirements.

b. Assimilation of food: Assimilation means the incorporation of the absorbed food materials into the tissue cells as their internal and homogenous component. The final products of fat digestion (fatty acids and glycerol) are again converted into fats and

excess fats are stored in adipose tissue. The excess sugars are converted into a complex polysaccharide, glycogen in the liver. The amino acids are utilized to synthesize different proteins required for the body.

DO YOU KNOW? The small intestine is about 5 m long and is the longest part of the digestive system. The large intestine is a thicker tube, but is about 1.5 m long.

Large intestine: The unabsorbed and undigested food is passed into the large intestine. It extends from the ileum to the anus. It is about 1.5 meters in length. It has three parts- **caecum**, **colon** and **rectum**.

The caecum is a small blind pouch like structure situated at the junction of the small and large intestine. From its blind end a finger – like structure called **vermiform appendix** arises. It is a **vestigial (functionless) organ** in human beings.

The colon is much broader than ileum. It passes up the abdomen on the right (**ascending colon**), crosses to the left just below the stomach (**transverse colon**) and down on the left side (**descending colon**). The rectum is the last part which opens into the anus. It is kept closed by a ring of muscles called anal sphincter which opens when passing stools.

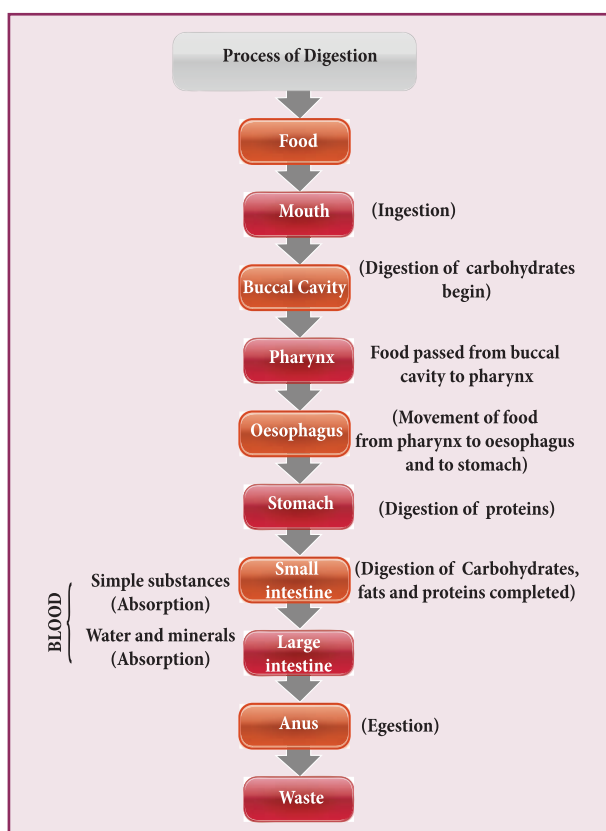
The undigested or unassimilated portion of the ingested food material is thrown out from the body through the anal aperture as faecal matter. This is known as **egestion** or **defaecation**.

Activity 2

Construct a model of the human digestive system using simple materials like funnel, pipe, cellotape and clean bag. Label its parts and write which parts help in the various steps of digestion.

Table 20.3 Chart showing the Digestive Enzymes

Digestive glands	Enzymes	Substrate (nutrient)	Products of digestion
Salivary glands	Ptyalin (Salivary amylase)	Starch	Maltose
Gastric glands	Pepsin	Proteins	Peptones
	Rennin (in infants)	Milk protein or caseinogen	Curdles milk to produce casein protein
Pancreas	Pancreatic amylase	Starch	Maltose
	Trypsin	Proteins and peptones	Peptides and amino acids
	Chymotrypsin	Protein	Proteoses, Peptones, Polypeptide, tri and dipeptides
	Pancreatic lipase	Emulsified fats	Fatty acids and Glycerol
Intestinal glands	Maltase	Maltose	Glucose and Glucose
	Lactase	Lactose	Glucose and Galactose
	Sucrase	Sucrose	Glucose and Fructose
	Lipase	Fats	Fatty acids and Glycerol



20.2 Human Excretory System

Metabolic activities continuously take place in living cells. All metabolic products produced by the biochemical reactions are not utilized by the body because certain nitrogenous toxic waste substances are also produced. They are called excretory products. In human beings **urea** is the major excretory product. The tissues and organs associated with the removal of waste products constitute the excretory system.

The human excretory system consists of a pair of kidney, which produce the urine, a pair of ureters which conduct the urine from kidneys to the urinary bladder, where urine is stored temporarily and urethra through which the urine is voided by bladder contractions.

If the waste products are accumulated and not eliminated, they become harmful and poisonous to the body. Hence, excretion plays an important role in maintaining the homeostatic condition of the body.

Some of the excretory organs other than kidneys are **skin** (removes small amounts of

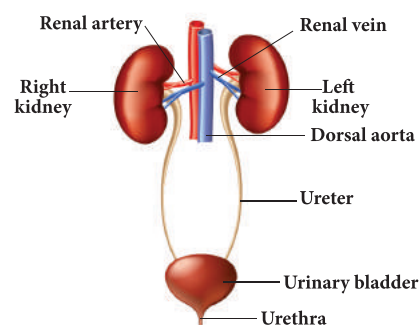


Figure 20.5 Excretory system

water, urea and salts in the form of sweat) and **lungs** (eliminate carbon-dioxide and water vapour through exhaling).

20.2.1 Skin

Skin is the outer most covering of the body. It stretches all over the body in the form of a layer. It accounts for 15% of an adult's human body weight. There are many structures and glands derived from the skin. It eliminates metabolic wastes through perspiration.

The human body functions normally at a temperature of about 37 °C. When it gets hot sweat glands start secreting sweat, which contains water with small amounts of other chemicals like ammonia, urea, lactic acid and salts (mainly sodium chloride). The sweat passes through the pores in the skin and gets evaporated.

20.2.2 Kidneys

Kidneys are bean-shaped organs reddish brown in colour. The kidneys lie on either side of the vertebral column in the abdominal cavity attached to the dorsal body wall. The right kidney is placed lower than the left kidney as the liver takes up much space on the right side. Each kidney is about 11 cm long, 5 cm wide and 3 cm thick. The kidney is covered by a layer of fibrous connective tissue, the renal capsules, adipose capsule and a fibrous membrane.

Internally the kidney consists of an outer dark region, the **cortex** and an inner lighter region, the **medulla**. Both of these regions contain **uriniferous tubules** or **nephrons**. The

medulla consists of multitubular conical masses called the medullary pyramids or renal pyramids whose bases are adjacent to cortex. On the inner concave side of each kidney, a notch called **hilum** is present through which blood vessels and nerves enter in and the urine leaves out.

Ureters: Ureters are thin muscular tubes emerging out from the hilum. Urine enters the ureter from the renal pelvis and is conducted along the ureter by peristaltic movements of its walls. The ureters carry urine from kidney to urinary bladder.

Urinary bladder: Urinary bladder is a sac-like structure, which lies in the pelvic cavity of the abdomen. It stores urine temporarily.

Urethra: Urethra is a membranous tube, which conducts urine to the exterior. The urethral sphincters keep the urethra closed and opens only at the time of **micturition** (urination).

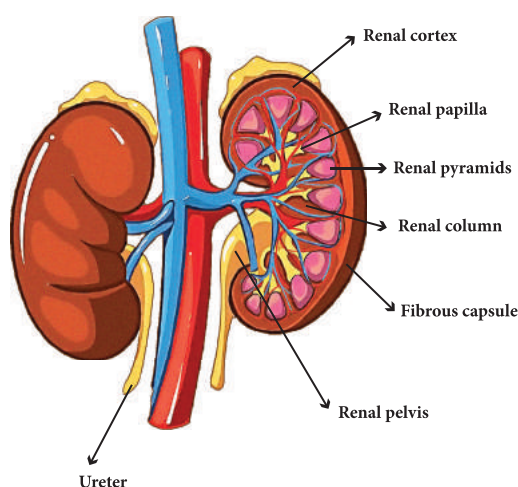


Figure 20.6 Longitudinal section of human kidney

Functions of kidney

1. Maintains the fluid and electrolytes balance in our body.
2. Regulates acid-base balance of blood.
3. Maintains the osmotic pressure in blood and tissues.
4. Helps to retain the important plasma constituents like glucose and amino acids.



20.2.3 Structure of Nephron

Each kidney consists of more than one million nephrons. **Nephrons or uriniferous tubules** are structural and functional units of the kidneys. Each nephron consists of **Renal corpuscle** or **Malphigian corpuscle** and **renal tubule**. The renal corpuscle consists of a cup-shaped structure called **Bowman's capsule** containing a bunch of capillaries called **glomerulus**. Blood enters the glomerular capillaries through **afferent** arterioles and leaves out through **efferent** arterioles. The Bowman's capsule continues as the renal tubule which consists of three regions **proximal convoluted tubule**, U-shaped hair pin loop, **the loop of Henle** and the **distal convoluted tubule**. The distal convoluted tubule opens into the **collecting tubule**. The nitrogenous wastes are drained into renal pelvis which leads to ureters and stored in the urinary bladder. Urine is expelled out through the urethra.

20.2.4 Mechanism of Urine Formation

The process of urine formation includes the following three stages.

- Glomerular filtration
- Tubular reabsorption
- Tubular secretion

Glomerular filtration: Urine formation begins with the filtration of blood through epithelial walls of the glomerulus and Bowman's capsule. The filtrate is called as the glomerular filtrate. Both essential and non-essential substances present in the blood are filtered.

Tubular reabsorption: The filtrate in the proximal tubule consists of essential substances such as glucose, amino acids, vitamins, sodium, potassium, bicarbonates and water that are reabsorbed into the blood by a process of **selective reabsorption**.

Tubular secretion: Substances such as H^+ or K^+ ions are secreted into the tubule. This tubular filtrate is finally known as urine, which is **hypertonic** in man. Finally the urine passes

into collecting ducts to the pelvis and through the ureter into the urinary bladder. When the urinary bladder is full the urine is expelled out through the urethra. This process is called **micturition**. A healthy person excretes one to two litres of urine per day.

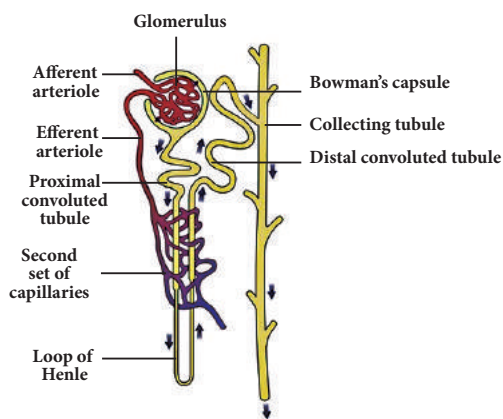
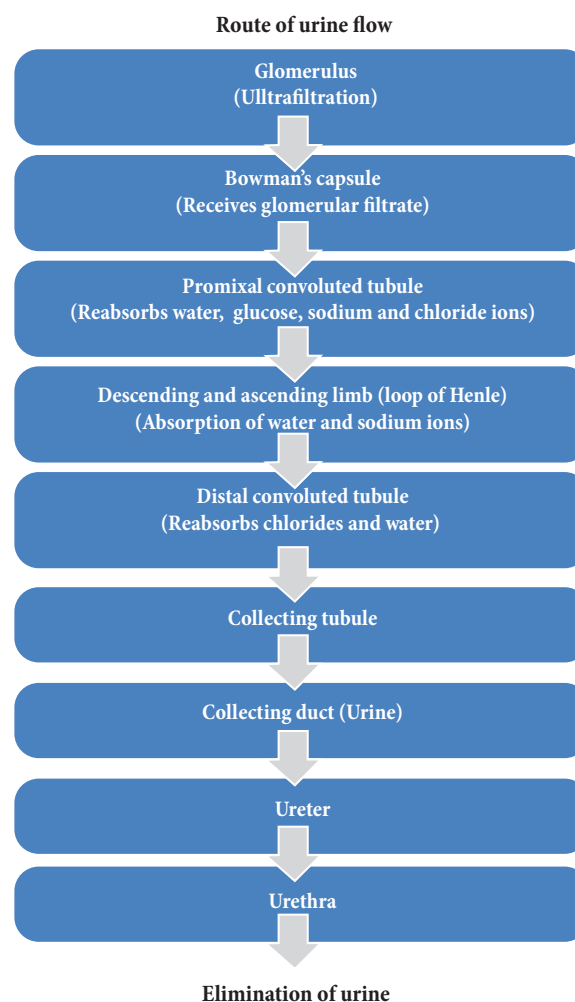


Figure 20.7 Structure of Nephron

DO YOU KNOW? Two healthy kidneys contain a total of about 2 million nephrons, which filter about 1700-1800 litres of blood. The kidneys reabsorb and redistribute 99% of the blood volume and only 1% of the blood filtered becomes urine.

Dialysis or Artificial kidney : When kidneys lose their filtering efficiency, excessive amount of fluid and toxic waste accumulate in the body. This condition is known as **kidney (renal) failure**. For this, an artificial kidney is used to filter the blood of the patient. The patient is said to be put on dialysis and the process of purifying blood by an artificial kidney is called **haemodialysis**. When renal failure cannot be treated by drug or dialysis, the patients are advised for kidney transplantation.

DO YOU KNOW? **First kidney transplant**
In 1954, Joseph E. Murray and his colleagues at Peter Bent Brigham Hospital in Boston, USA performed first successful kidney transplant between Ronald and Richard Herrick who were identical twins. The recipient Richard Herrick died after 8 years of transplantation



20.3 Human Reproductive System

The capacity to reproduce is one of the most important characteristics of living beings. There is a distinct sexual dimorphism in human beings i.e., males are visibly different from females in physical build up, external genital organs and secondary sexual characters.

The reproductive systems of male and female consist of many organs which are distinguished as primary and secondary sex organs. The primary sex organs are gonads, which produce gametes (sex cells) and secrete sex hormones. The secondary sex organs include the genital ducts and glands which help in the transportation of gametes and enable the reproductive process.

The reproductive organs become functional after attaining sexual maturity. In males, sexual



maturity is attained at the age of 13-14 years. In females, it is attained at the age of 11-13 years. This age is known as the age of puberty. During sexual maturity, hormonal changes take place in males and females and secondary sexual characters are developed under the influence of these hormones.

20.3.1 Male Reproductive System

Human male reproductive system consists of testes (primary sex organs), scrotum, vas deferens, urethra, penis and accessory glands.

Testis: A pair of testes lies outside the abdominal cavity of the male. These testes are the male gonads, which produce male gametes (**sperms**) and male sex hormone (**Testosterone**). Along the inner side of each testis lies a mass of coiled tubules called **epididymis**. The **Sertoli cells** of the testes provide nourishment to the developing sperms.

Scrotum: The scrotum is a loose pouch-like sac of skin which is divided internally into right and left **scrotal sacs** by muscular partition. The two testes lie in the respective scrotal sacs. It also contains many nerves and blood vessels. The **scrotum** acts as a **thermoregulator organ** and provides an optimum temperature for the formation of sperms. The sperms develop at a temperature of 1-3°C lower than the normal body temperature.

Vas deferens: It is a straight tube which carries the sperms to the **seminal vesicles**. The sperms are stored in the seminal plasma of seminal vesicle, which is rich in fructose, calcium and enzymes. Fructose is a source of energy for the sperm. The **vas deferens** along with seminal vesicles opens into ejaculatory duct which expels the sperm and its secretions from seminal vesicles into the urethra.

Urethra: It is contained inside the penis and conveys the sperms from the vas deferens which pass through the urethral opening. The accessory glands associated with the male reproductive system consist of seminal vesicles, prostate gland and Cowper's glands. The secretions of these glands form seminal fluid and mixes with the sperm to form

semen. This fluid provides nutrition and helps in the transport of sperms.

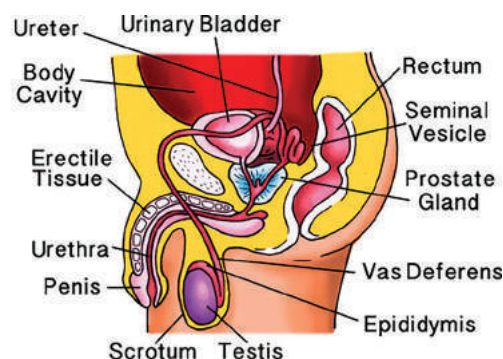


Figure 20.8 Male reproductive system



The sperm is the smallest cell in the male body. A normal male produces more than 500 billion sperm cells in his life time. The process of formation of sperms is known as spermatogenesis.

20.3.2 Female Reproductive System

The female reproductive system consists of ovaries (primary sex organs), oviducts, uterus and vagina.

Ovaries: A pair of almond-shaped ovaries is located in the lower part of abdominal cavity near the kidneys in female. The ovaries are the female gonads, which produce female gametes (**eggs or ova**) and secrete female sex hormones (**Oestrogen and Progesterone**). A mature ovary contains a large number of ova in different stages of development.

Fallopian tubes (Oviducts): These are paired tubes originating from uterus, one on either side. The terminal part of **fallopian tube** is funnel-shaped with finger-like projections called **fimbriae** lying near the ovary. The fimbriae pick up the ovum released from ovary and push it into the fallopian tube.

Uterus: Uterus is a pear-shaped muscular, hollow structure present in the pelvic cavity. It lies between urinary bladder and rectum.

Development of foetus occurs inside the uterus. The narrower lower part of uterus is called **cervix**, which leads into vagina.

Vagina: The uterus narrows down into a hollow muscular tube called vagina. It connects cervix and the external genitalia. It receives the sperms, acts as birth canal during child birth (**parturition**).

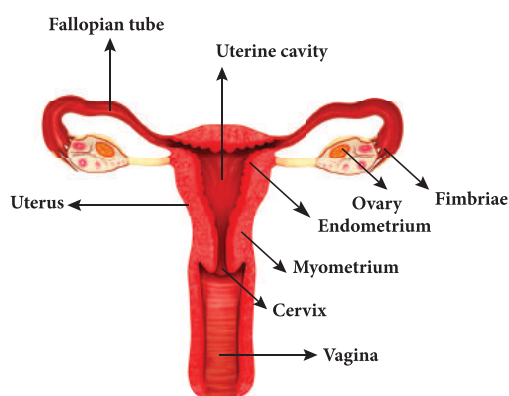


Figure 20.9 Female reproductive system

More to Know

An ovum is the largest human cell. The process of formation of ova is known as **oogenesis**.

Points to Remember

- ❖ All the organ systems work together in coordination to maintain the body in a homeostatic condition of an organism.
- ❖ Alimentary canal consists of mouth, buccal cavity, pharynx, oesophagus, stomach, small intestine (consisting of duodenum, jejunum and ileum), large intestine (consisting of caecum, colon and rectum) and anus.
- ❖ The five stages of nutrition process include ingestion, digestion, absorption, assimilation and egestion.
- ❖ The small intestine serves both for digestion and absorption.
- ❖ The human excretory system consists of a pair of kidney, which produce the urine.
- ❖ The process of urine formation includes the following three stages: Glomerular filtration, tubular reabsorption and tubular secretion.
- ❖ The reproductive organ of male is testis and female is ovary which are distinguished as primary sex organs.

A-Z GLOSSARY

Emulsification	Conversion of large fat droplets into smaller ones.
Enzymes	Substances produced by living organisms which acts as a catalyst to bring about specific biochemical reactions.
Homeostasis	Tendency of the body to seek and maintain a balance condition or equilibrium within its internal environment.
Mastication (Chewing)	Process by which food is crushed and ground by teeth.
Metabolism	Sum total of all chemical and energy changes taking place in an organism.
Osmoregulation	Maintenance of constant osmotic pressure in the fluids of an organism by the control of water and salt concentration.
Regurgitation	Act of bringing swallowed food back into the mouth.
Toxic substance	Substances that can be poisonous or cause health effects to living organisms.



TEXTBOOK EXERCISES



I. Choose the correct answer.

- Which of the following is not a salivary gland?
 - Sublingual
 - Lachrymal
 - Submaxillary
 - Parotid
- Stomach of human beings mainly digests _____
 - carbohydrates
 - proteins
 - fat
 - sucrose
- To prevent the entry of food into the trachea, the opening is guarded by _____
 - epiglottis
 - glottis
 - hard palate
 - soft palate
- Bile helps in the digestion of _____
 - proteins
 - sugar
 - fats
 - carbohydrates
- The structural and functional unit of the kidney is _____
 - villi
 - liver
 - nephron
 - ureter
- Which one of the following substance is not a constituent of sweat?
 - Urea
 - Protein
 - Water
 - Salt
- The common passage meant for transporting urine and sperms in male is _____
 - ureter
 - urethra
 - vas deferens
 - scrotum
- Which of the following is not a part of female reproductive system?
 - Ovary
 - Uterus
 - Testes
 - Fallopian tube

II. Fill in the blanks.

- The opening of the stomach into the intestine is called _____.

- The muscular and sensory organ which helps in mixing the food with saliva is _____.
- Bile, secreted by liver is stored temporarily in _____.
- The longest part of alimentary canal is _____.
- The human body functions normally at a temperature of about _____.
- The largest cell in the human body of a female is _____.

III. State whether true or false. If false, correct the statement.

- Nitric acid in the stomach kills microorganisms in the food.
- During digestion, proteins are broken down into amino acids.
- Glomerular filtrate consists of many substances like amino acids, vitamins, hormones, salts, glucose and other essential substances.

IV. Match the following.

Organ	Elimination
Skin	a. Urine
Lungs	b. Sweat
Intestine	c. Carbon dioxide
Kidneys	d. Undigested food

V. Differentiate the following.

- Excretion and Secretion
- Absorption and Assimilation
- Ingestion and Egestion
- Diphyodont and Heterodont
- Incisors and Canines



VI. Answer briefly.

1. How is the small intestine designed to absorb digested food?
2. Why do we sweat?
3. Mention any two vital functions of human kidney.
4. What is micturition?
5. Name the types of teeth present in an adult human being. Mention the functions of each.
6. Explain the structure of nephron.

VII. Answer in detail.

1. Describe the alimentary canal of man
2. Explain the structure of kidney and the steps involved in the formation of urine

VIII. Assertion and Reason.

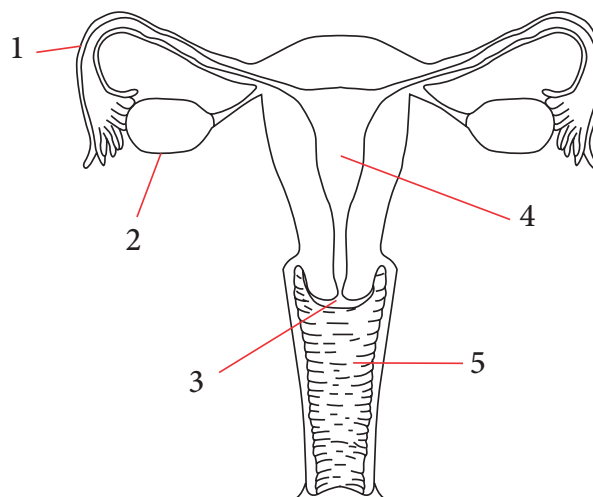
Mark the correct answer as:

- a. If both Assertion and Reason are true and Reason is the correct explanation of Assertion.
 - b. If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
 - c. If Assertion is true but Reason is false.
 - d. If both Assertion and Reason are false.
1. Assertion: Urea is excreted out through the kidneys.
Reason: Urea is a toxic substance.
 2. Assertion: In both the sexes gonads perform dual function.
Reason: Gonads are also called primary sex organs.

IX. Higher Order Thinking Skills

1. If pepsin is lacking in gastric juice, then which event in the stomach will be affected?
 - a. digestion of starch into sugars.
 - b. breaking of proteins into peptides.
 - c. digestion of nucleic acids.
 - d. breaking of fats into glycerol and fatty acids.
2. Name the blood vessel that (a) enter malphigian capsule and (b) leaves malphigian capsule.
3. Why do you think that urine analysis is an important part of medical diagnosis?
4. Why your doctor advises you to drink plenty of water?
5. Can you guess why there are sweat glands on the palm of our hands and the soles of our feet?

X. Match the parts of the given figure with the correct option.

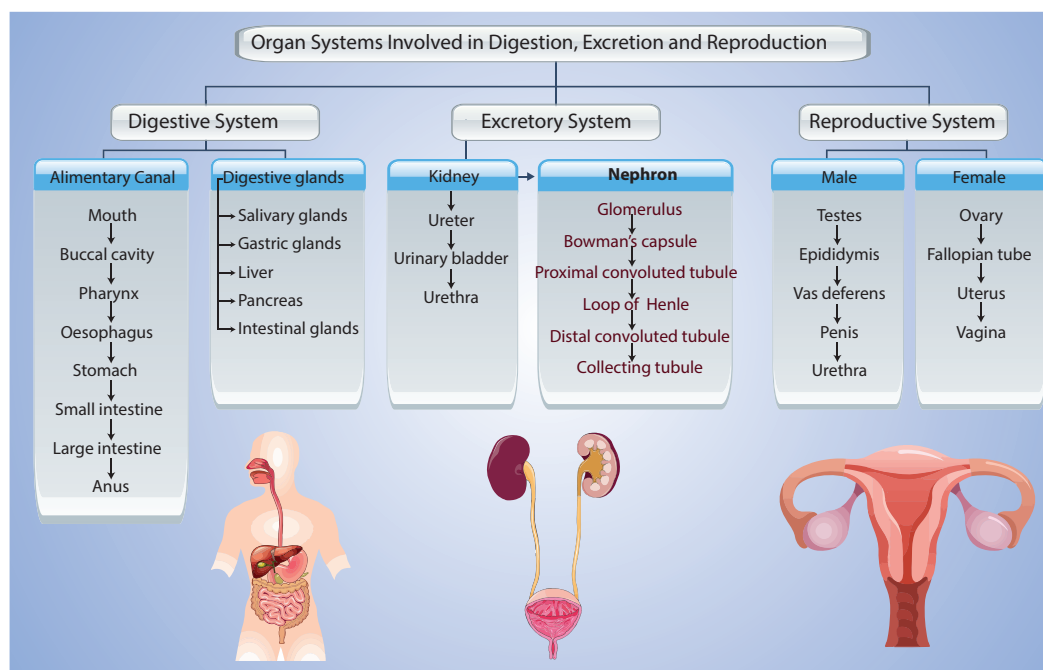


1	2	3	4	5
a. Fallopian tube	Oviduct	Uterus	Cervix	Vagina
b. Oviduct	Cervix	Vagina	Ovary	Vas deferens
c. Ovary	Oviduct	Uterus	Vagina	Cervix
d. Fallopian tube	Ovary	Cervix	Uterus	Vagina

REFERENCE BOOKS

Verma P.S and Agarwal, V.K. Animal Physiology, S. Chand and Company, New Delhi

Concept Map



ICT CORNER

Human digestive system

This activity enables to explore the functions of every part in the digestive system



Steps

- Type the URL link given below in the browser or scan the QR code. You can view “the digestive system”.
- Click the **go to interactive mode** to explore the functions of each part you want to learn.
- Every part and its function can be learnt by clicking that particular part that we want to learn.
- Also you can see the process of digestion by clicking **go to animation mode**.

Browse in the link:

URL: http://higher.ed.mheducation.com/sites/0072495855/student_view0/chapter26/animation__organs_of_digestion.html

