**HND 2nd Semester**

**Course Title: Anatomy Instructor: Dr. Ahmed Hayat**

 **MID Term Assignment Marks: 30**

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***NOTE: Mention your name and roll number on the assignments.***

Q1: Write a paragraph on the process of food digestion. Highlight the functions of each organ involved.

Q2: How kidneys are involved in urine formation. Explain the process step by step in detail.

**QUESTION NO.1:**

**Write a paragraph on the process of food digestion. Highlight the functions of each organ involved.**

**WHAT IS MEANT BY FOOD DIGESTION:**

The term food digestion is related to the breakdown and absorption of food in the stomach and small intestine. The food is broken down from large complex molecules to small and simpler molecules which is then absorbed in the water blood plasma which comes from the small intestine.

1: DIGESTIVE SYSTEM**:**

## DEFINITION;

‘The digestive system is the system which is responsible for the system of organs for getting the food into and out of the body and the food and nutrients which are absorbed in the process which is used in keeping the body healthy and functioning normally.’

# 2: ORANGS INVOLVED IN THE

#  DIGESTIVE SYSTEM:

The organs involved in the digestive system are given below;

1: Mouth.

2: Pharynx.

3: Esophagus.

4: Stomach.

5: Small Intestine.

6: Large Intestine.

7: Rectum.

3: ACCESSORY DIGESTIVE ORGANS**:**

The followings are the accessory organs of the digestive system;

1: Liver.

2: Bladder.

3: Pancreas.

4: Salivary glands.

5: Tongue.

6: Gallbladder.

4: FUNCTIONS OF THE GI TRACT**:**

The word GI Tract means Gastrointestinal tract. These are the main functions of the GI tract, which are as follows;

# **1: INGESTION**:

 When the food is taken into the mouth / alimentary tract.

# **2: PROPULSION**:

 Moving and mixing of the food contents along the alimentary tract.

# **3: DIGESTION**:

 It is when the food is broken down in the stomach and small intestine i-e Mechanical breakdown of the food (mastication) as in chewing. The other is the Chemical digestion of the food from large to small molecules by digestive enzymes.

# **4: ABSORPTION**:

 Through this process the food which is digested, the molecules is passed through the walls of the organs of the alimentary canal into the blood stream and is circulated in the body.

# **5: ELIMINATION**:

 The food that have been eaten and which was not digested or absorbed, Which are converted into waste products that are excreted from the alimentary canal in the form of feces by the process of Defecation.

# 5: DIGESTIVE ORGANS:

## 1: MOUTH (TONGUE):

 The tongue is the first organ and is a muscular organ in the mouth that manipulates the food by pushing the food round and chew it with the teeth at the same time and helps in the process of swallowing. The tongue is the gland of taste, its upper surface is covered with the taste buds which helps in the taste of different types of food like (sour, sweet, bitter, salty).this is done by the Papillae. And the tongue also have microscopic hairs like structures called the Microvilli. The tongue also helps in the function of Speech.

## 2: PHARYNX:

 Pharynx is the tube which connects the nasal and the oral cavities to the larynx and esophagus which is referred to as the throat. It has muscular walls which helps in the process of swallowing. It is the pathway in which the food travels from the mouth to the esophagus. Pharynx is also the part of the respiratory system.

## 3: ESOPHAGUS:

 The esophagus is also a muscular long and thin tube which helps in the connection of the pharynx to the stomach. It is located near the Trachea (The windpipe). It brings the food from the mouth to the stomach by the process of Peristalsis.

## 4: STOMACH:

 The stomach is a strong muscular sack like organ with strong muscular three layered walls. The stomach contains many strong digestive juices and enzymes which helps in the breakdown of food and in holding of the food. And make the hard large molecules in to small and in the form of paste and it is held there for about 2 hours. 10% of the digestion and absorption is done in the stomach.

## 5: SMALL INTESTINE:

 The small intestine digests and absorbs 90% of the water and important from the digested food. The small intestine has three parts the (Duodenum, Jejunum and Ileum) in all these parts absorption occurs of nutrients, vitamins and minerals.

## 6: LARGE INTESTINE:

 The digested food is gone to the large intestine from the small intestine. The large intestine is also divided into parts as the small intestine (Cecum, ascending colon, transverse colon, descending colon, sigmoid colon). The large intestine helps in the reabsorption of the water, electrolytes, vitamins, minerals and nutrients. It is also involve in the formation of feces which are hard waste products due to the reabsorption of water, which are then pushed to the rectum for elimination.

## 7: RECTUM:

 The rectum is the last organ of the digestive system that receives the waste material from the last part of the large intestine (colon). It is an 8 inches chamber that that connects the colon to the anus. The feces are in the rectum and it sends message to the brain that the stool is here and it is excreted out of the body.

# 6: ACCESSORY DIGESTIVE ORGANS:

 The following are the accessory organs of the digestive system;

## 1: LIVER:

 The liver has a very important position in the human body because it has many important functions that is essential for the normal functioning of the body. The liver produces many enzymes and bile juices (bilirubin, hormones, cholesterol, digestive juices and enzymes etc). It activates the enzymes for different processes, helps in the digestion of carbs, proteins and fats. It filters the blood from different chemicals and drugs, it detoxifies the chemicals in the drugs which are harmful for the body. It is also the only organ in the human body that can that can grow back to its original size if it is harmed.

## 2: PANCREAS:

 The pancreas also helps in the digestion of food by the production of important enzymes like (insulin and hormones). The pancreas works in two different functions the endocrine (releases the juices and enzymes into the blood stream directly) and the exocrine (releases the juices into the ducts). Thus it helps in digestion and in the balance of the blood sugar level.

## 3: TONGUE:

 The tongue is a movable organ so it helps in the movement of food, chewing and rolling of the food, it helps in the softening of the hard food formation of the Bolus and helps in the swallowing of the food. It helps in the identification of different foods like (sour, sweet, bitter, salty). It also helps in the speech of a person.

## 4: SALIVARY GLANDS:

 The salivary glands produces the saliva as it can be known from its name, the saliva keeps the mouth and the other digestive organs moist. The saliva contains different types of digestive enzymes like (salivary amylase) which is used in the breakdown of carbs and it makes the movement of the food easy and smooth from the mouth to the pharynx and so on acts like a lubricant. The salivary glands can be found in the mouth’s palate, cheeks and at the bottom of the mouth.

## 5: GALLBLADDER:

 The gallbladder is a small organ which is located inferior and posterior to the liver and is a storing organ. The size of the gallbladder is small but it plays an important role in the digestion of the food, it stores different digestive enzymes and juices until they are needed like (it stores the Bile which is produced by the liver until it is needed for the digestion of the fatty foods in the small intestine).

**QUESTION NO.2:**

**How kidneys are involved in the urine formation? Explain the process step by step in detail.**

**1: WHAT IS THE URINARY SYSTEM:**

 The urinary system is also known as the Renal system or The Urinary tract, which has the following parts;

**Two Kidneys:**

These are the excretory organs in which urine is formed.

**Two Ureters:**

These are the two tube like pipes that takes the urine from the kidneys to the bladder.

**Bladder:**

This is the muscular reservoir where urine is kept.

**The Urethra:**

This is the place where urine comes from the bladder and is a channel of exterior

**2: WHAT IS A KIDNEY?**

 The kidneys are the two very important organs of the living organisms, (which are in the shape of a bean, are reddish in color, 11 cm longs, 5 cm width, and are bounded with two thick tough membranes). They are in the renal system and helps in the excretion of waste as urine from the body. It helps in the filtration of the blood and in the production of some hormones which are used in the formation of red blood cells. The kidneys also promotes the bone health and in the regulation of blood pressure.

**3: WHAT IS URINE:**

 Urine is basically the waste materials of the body in the form of liquid. It is the by-product of the metabolism waste. The urine is made up of (water, salts, toxic chemicals, electrolytes like potassium and phosphorus and chemicals like urea and uric acid) this is done in the kidneys while filtration which is then excreted out of the body.

## 1: THE KIDNEYS INVOLVED IN THE FORMATION OF URINE:

 As the kidneys are the organs of filtration so the filter the toxic chemicals and other waste substances from the body and forms urine and excrete them. This process is done in many steps which (Glomerular filtration, reabsorption, secretion). These processes are done in a way that only the waste substances, toxic chemicals and excess water are expelled out of the body.

## 2: THE PROCESS OF URINE FORMATION:

 The following is the process of urine formation in the body which is given below;

### 1: GLOMERULAR FILTRATION.

### 2: TUBULAR REABSORPTION.

### 3: TUBULAR SECRETION.

## 3: FIRST WE WILL LOOK AT THE ANATOMY OF NEPHRON:

 The anatomy of the nephron is very essential to know for the formation of the urine. The nephron is made up of two main parts;

**The Renal Corpuscle.**

**The Renal Tubule.**

### 1: THE RENAL CORPUSCLE:

 The renal corpuscle is divided into two parts (The glomerulus and the Bowman’s capsule). The high pressure filtration of the blood occurs at the renal corpuscle, the blood which comes to the glomerulus is done by the Afferent arteriole while the one which takes the blood from the glomerulus is called the Efferent arteriole. Due to this a network of capillaries is created which is called the capillaries of the glomerulus. Then there is the Bowman’ capsule which is a Cup-shaped structure in which the glomerulus is situated. Here the Bowman’s capsule with the glomerulus filter the blood from the toxic waste

### 2: THE RENAL TUBULE:

 The renal tubule is also divided into parts;

**The proximal convoluted tubule (PCT).**

**The loop of Henle.**

**The distal convoluted tubule (DCT).**

 When the blood is filtered and comes from the renal corpuscle, the filtrate is called the glomerular filtrate. This filtrate then enters the PCT and the absorption of the useful substance takes place like (salts, water, bio carbonate, vitamins, minerals etc.), these are absorbed from the filtrate and the waste materials like (urea, uric acid etc.) are added into the filtrate and then it enters in to the loop of Henle. Where the reabsorption of the water take place and then it is sent to the DCT and the DCT takes the filtrate to the collecting ducts into the renal pelvis and goes to the urinary bladder through the ureters.

## 4: FORMATION OF URINE:

### 1: GLOMERULAR FILTRATE:

 The process of filtration occurs in the glomerular capillaries which forms the ultra -filtrate and the blood goes through the capillaries in high pressure and gets filtered through the walls of the capillaries by the process of Osmosis and Diffusion. Without the blood cells and the proteins, the rest of the filtrate goes into the Bowman’s capsule and the ultra-filtrate is formed. The rate of the glomerular filtrate is 180 liter/day. The 99% of the 180 L of water that leaves the blood each day by the glomerular filtration returns to the blood from the proximal tubule through the process of Passive reabsorption.

### 2: TUBULAR REABSORPTION:

 When the filtrate goes into the Bowman’s capsule except the blood cells and the proteins with high pressure, so at the PCT the filtrate is reabsorbed like (75% water) and some other substances like (sodium, bio carbonates, potassium etc.). The absorption of the filtrate depends upon the permeability of the different parts of the nephron. Like the DCT does the selective absorption, and the blood which is reabsorbed are transported back to form blood

### 3: TUBULAR SECRETION:

 The peritubular capillaries that takes the water and the other substances back to the blood stream, also helps in the activation of the secretion of the substances like Hydrogen and potassium ions due to which the sodium potassium balanced is kept. Some of the toxic chemical are not filtered into the glomerulus, thus they are secreted into the filtrate during tubular secretion.

### 4: CONCLUSION:

 The nephron processes the blood and creates the urine through the process of filtration, reabsorption and secretion. The urine that is formed during this process is (95% water and 5% other waste substances). The other nitrogenous wastes are excreted out which are (ammonia, urea, uric acid, sodium, potassium etc.) are also excreted out of the body.