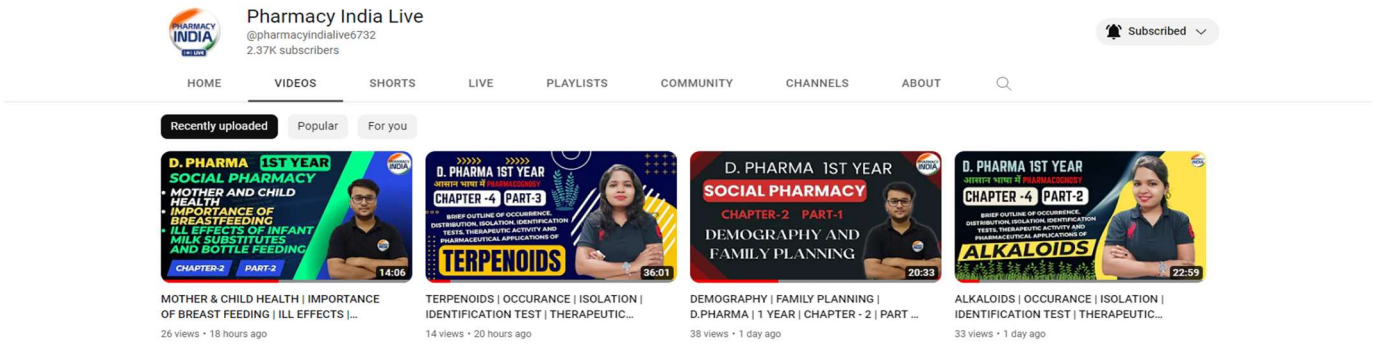
HUMAN ANATOMY AND PHYSIOOGY

# MODEL PAPER – 3

## Syllabus to be covered in this module are-

- ❖Chapter-8 Cardiovascular System
- ❖Chapter-9 Respiratory System
- ❖Chapter-10 Digestive System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# Questions

## Long Questions-

Ques.1 Describe the internal anatomy of the heart.

Ques.2 Define blood pressure and discuss various factors regulating the blood pressure in human beings.

Ques.3 What is the cardiac cycle? Describe various events of the cardiac cycle.

Ques.4 Explain coronary and portal blood circulation.

Ques.5 Write short note on heart valves and heart sounds.

Ques.6 Give an account of the transport of oxygen and carbon dioxide in the blood.

Ques.7 Explain the mechanism of respiration.

Ques.8 Explain the mechanism of breathing.

Ques.9 Describe the gross anatomy of the stomach. Explain its physiological functions.

Ques.10 Write the anatomy of the pancreas. Discuss the endocrine and exocrine secretions of pancreas.

Ques.11 Explain how digestion of carbohydrates, proteins, and fats takes place.

## Short Questions

Ques.1 Discuss the digestion of carbohydrates.

Ques.2 Discuss the food absorption in the small intestine.

Ques.3 Describe the functions of the liver.

Qyes.4 Discuss the factors regulating blood pressure.

Ques.5 Define Atherosclerosis and Congestive cardiac failure.

Ques.6 Define hypertension and hypotension.

Ques.7 Write a short note on digestive enzymes.

Ques.8 Explain the lung volumes and capacities.

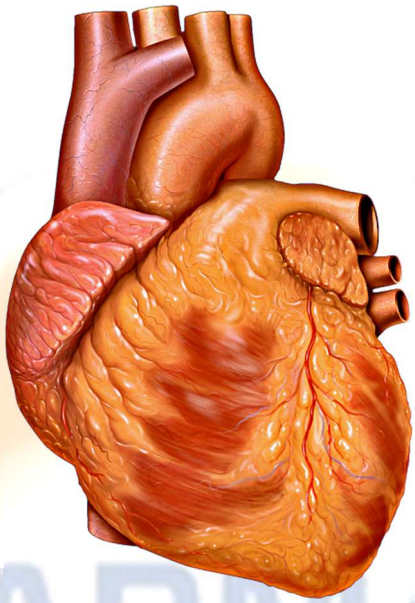
Ques.9 Define hypoxia and asphyxia.

Ques.10 Define oxygen therapy and resuscitation.

# Long Answers

## Ques.1 Describe the internal anatomy of the heart.

**Ans- Heart**



- The heart is a conical hollow muscular organ situated in the middle mediastinum and is enclosed within the pericardium.
- It is positioned posteriorly to the body of the sternum with one-third situated on the right and two-thirds on the left of the midline.
- The heart measures 12 x 8.5 x 6 cm and weighs ~310 g (males) and ~255 g (females).
- It pumps blood to various parts of the body to meet their nutritive requirements.

**Structure of the Human Heart**

- The human heart is about the size of a human fist and is divided into four chambers, namely two ventricles and two atria.
- The ventricles are the chambers that pump blood and the atrium are the chambers that receive blood.
- Among these both the right atrium and ventricle make up the "right heart," and the left atrium and ventricle make up the "left heart."
- Atria are thin and have less muscular walls and are smaller than ventricles. These are the blood-receiving chambers that are fed by the large veins.

- Ventricles are larger and more muscular chambers responsible for pumping and pushing blood out into circulation. These are connected to larger arteries that deliver blood for circulation.

- The right ventricle and right atrium are comparatively smaller than the left chambers.
- The walls consist of fewer muscles compared to the left portion, and the size difference is based on their functions.
- The blood originating from the right side flows through the pulmonary circulation, while blood arising from the left chambers is pumped throughout the body.

- **The structure of the heart also houses the biggest artery in the body – the aorta.**

# HUMAN ANATOMY AND PHYSIOOGY

**Position of Heart**

- **Anteriorly**: the body of the sternum, and adjoining costal cartilages; left lung, and pleura (apex)
- **Posteriorly**: oesophagus, descending thoracic aorta, azygos, hemiazygos veins, and thoracic duct
- **Superficially** : bifurcation of the main pulmonary trunk
- **Inferiorly**: diaphragm
- **Laterally**: lungs, pleura

**Layers of the Heart Walls**

- **Epicardium** - the outer layer of the wall of the heart and is formed by the visceral layer of the serous pericardium.
- **Myocardium** - the muscular middle layer of the wall of the heart and has excitable tissue and the conducting system.
- **Endocardium**
- A middle concentric layer
- A subendocardial layer.

❖ The rest of the heart is composed mainly of the subepicardial and subendocardial layers.
❖ The function of the heart in any organism is to maintain a constant flow of blood throughout the body.
❖ This replenishes oxygen and circulates nutrients among the cells and tissues.

**Following are the main functions of the heart:**

❖ One of the primary functions of the human heart is to pump blood throughout the body.
❖ Blood delivers oxygen, hormones, glucose and other components to various parts of the body, including the human heart.
❖ The heart also ensures that adequate blood pressure is maintained in the body.

➢ There are two types of circulation within the body, namely pulmonary circulation and systemic circulation.

- **Pulmonary circulation** is a portion of circulation responsible for carrying deoxygenated blood away from the heart, to the lungs and then bringing oxygenated blood back to the heart.
- **Systemic circulation** is another portion of circulation where the oxygenated blood is pumped from the heart to every organ and tissue in the body, and deoxygenated blood comes back again to the heart.

❖ Now, the heart itself is a muscle and therefore, it needs a constant supply of oxygenated blood.
❖ This is where another type of circulation comes into play, the coronary circulation.

➢ Coronary circulation is an essential portion of the circulation, where oxygenated blood is supplied to the heart.
➢ This is important as the heart is responsible for supplying blood throughout the body.
➢ Moreover, organs like the brain need a steady flow of fresh, oxygenated blood to ensure functionality.

## Ques.2 Define blood pressure and discuss various factors regulating the blood pressure in human beings.

**Ans- Blood Pressure**

# HUMAN ANATOMY AND PHYSIOOGY

- Blood pressure (BP) is the pressure of circulating blood against the walls of blood vessels.
- Most of this pressure results from the heart pumping blood through the circulatory system.
- When used without qualification, the term "blood pressure" refers to the pressure in the large arteries.
- Blood pressure is usually expressed in terms of the systolic pressure (maximum pressure during one heartbeat) over diastolic pressure (minimum pressure between two heartbeats) in the cardiac cycle.
- It is measured in millimetres of mercury (mmHg) above the surrounding atmospheric pressure.
- Blood pressure is one of the vital signs—together with respiratory rate, heart rate, oxygen saturation, and body temperature—that healthcare professionals use in evaluating a patient's health.
- Normal resting blood pressure, in an adult is approximately 120 millimetres of mercury (16 kPa) systolic over 80 millimetres of mercury (11 kPa) diastolic, denoted as "120/80 mmHg".
- Globally, the average blood pressure, age standardized, has remained about the same since 1975 to the present, at approx. 127/79 mmHg in men and 122/77 mmHg in women, although these average data mask significantly diverging regional trends.

- Traditionally, a health-care worker measured blood pressure non-invasively by auscultation (listening) through a stethoscope for sounds in one arm's artery as the artery is squeezed, closer to the heart, by an aneroid gauge or a mercury-tube sphygmomanomet.
- Auscultation is still generally considered to be the gold standard of accuracy for non-invasive blood pressure readings in clinic.
- However, semi-automated methods have become common, largely due to concerns about potential mercury toxicity, although cost, ease of use and applicability to ambulatory blood pressure or home blood pressure measurements have also influenced this trend.
- Early automated alternatives to mercury-tube sphygmomanometers were often seriously inaccurate, but modern devices validated to international standards achieve an average difference between two standardized reading methods of 5 mm Hg or less, and a standard deviation of less than 8 mm Hg.
- Most of these semi-automated methods measure blood pressure using oscillometry (measurement by a pressure transducer in the cuff of the device of small oscillations of intra-cuff pressure accompanying heartbeat-induced changes in the volume of each pulse).

- Blood pressure is influenced by cardiac output, systemic vascular resistance, blood volume and arterial stiffness, and varies depending on patient's situation, emotional state, activity and relative health or disease state.
- In the short term, blood pressure is regulated by baroreceptors, which act via the brain to influence the nervous and the endocrine systems.

- Blood pressure that is too low is called **hypotension**, pressure that is consistently too high is called **hypertension**, and normal pressure is called **normotension**.
- Both hypertension and hypotension have many causes and may be of sudden onset or of long duration.
- Long-term hypertension is a risk factor for many diseases, including stroke, heart disease, and kidney failure.
- Long-term hypertension is more common than long-term hypotension.

## Factors regulating Blood Pressure

### ➢ Exercise

- ❖ Systolic pressure rises 20 to 30 mm Hg above baseline after moderate exercise as a result of an increase in contraction volume and pace.
- ❖ Moderate exercise often has little effect on diastolic pressure.
- ❖ This is because moderate exercise has little effect on peripheral resistance, which determines diastolic pressure.
- ❖ Systolic pressure increases by 40 to 50 mm Hg above baseline after intense muscular exertion.
- ❖ However, during intense muscular exertion, the peripheral resistance lowers, which causes the diastolic pressure to fall.

### ➢ Emotional Conditions

- ❖ The release of adrenaline causes the blood pressure to rise during excitement or anxiety.

### ➢ Age and Sex

- ❖ As people get older, their arterial blood pressure rises.
- ❖ Thus the risk of hypertension (high blood pressure) increases with age.
- Until menopause, arterial pressure in women is 5 mm Hg lower than the men belonging to the same age group.
- Females have increased pressure after menopause which is almost equivalent to that of men.

### ➢ Sleep

- ❖ Usually, the pressure is lowered up to 15 to 20 mm Hg during deep sleep. However, it marginally rises while having dream-related sleep.

### ➢ Body Built

- ❖ Obese people experience more pressure than thin people do.
- ❖ Also, after meals, there is an increase in cardiac output that causes a rise in arterial blood pressure for a short while.

## Ques.3 What is the cardiac cycle? Describe various events of the cardiac cycle

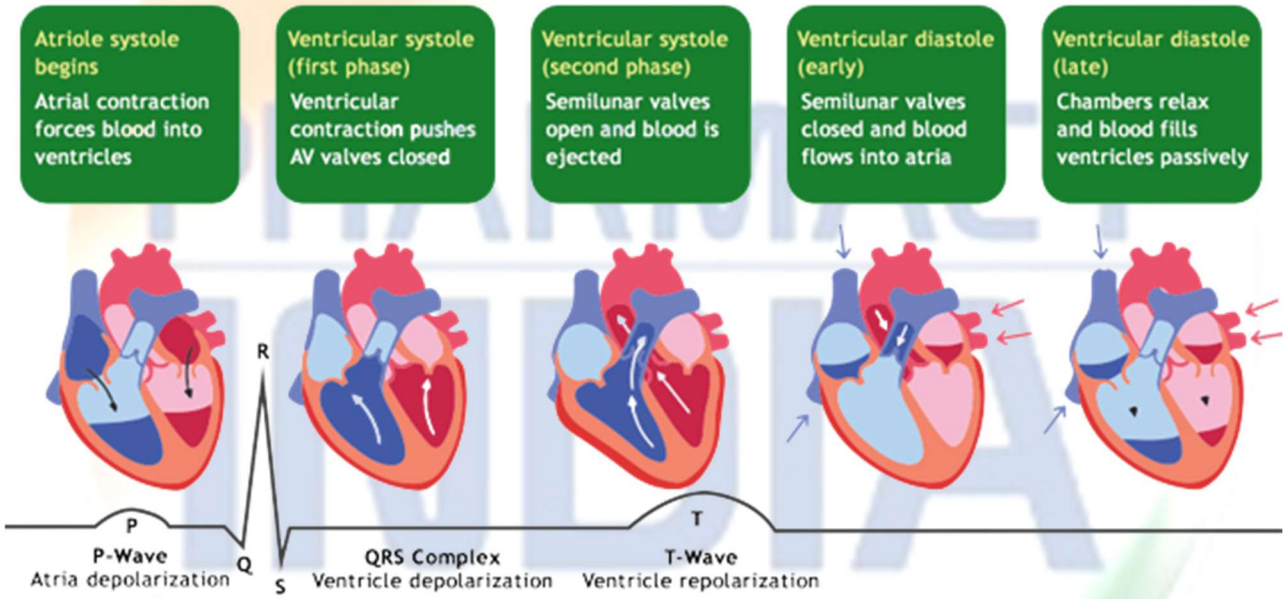
**Ans- Cardiac Cycle**

- ❖ The cardiac cycle attributes to a comprehensive heartbeat from its production to the commencement of the next beat.
- ❖ It comprises diastole, the systole, and the intervening pause.
- ❖ The occurrence of a cardiac cycle is illustrated by a heart rate, which is naturally indicated as beats per minute.
- ❖ A healthy human heart beats 72 times per minute which states that there are 72 cardiac cycles per minute.
- ❖ The cardiac cycle involves a complete contraction and relaxation of both the atria and ventricles and the cycle last approximately 0.8 seconds.

### ➢ Cardiac Cycle Phases

Following are the different phases that occur in a cardiac cycle:

- **Atrial Diastole**: In this stage, chambers of the heart are calmed.
  - That is when the aortic valve and pulmonary artery closes and atrioventricular valves open, thus causing chambers of the heart to relax.
- **Atrial Systole**: At this phase, blood cells flow from atrium to ventricle and at this period, atrium contracts.
- **Isovolumic Contraction**: At this stage, ventricles begin to contract.
  - The atrioventricular valves, valve, and pulmonary artery valves close, but there won't be any transformation in volume.
- **Ventricular Ejection**: Here ventricles contract and emptying. Pulmonary artery and aortic valve close.
- **Isovolumic Relaxation**: In this phase, no blood enters the ventricles and consequently, pressure decreases, ventricles stop contracting and begin to relax.
  - Now due to the pressure in the aorta – pulmonary artery and aortic valve close.
- **Ventricular Filling Stage**: In this stage, blood flows from atria into the ventricles.




  - It is altogether known as one stage (first and second stage).
  - After that, they are three phases that involve the flow of blood to the pulmonary artery from ventricles.

➢ **Duration of Cardiac Cycle**

Ia normal person, a heartbeat is 72 beats/minute. So, the duration of one cardiac cycle can be calculated as:

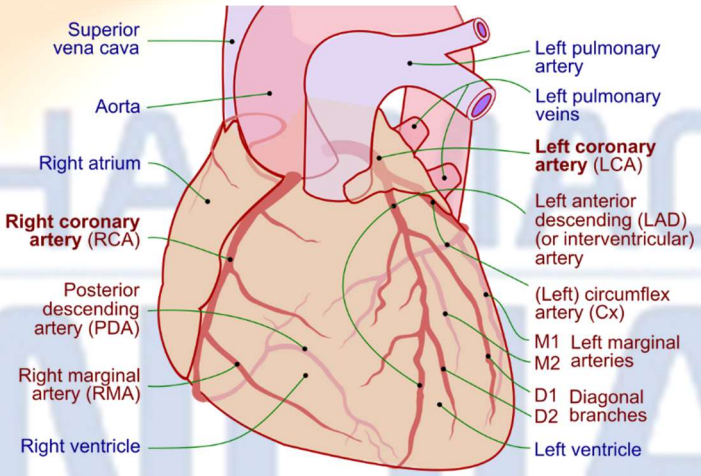
- ❖ 1/72 beats/minute=.0139 minutes/beat
- ❖ At a heartbeat 72 beats/minute, duration of each cardiac cycle will be 0.8 seconds.
- ❖ Duration of different stages of the cardiac cycle is given below:
- ❖ Atrial systole: continues for about 0.1 seconds
- ❖ Ventricular systole: continues for about 0.3 seconds
- ❖ Atrial diastole: continues for about 0.7 seconds
- ❖ Ventricular diastole: continues for about 0.5 seconds

# HUMAN ANATOMY AND PHYSIOOGY

## Ques.4 Explain coronary and portal blood circulation.

## Ans- Coronary Circulation

- Coronary arteries supply blood to the heart muscle.
- Like all other tissues in the body, the heart muscle needs oxygen-rich blood to function.
- Also, oxygen-depleted blood must be carried away.
- The coronary arteries wrap around the outside of the heart.
- Small branches dive into the heart muscle to bring it blood.
- Coronary circulation is the circulation of blood in the arteries and veins that supply the heart muscle (myocardium).
- Coronary arteries supply oxygenated blood to the heart muscle.
- Cardiac veins then drain away the blood after it has been deoxygenated.
- Because the rest of the body, and most especially the brain, needs a steady supply of oxygenated blood that is free of all but the slightest interruptions, the heart is required to function continuously.

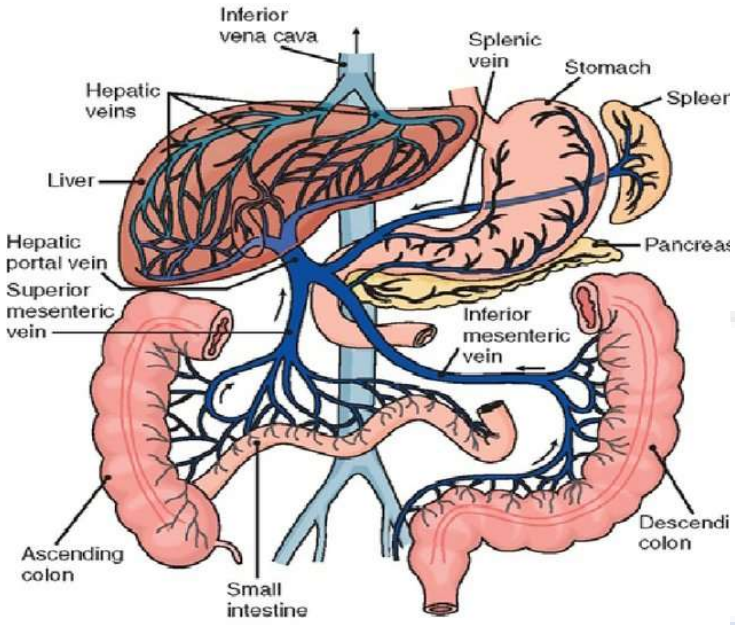



- Therefore, its circulation is of major importance not only to its own tissues but to the entire body and even the level of consciousness of the brain from moment to moment.
- Interruptions of coronary circulation quickly cause heart attacks (myocardial infarctions), in which the heart muscle is damaged by oxygen starvation.
- Such interruptions are usually caused by coronary ischemia linked to coronary artery disease, and sometimes to embolism from other causes like obstruction in blood flow through vessels.

## ➢ Portal Circulation

- Portal circulation, i.e. hepatic portal system, is a functional component of hepatic circulation.
- Its main component is about 8 cm long trunk of the vena portae, which arises behind the head of the pancreas at the confluence of the superior mesenteric vein and splenic vein (lienalis).
- The vena portae is not a real vein because it does not lead blood directly to the heart.
- It first leads to the liver, where it breaks down into the secondary capillary network of the liver sinusoids, and then it flows into the inferior vena cava and goes to the heart through the venae hepaticae system.
- n addition to the hepatic venous portal system, there is another similar system in the body - the pituitary portal.

- The liver is unusual in that it has a double blood supply; the right and left hepatic arteries carry oxygenated blood to the liver, and the portal vein carries venous blood from the GI tract to the liver.




- The venous blood from the GI tract drains into the superior and inferior mesenteric veins.
- these two vessels are then joined by the splenic vein just posterior to the neck of the pancreas to form the portal vein.
- This then splits to form the right and left branches, each supplying about half of the liver.
- On entering the liver, the blood drains into the hepatic sinusoids, where it is screened by specialised macrophages (Kupffer cells) to remove any pathogens that manage to get past the GI defences.
- The plasma is filtered through the endothelial lining of the sinusoids and bathes the hepatocytes; these cells contain vast numbers of enzymes capable of braking down and metabolising most of what has been absorbed.
- The portal venous blood contains all of the products of digestion absorbed from the GI tract.
- So all useful and non-useful products are processed in the liver before being either released back into the hepatic veins which join the inferior vena cava just inferior to the diaphragm, or stored in the liver for later use.

## Ques.5 Write short note on heart valves and heart sounds.

### Ans- Heart Valves

- A healthy heart transports blood in a predictable route through four chambers.
- The four chambers are the left and right atria on the top of your heart and the left and right ventricles on the bottom.
- Between chambers, there are valves, which are made of thin but strong flaps of tissue.
- They're called leaflets or cusps.
- The valves open and close to help blood move along its path:

- Blood that needs oxygen flows from your body into the right atrium.
- It then flows through the tricuspid valve to the right ventricle.
- The right ventricle pumps the blood through the pulmonary valve and into your lungs, where it picks up oxygen.
- The oxygen-rich blood then flows to the left atrium.
- The heart pumps blood through the mitral valve into the left ventricle.
- From the left ventricle, the blood flows through the aortic valve to the rest of your body.

➢ **Tricuspid valve**:

❖ This valve has three leaflets.
❖ They allow blood to flow from the right atrium to the right ventricle.
❖ They also prevent blood from flowing backward from the right ventricle to the right atrium.

➢ **Pulmonary valve**:

❖ This valve also has three leaflets.
❖ They allow blood to pump from the right ventricle to the pulmonary artery.
❖ This artery leads to the lungs, where blood picks up oxygen.
❖ The pulmonary valve prevents blood from going backward from the pulmonary artery to the right ventricle.

➢ **Mitral valve**:

❖ This valve has two leaflets.
❖ They allow blood to flow from the lungs into the left atrium.
❖ And they prevent backward flow from the left ventricle to the left atrium.

➢ **Aortic valve**:

❖ This valve has three leaflets.
❖ They open to let blood flow from your heart's left ventricle to the aorta.
❖ The aorta is the largest blood vessel in your body.
❖ It brings oxygenated blood from your heart to the rest of your body.
❖ The aortic valve prevents backward flow from the aorta into the left ventricle.

## ➢ Heart Sounds:

❖ The sounds produced or generated by the beating heart during each cardiac cycle, particularly when the heart valves snap shut, are heart sounds.
❖ The sounds specifically indicate the turbulence which is generated during the snapping shut of the valves.
❖ In cardiac auscultation, examiners can use a stethoscope to hear these distinct and unique sounds, which render information indicating the state of the heart.
❖ It can also be detected with the help of a phonocardiograph.
❖ These sounds are generated by the flowing of blood in and out of the chambers of the heart through the valves as and when it closes and opens.
❖ Auscultation is utilized in the detection of abnormal or unusual sounds of the heart and decides the course of action further.

**Types of Heart Sounds**

Heartbeat is constituted by two phases which make up a cardiac cycle. These two phases are –

- Contraction of ventricles to pump out blood – systole
- Relaxation of ventricles filling with blood – diastole

There are 4 types of heart sounds –

- **S1** – "lub" caused by the closing of the AV valves
- **S2** – "dub" caused by the closing of semilunar valves
- **S3** – linked with flow of blood into the ventricles
- **S4** – linked with atrial contraction

- Generally, the heart makes two sounds – "lub" and "dub".
- The third and fourth sounds are audible in individuals, however, they could show abnormalities in the functioning of the heart.
- While the S1 and S2 are high-pitched, S3 and S4 are low-pitched sounds.

## Ques.6 Give an account of the transport of oxygen and carbon dioxide in the blood.

## Ans- Transport of Oxygen during Respiration

- During respiration, about 97% of oxygen is transported by red blood cells in the blood, and the remaining 3% gets dissolved in the plasma.
- Haemoglobin is a pigment present in the RBCs that gives blood its red colour.
- Oxygen binds with haemoglobin to form oxyhaemoglobin, which depends on the partial pressures of oxygen, carbon dioxide, H+ concentration and temperature.
- One haemoglobin molecule can carry up to 4 molecules of oxygen.
- The partial pressure of oxygen, H+ concentration and low temperature are the ideal conditions for the formation of oxyhaemoglobin.
- These conditions are met in the alveoli.
- But in the tissues, opposite conditions exist, and so oxygen is dissociated from the oxyhaemoglobin.
- Every 100mL of blood that gets oxygenated on the lung surface can deliver 5 mL of oxygen to the tissues on average.

### Transport of Carbon Dioxide during Respiration

- Around 20-25% of carbon dioxide is carried by haemoglobin as carbamino-haemoglobin.
- 7% is in a dissolved state in the plasma, and the remaining is carried as bicarbonate.
- Again, the binding of carbon dioxide with haemoglobin is related to the partial pressure of carbon dioxide and the partial pressure of oxygen.
- As mentioned earlier, the partial pressure of carbon dioxide is high in the tissues, and this is where more binding of carbon dioxide occurs.
- In the alveoli, where the partial pressure of oxygen is high, carbon dioxide gets dissociated from carbamino-haemoglobin.
- The enzyme carbonic anhydrase present in a high concentration in RBCs and in small quantities in the plasma facilitates this reaction in both directions.
- So, the bicarbonate formed in the tissues releases carbon dioxide at the alveoli.
- Every 100 mL of deoxygenated blood can deliver 4 mL of carbon dioxide to the alveoli.

## Ques.7 Explain the mechanism of respiration.

## Ans- Mechanism of Respiration

- Mechanism of respiration involves the breathing mechanism and exchange of gases.
- ❖ The gaseous exchange occurs by diffusion in the alveoli.
- ❖ It depends upon the pressure differences between blood and tissues, or atmospheric air and blood.
- ❖ The exchange of gases takes place at the surface of the alveolus.

➢ **Exchange of Gases**

- The exchange of gases takes place in the following manner:

❖ **Transport Of Oxygen**

- Oxygen in the blood is carried to the tissue in two forms- Oxyhaemoglobin- chemical composition
- The oxygen in the blood combines with haemoglobin when the concentration of oxygen is high in the blood.
- Oxyhaemoglobin, being unstable, dissociates to release oxygen. Low oxygen, low pH and high temperatures stimulate the dissociation process.
- Internal Respiration

❖ The gaseous exchange taking place in the tissues is called internal respiration.
❖ Here, the oxygen carried in the form of oxyhaemoglobin gets dissociated to release oxygen.
❖ This oxygen breaks down glucose to release carbon dioxide, water, and energy.
❖ The energy is utilized by the body, while the carbon dioxide is diffused from the tissues.

❖ **Transport Of Carbon dioxide** : From Tissues To Lungs

Carbon dioxide is transported by three mechanisms:

- Some carbon dioxide dissolves in the water of plasma to form carbonic acid.
- Carbonic acid ionizes to form bicarbonate ions.
- The hydrogen ions are catalysed by the enzyme carbonic anhydrase.
- Bicarbonate ions combine with sodium and potassium to form sodium bicarbonate and potassium bicarbonate.
- Some carbon dioxide combines with haemoglobin for the formation of carbaminohaemoglobin.
- It is finally carried to the lungs and released out of the body through expiration.

❖ **Intrapleural Breathing**

- Intrapleural breathing is used to refer to the pressure that is present in the space between the pleura and the lungs.
- This space is referred to as the pleural cavity.
- The pressure in this region is normally less than the atmospheric pressure.
- This is the reason why pleural pressure is termed as negative pressure.
- The lung movement is governed by the pressure gradient, the transpulmonary pressure, which exists between the pleura and the lungs.
- The difference in the pressures between intrapulmonary and intrapleural pressures is known as transpulmonary pressure.

❖ The pressure in the pleural cavity while breathing turns negative while there is an increase in the transpulmonary pressure causing the lungs to expand.
❖ While expiration, the lungs recoil as a result of an increase in the pleural pressure.

- ❖ The competing forces inside the thorax results in the formation of negative intrapleural pressure, one of these forces is associated with the lung's elasticity.
- ❖ The lungs have elastic tissues which cause it to be pulled inwards off the thoracic wall.
- ❖ An inward pull of the lung tissue is also generated by the surface tension of the alveolar fluid.
- ❖ The inward tension generated from the lungs is opposed by forces from the thoracic wall and the pleural fluid.

### ➢ Respiratory Gas Transport

- After the gases have scattered in the lungs, causing the blood to become oxygenated, leaving carbon dioxide, the next phase of transportation of oxygen-rich blood to the tissues takes place.
- Meanwhile, the next round of deoxygenated blood needs to be brought to the lungs for the cycle to continue.
- In the bloodstream, the transportation of gases occurs all through the body which is contributed to the cardiovascular system comprising the blood vessels and the heart.
- The blood carrying oxygen leaves the lungs to flow into the heart through the pulmonary veins, which are pumped to the rest of the body from the left ventricle through the aorta and its corresponding branches.

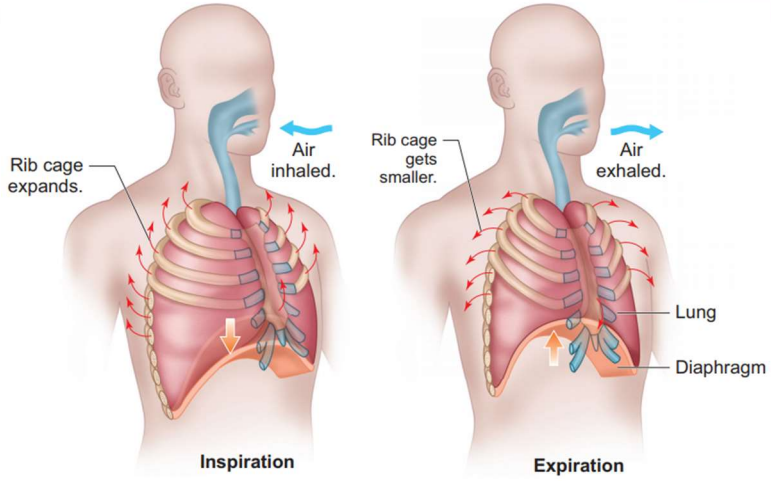
## Ques.8 Explain the mechanism of breathing.

**Ans- Mechanism of Breathing**

- ❖ All living beings need oxygen to live.
- ❖ The process of breaking down food particles into energy also requires an oxygen supply.
- ❖ Saying this, breathing is a respiratory process of taking in oxygen and exhaling carbon dioxide.
- ❖ This is also called ventilation.
- ❖ In short, the out and in movements of air into the lungs is called breathing or external ventilation.

### Mechanism of Breathing

- As noted, the breathing rate varies from person to person, ranging from 15-18 times per minute.
- When it comes to understanding the mechanism of respiration, the pressure of air plays a major role.
- The alveolar spaces of the lungs take in air by the active process of inspiration;
- When the pressure inside the lungs exceeds the pressure of the atmosphere, the oxygen comes out as carbon dioxide during expiration.



**Important Pointers About the 'Inspiration' Process:**

- Muscles contract.
- The ribs pull outside.
- Diaphragm contracts.
- The above steps result in the expansion of the chest cavity.
- A minimal amount of air is sucked into the lungs and gets filled into the expanded alveoli region.
- Inside the lungs, the pressure of air and the atmosphere is quite similar.
- Yet, when the lungs expand, the pressure of air will decrease inside the lungs.
- This is the common mechanism of breathing in human beings, irrespective of age, gender and any other physical factors. Note that the inspiration of air takes place only when the thoracic cavity increases in volume.

**Important Pointers About the 'Expiration' Process:**

- On the contrary, expiration is a process of exchanging gaseous matter inside the lungs, to expel the air outside.
- Rib muscles contract.
- Air pressure increases outside of the thoracic region.
- Internal intercostal muscles contract whereas the external intercostal muscles relax.
- The size of the thoracic cavity is reduced, hence ribs pull inwards.
- Abdominal muscles will contract in shape.
- Lungs will compress due to the relaxation of the diaphragm.
- Henceforth, due to an increase in pressure, the air is pushed outside.

## Ques.9 Describe the gross anatomy of the stomach. Explain its physiological functions

## Ans- Stomach

**The Stomach**

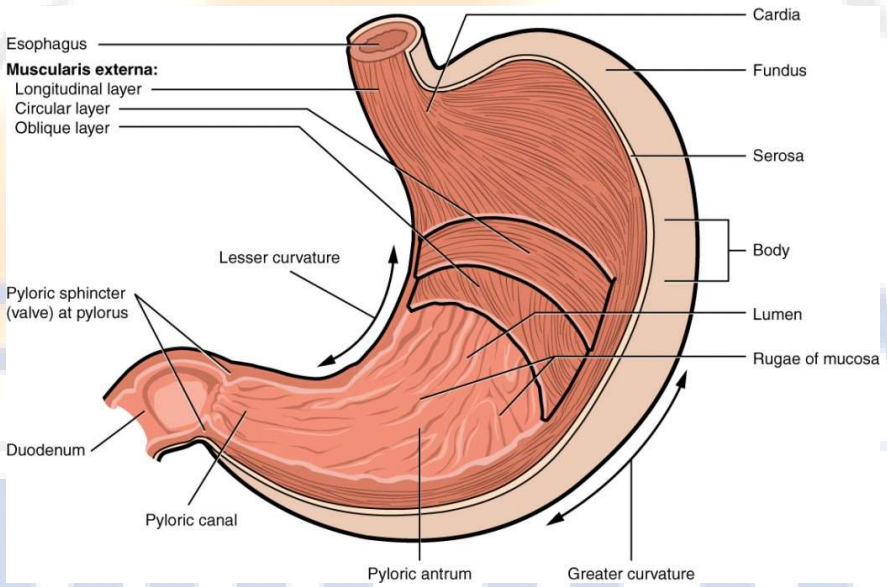
The stomach is an expanded J-shaped organ in the upper left region of the abdominal cavity. In addition to the two muscle layers already described, it has a third, inner oblique (angled) layer that aids in grinding food and mixing it with digestive juices. The left-facing arch of the stomach is the greater curvature, whereas the right surface forms the lesser curvature. The superior rounded portion under the left side of the diaphragm is the stomach's fundus.

**Sphincters:** A sphincter is a muscular ring that regulates the size of an opening. There are two sphincters that separate the stomach from the organs above and below.

Between the esophagus and the stomach is the lower esophageal sphincter (LES). This muscle has also been called the cardiac sphincter because it separates the esophagus from the region of the stomach that is close to the heart. Between the distal, or far, end of the stomach and the small the pyloric sphincter.

**Functions of the Stomach:**

- The stomach serves as a storage pouch, digestive organ, and churn. When the stomach is empty, the lining forms many folds called rugae. These folds disappear as the stomach expands. (The stomach can stretch to hold one half of a gallon of food and liquid.)
- Special cells in the lining of the stomach secrete substances that mix together to form gastric juice. Some of the cells secrete a great amount of mucus to protect the stomach lining from digestive secretions.
- Other cells produce the active components of the gastric juice, which are: Hydrochloric acid (HCI), a strong acid that helps break down protein and destroys foreign organisms. Pepsin, a protein-digesting enzyme produced in an inactive form and activated only when food enters the stomach and HCI is produced.
- **Chyme**, from a Greek word meaning "juice," is the highly acidic, semi-liquid mixture of gastric juice and food that leaves the stomach to enter the small intestine.




**Secretion of gastric juice**

There is always a small quantity of gastric juice present in the stomach, even when it contains no food. This is known as fasting juice. Secretion reaches its maximum level about 1 hour after a meal then declines to the fasting level after about 4 hours.

**There are three phases of secretion of gastric juice:**

1. Cephalic phase. This flow of juice occurs before food reaches the stomach and is due to reflex stimulation of the vagus nerves initiated by the sight, smell, or taste of food. When the vagus nerves have been cut (vagotomy) this phase of gastric secretion stops.

2. Gastric phase. When stimulated by the presence of food the enteroendocrine cells in the pyloric antrum and duodenum secrete gastrin, a hormone which passes directly into the circulating blood. Gastrin, circulating in the blood which supplies the stomach, stimulates the gastric glands to produce more gastric juice. In this way the secretion of digestive juice is continued after the completion of the meal and the end of the cephalic phase. Gastrin secretion is suppressed when the pH in the pyloric antrum falls to about 1.5.

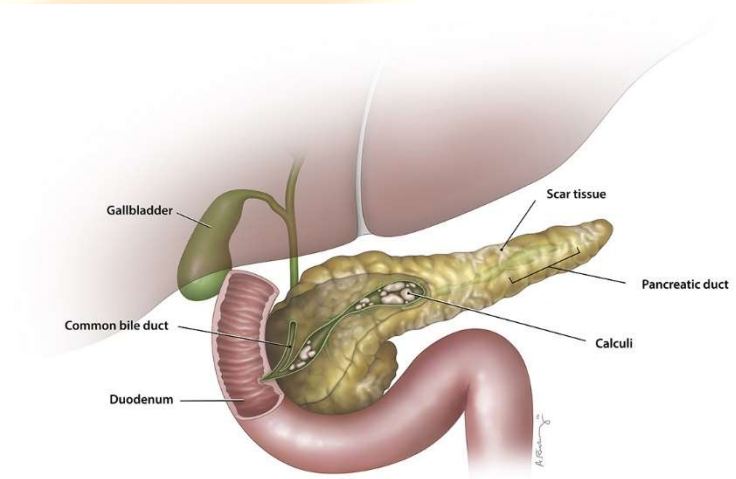
3. Intestinal phase. When the partially digested contents of the stomach reach the small intestine, a hormone complex enterogastrone is produced by endocrine cells in the intestinal mucosa, which slows

down the secretion of gastric juice and reduces gastric motility. Two of the hormones forming this complex are secretin and cholecystokinin (CCK).

## Ques.10 Write the anatomy of the pancreas. Discuss the endocrine and exocrine secretions of pancreas.

**Ans- Pancreas**

- The pancreas is an elongated, tapered organ located across the back of the belly, behind the stomach.
- The right side of the organ—called the head—is the widest part of the organ and lies in the curve of the duodenum, the first division of the small intestine.
- The tapered left side extends slightly upward—called the body of the pancreas—and ends near the spleen—called the tail.




### ➢ Functions of the pancreas

The pancreas has digestive and hormonal functions:

- The enzymes secreted by the exocrine gland in the pancreas help break down carbohydrates, fats, proteins, and acids in the duodenum.
- These enzymes travel down the pancreatic duct into the bile duct in an inactive form.
- When they enter the duodenum, they are activated.
- The exocrine tissue also secretes a bicarbonate to neutralize stomach acid in the duodenum.
- This is the first section of the small intestine.
- The main hormones secreted by the endocrine gland in the pancreas are insulin and glucagon, which regulate the level of glucose in the blood, and somatostatin, which prevents the release of insulin and glucagon.

The pancreas is made up of 2 types of glands:

***Exocrine Function:***

The pancreas contains exocrine glands that produce **enzymes** important to digestion. These enzymes include trypsin and chymotrypsin to digest proteins; amylase for the digestion of carbohydrates; and lipase to break down fats. When food enters the stomach, these pancreatic juices are released into a system of ducts that culminate in the main **pancreatic duct**. The pancreatic duct joins the **common bile duct** to form the **ampulla of Vater** which is located at the first portion of the small intestine, called

the **duodenum**. 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.

***Endocrine Function:***

The endocrine component of the pancreas consists of islet cells (islets of Langerhans) that create and release important **hormones** directly into the bloodstream. Two of the main pancreatic hormones are **insulin**, which acts to lower blood sugar, and **glucagon**, which acts to raise blood sugar. Maintaining proper blood sugar levels is crucial to the functioning of key organs including the brain, liver, and kidneys.

## Ques.11 Explain how digestion of carbohydrates, proteins, and fats takes place.

## Ans- Carbohydrates

All the food you eat goes through your digestive system so it can be broken down and used by the body. Carbohydrates take a journey starting with the intake at the mouth and ending with elimination from your colon. There is a lot that happens between the point of entry and exit.

**1. The mouth**

You begin to digest carbohydrates the minute the food hits your mouth. The saliva secreted from your salivary glands moistens food as it's chewed.

Saliva releases an enzyme called amylase, which begins the breakdown process of the sugars in the carbohydrates you are eating.

**2. The stomach**

From there, you swallow the food now that it's chewed into smaller pieces. The carbohydrates travel through your oesophagus to your stomach. At this stage, the food is referred to as chyme.

Your stomach makes acid to kill bacteria in the chyme before it makes its next step in the digestion journey.

**3. The small intestine, pancreas, and liver**

The chyme then goes from the stomach into the first part of the small intestine, called the duodenum. This causes the pancreas to release pancreatic amylase. This enzyme breaks down the chyme into dextrin and maltose.

From there, the wall of the small intestine begins to make lactase, sucrase, and maltase. These enzymes break down the sugars even further into monosaccharides or single sugars.

These sugars are the ones that are finally absorbed into the small intestine. Once they're absorbed, they're processed even more by the liver and stored as glycogen. Other glucose is moved through the body by the bloodstream.

The hormone insulin is released from the pancreas and allows the glucose to be used as energy.

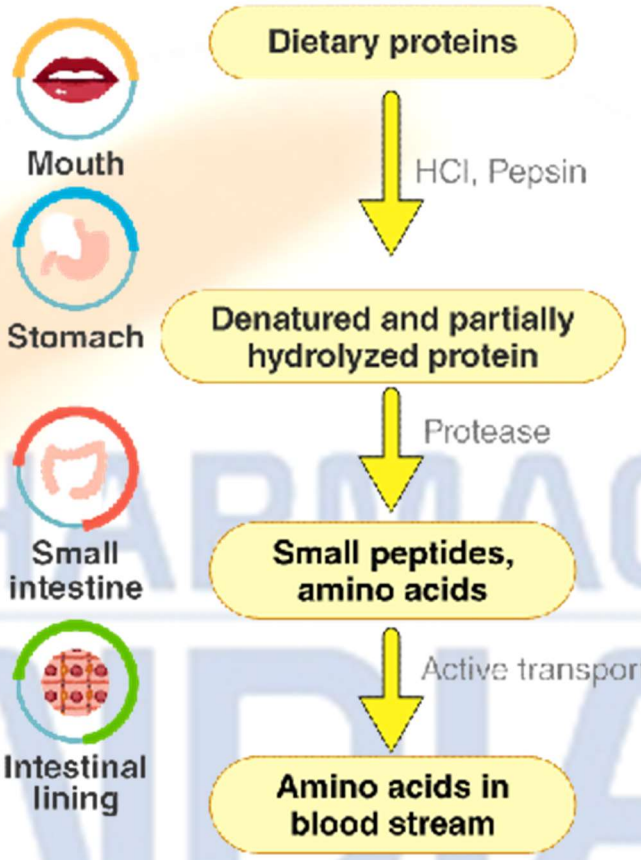
**4. Colon**

Anything that is left over after these digestive processes goes to the colon. It's then broken down by intestinal bacteria. Fibre is contained in many carbohydrates and cannot be digested by the body. It reaches the colon and is then eliminated with your stools.

## ➢ Protein

- Protein absorption also happens in your small intestine, which contains microvilli.

- These are small, finger-like structures that increase the absorptive surface area of your small intestine.
- This allows for maximum absorption of amino acids and other nutrients.
- Once they've been absorbed, amino acids are released into your bloodstream, which takes them to cells in other parts of your body so they can start repairing tissue and building muscle.




## ➢ Fats

- ➢ Fats are a type of lipid that is vital for health. They provide energy, cushion the organs, help cells grow and reproduce, and keep the body warm.
- ➢ Fat digestion begins before food even enters the stomach, with chemical digestion starting in the mouth. The body continues digesting fat as food moves through the digestive tract.
- ➢ Lipids are not water soluble, which means that water cannot absorb them or break them down. Most of the body's digestive enzymes are water-based, so the body must use special enzymes to break down fat throughout the digestive tract.
- ➢ The body begins breaking down fat in the mouth, using enzymes in saliva Trusted Source. Chewing increases the surface area of foods, allowing the enzymes to break down food more effectively. The most important chemicals that help with fat digestion in the mouth are lingual lipase and phospholipids, which turn fats into small drops.
- ➢ While some fat digestion happens in the stomach, most of this process occurs in the intestines.
- ➢ The next step in fat digestion happens when gastric lipase in the stomach further breaks down fats. As the stomach contracts, this process intensifies. The stomach can convert close to 30% of fats into diglycerides and fatty acids by about 2–4 hours after eating.

- Next, the contents of the stomach, including the diglycerides and fatty acids, travel to the small intestine. The liver releases bile, which contains lecithin, bile salts, and emulsifiers that help further break down fats.
- Bile grabs onto the fats, and the emulsifiers increase their surface area, making them easier for digestive enzymes to act on.
- Following this, enzymes break apart fatty acids. Lipase from the pancreas further digests fats into monoglycerides and fatty acids. Bile again grabs onto the fat to help move it to the tiny hair-like projections of the intestines. These projections, called microvilli, help transport the fats into the cells of the digestive system.
- From there, the body must absorb fats. To do this, the broken-down components of the fats regroup into triacylglycerols. These can join with cholesterol, phospholipids, and a protein to form lipoproteins. Lipoproteins enter the lymphatic system, and the body then releases them into the bloodstream.
- As fat digestion requires numerous enzymes, various conditions can affect this process and, as a result, absorption. Liver disorders, small bowel syndrome, and problems with the small intestine can make it more difficult for the body to digest and absorb fat. Due to this, some people with these conditions may notice fatty stools.

# Short Answers

## Ques.1 Discuss the digestion of carbohydrates.

### Ans-

- Carbohydrate digestion begins in the mouth with the mechanical action of chewing and the chemical action of salivary amylase.
- Carbohydrates are not chemically broken down in the stomach, but rather in the small intestine.
- Pancreatic amylase and the disaccharidases finish the chemical breakdown of digestible carbohydrates.
- The monosaccharides are absorbed into the bloodstream and delivered to the liver.
- Some of the indigestible carbohydrates are digested by bacteria in the large intestine.
- Glucose itself participates in regulating its levels in the blood.
- Not all carbohydrates have the same effect on blood-glucose levels.
- The glycaemic response is a measurement of the effects of a carbohydrate-containing food on blood-glucose levels.

## Ques.2 Discuss the food absorption in the small intestine.

**Ans- Small intestine:**

- The small intestine is where many nutrients and minerals, as well as water, are absorbed.
- It secretes digestive juices that aid in food digestion and absorption.
- The pancreatic and gallbladder juices are transferred to the small intestine, where they aid in digestion.

**Absorption of food in the small intestine:**

- The small intestine is divided into three sections: the duodenum (the shortest portion near the stomach), the jejunum (the middle section), and the ileum (the end portion of the small intestine which involves the absorption of remaining products).
- The presence of small finger-like projections called villi in the duodenum aids in food absorption.
- The jejunum has an enterocyte cell lining that digest small nutrients with the help of digestive enzymes.
- The ileum aids in the absorption of bile salts, vitamin B12, and other by-products.
- The hormones cholecystokinin and secretin are produced in the small intestine, and together with digestive enzymes and juices, they result in food absorption and digestion.
- Three types of nutrients are digested in the small intestine: lipids, proteins, and carbohydrates.

## Ques.3 Describe the functions of the liver.

**Ans- Functions of the liver**

This most remarkable organ has many functions that affect digestion, metabolism, blood composition, and elimination of waste. Some of its major activities are:

- The manufacture of bile, a substance needed for the digestion of fats.

- The storage of glucose (simple sugar) in the form of glycogen, the animal equivalent of the starch found in plants. When the blood sugar level falls below normal, liver cells convert glycogen to glucose, which is released into the blood restoring the normal blood sugar concentration.
- The modification of fats so that they can be used more efficiently by cells all over the body.
- The storage of some vitamins and iron.
- The formation of blood plasma proteins, such as albumin, globulins, and clotting factors.
- The destruction of old red blood cells and the recycling or elimination of their breakdown products. One by-product, a pigment called bilirubin, is eliminated in bile and gives the stool its characteristic dark colour.
- The synthesis of urea, a waste product of protein metabolism. Urea is released into the blood and transported to the kidneys for elimination.
- The detoxification (removal of the poisonous properties) of harmful substances, such as alcohol and certain drugs.

## Ques.4 Discuss the factors regulating blood pressure.

**Ans-** Five factors influence blood pressure:

- Cardiac output
- Peripheral vascular resistance
- Volume of circulating blood
- Viscosity of blood
- Elasticity of vessels walls

- Blood pressure increases with increased cardiac output, peripheral vascular resistance, volume of blood, viscosity of blood and rigidity of vessel walls.
- Blood pressure decreases with decreased cardiac output, peripheral vascular resistance, volume of blood, viscosity of blood and elasticity of vessel walls.

**Cardiac Output**

Cardiac output is the volume of blood flow from the heart through the ventricles, and is usually measured in litres per minute (L/min). Cardiac output can be calculated by the stroke volume multiplied by the heart rate. Any factor that causes cardiac output to increase, by elevating heart rate or stroke volume or both, will elevate blood pressure and promote blood flow.

**Peripheral Vascular Resistance**

Peripheral vascular resistance refers to compliance, which is the ability of any compartment to expand to accommodate increased content. A metal pipe, for example, is not compliant, whereas a balloon is. The greater the compliance of an artery, the more effectively it can expand to accommodate surges in blood flow without increased resistance or blood pressure.

**Volume of Circulating Blood**

Volume of circulating blood is the amount of blood moving through the body. Increased venous return stretches the walls of the atria where specialized baroreceptors are located. Baroreceptors are pressure-sensing receptors. As the atrial baroreceptors increase their rate of firing and as they stretch due to the increased blood pressure, the cardiac centre responds by increasing sympathetic stimulation and inhibiting parasympathetic stimulation to increase HR. The opposite is also true.

# HUMAN ANATOMY AND PHYSIOOGY

## Ques.5 Define Atherosclerosis and Congestive cardiac failure.

### Ans- Atherosclerosis

Atherosclerosis is a hardening and narrowing of your arteries caused by cholesterol plaques lining the artery over time. It can put blood flow at risk as your arteries become blocked.

Arteries are blood vessels that carry blood from your heart throughout your body. They are lined by a thin layer of cells called the endothelium. It keeps the inside of your arteries in shape and smooth, which keeps blood flowing.

Atherosclerosis begins with damage to the endothelium. Common causes include:

- High cholesterol
- High blood pressure
- Inflammation, like from arthritis or lupus
- Obesity or diabetes
- Smoking

Symptoms related to your coronary arteries include:

- Arrhythmia, an unusual heartbeat
- Pain or pressure in your upper body, including your chest, arms, neck, or jaw. This is known as angina.
- Shortness of breath

Symptoms related to the arteries that deliver blood to your brain include:

- Numbness or weakness in your arms or legs
- A hard time speaking or understanding someone who's talking
- Drooping facial muscles
- Paralysis
- Severe headache
- Trouble seeing in one or both eyes

Symptoms related to the arteries of your arms, legs, and pelvis include:

- Leg pain when walking
- Numbness

### Cardiac Failure

Heart failure means that your heart cannot pump enough oxygen-rich blood to meet your body's needs. Heart failure does not mean that your heart has stopped or is about to stop beating. But without enough blood flow, your organs may not work well, which can cause serious problems.

Heart failure can affect one or both sides of your heart:

- **With right-sided heart failure**, your heart is too weak to pump enough blood to your lungs to get oxygen.
- **With left-sided heart failure**, your heart cannot pump enough oxygen-rich blood out to your body. This happens when the left side of your heart becomes either:
    - Too weak to pump enough blood.
    - Too thick or stiff to relax and fill with enough blood.

Conditions that can cause heart failure include:

- Arrhythmia (a problem with the rate or rhythm of your heartbeat)
- Cardiomyopathy
- Congenital heart defects or other types of heart diseases that you are born with
- Coronary artery disease
- Endocarditis
- Heart attack
- Heart valve diseases
- High blood pressure
- A blood clot in your lung
- Diabetes

- Certain severe lung diseases, such as COPD (chronic obstructive pulmonary disease)
- Obesity

Symptoms of heart failure may include:

- Feeling short of breath (like you can't get enough air) when you do things like climbing stairs. This may be one of the first symptoms you notice.
- Fatigue or weakness even after rest.
- Coughing.
- Swelling and weight gain from fluid in your ankles, lower legs, or abdomen (belly).
- Difficulty sleeping when lying flat.
- Nausea and loss of appetite.
- Swelling in the veins of your neck.
- Needing to urinate (pee) often.

## Ques.6 Define hypertension and hypotension.

**Ans- Hypertension**

- A condition in which the force of the blood against the artery walls is too high.
- Usually hypertension is defined as blood pressure above 140/90, and is considered severe if the pressure is above 180/120.
- High blood pressure often has no symptoms. Over time, if untreated, it can cause health conditions, such as heart disease and stroke.
- Eating a healthier diet with less salt, exercising regularly and taking medication can help lower blood pressure.

➢ **Hypotension**

- This is a sudden drop in blood pressure when standing from a sitting position or after lying down.
- Causes include dehydration, long-term bed rest, pregnancy, certain medical conditions and some medications.
- This type of low blood pressure is common in older adults.

## Ques.7 Write a short note on digestive enzymes.

**Ans-** Digestive enzymes play a key role in breaking down the food you eat. These proteins speed up chemical reactions that turn nutrients into substances that your digestive tract can absorb.

Your **saliva** has digestive enzymes in it. Some of your organs, including your **pancreas**, **gallbladder**, and **liver**, also release them. Cells on the surface of your **intestines** store them, too.

Different types of enzymes target different nutrients:

- **Amylase** breaks down carbs and starches
- **Protease** works on proteins
- **Lipase** handles fats

**Natural Sources of Digestive Enzymes**

Fruits, vegetables, and other foods have natural digestive enzymes. Eating them can improve your digestion.

- Honey, especially the raw kind, has amylase and protease.
- Mangoes and bananas have amylase, which also helps the fruit to ripen.
- Papaya has a type of protease called papain.
- **Avocados** have the digestive enzyme lipase.
- Sauerkraut, or fermented cabbage, picks up digestive enzymes during the fermentation process.

## Ques.8 Explain the lung volumes and capacities.

## Ans-

- ❖ Lung volumes and lung capacities refer to the volume of air in the lungs at different phases of the respiratory cycle.
- ❖ The average total lung capacity of an adult human male is about 3 litres of air.
  - **ERV:** Expiratory reserve volume: the maximal volume of air that can be exhaled from the end-expiratory position
  - **TLC:** Total lung capacity: the volume in the lungs at maximal inflation, the sum of VC and RV
  - **VC:** Vital capacity: the volume of air breathed out after the deepest inhalation
  - **IC:** Inspiratory capacity: the sum of IRV and TV
  - **FVC:** Forced vital capacity: the determination of the vital capacity from a maximally forced expiratory effort
  - **RV/TLC%:** Residual volume expressed as percent of TLC

## Ques.9 Define hypoxia and asphyxia.

## Ans-

### ❖ Hypoxia

- It is a state in which oxygen is not available in sufficient amounts at the tissue level to maintain adequate homeostasis.
- this can result from inadequate oxygen delivery to the tissues either due to low blood supply or low oxygen content in the blood (hypoxemia).

### ❖ Asphyxia

- Or asphyxiation is a condition of deficient supply of oxygen to the body which arises from abnormal breathing.
- Asphyxia causes generalized hypoxia, which affects primarily the tissues and organs.
- There are many circumstances that can induce asphyxia, all of which are characterized by the inability of a person to acquire sufficient oxygen through breathing for an extended period.
- Asphyxia can cause coma or death.

## Ques.10 Define oxygen therapy and resuscitation.

## Ans-

Oxygen, a gas found in the air we breathe, is necessary for human life. Some people with breathing disorders cannot get enough oxygen naturally. They may need supplemental oxygen, or oxygen therapy. People who receive oxygen therapy often see improved energy levels and sleep, and better quality of life. Oxygen therapy is prescribed for people who cannot get enough oxygen on their own. This is often because of lung conditions that prevents the lungs from absorbing oxygen, including:

- chronic obstructive pulmonary disease (COPD)

- pneumonia
- asthma
- bronchopulmonary dysplasia, underdeveloped lungs in new-borns
- heart failure
- cystic fibrosis
- sleep apnea
- lung disease
- trauma to the respiratory system

When you are not getting enough oxygen, you'll experience a host of symptoms, including:

- rapid breathing
- shortness of breath
- fast heart rate
- coughing or wheezing
- sweating
- confusion
- changes in the color of your skin

There are several different types of oxygen therapies that can be used. These include:

- oxygen gas
- liquid oxygen
- oxygen concentrators
- hyperbaric oxygen therapy

# Very Short Answers

**1. In which part of the respiratory system, gaseous exchange takes place?**
**(a) Alveoli**
(c) Larynx
(b) Pharynx
(d) Trachea

**2. _____is located between two pleural sacs and is the central compartment of the thoracic cavity?**
(a) Hilum
(b) Pleura
**(c) Mediastinum**
(d) Thoracic cage

**3. Which of the following statements is true about involuntary breathing?**
(a) It is controlled by the bronchioles
(b) It is controlled by the pulmonary arterioles
(c) It is controlled by the alveolar-capillary network
**(d) It is controlled by the neurons, located in the medulla and pons**

**4. Which of the following are parts of the human respiratory system?**
(a) Trachea
(b) Diaphragm
(c) The lungs
**(d) All of the above**

**5. Which of the following gas is released out during the process of respiration?**
(a) Oxygen
(b) Hydrogen
**(c) Carbon dioxide**
(d) None of the above

**6. The tiny air sacs present man lungs are called**
**(a) Alveoli**
(b) Bronchus
(c) Bronchioles
(d) All of the above

**7. Which of the following functions by filtering and keeping the mucus and dirt away from our lungs?**
**(a) Cilia**
(b) Bronchioles
(c) Hairs in the lungs
(d) All of the above

**8. The total number of alveoli present in the human lungs is estimated to be around**
(a) 1 billion
(b) 800 million
**(c) 500 million**
(d) 1500 million

**9. The exchange of gases between the external environment and the lungs**

(a) Respiration
**(b) External respiration**
(c) Cellular respiration
(d) None of the above

**10. Which one of the following statements is false about the trachea?**
(a) Has C-shaped rings
**(b) It is covered by epiglottis**
(c) It splits into the right and left lungs
(d) None of the above

**11. The maximum volume of air contained in the lung by a full forced inhalation is called**
(a) Tidal volume
(b) Vital capacity
(c) Ventilation rate
**(d) Total lung capacity**

**12. Which one of the following is correct regarding the larynx?**
(a) It houses the vocal cords
(b) It prevents the invading pathogens into the trachea
(c) It is an organ made of cartilage and connects the pharynx to the trachea
**(d) All of the above**

**13. Which of the following is the function of the trachea?**
(a) Gaseous Exchange
**(b) Filters the air we breathe**
(c) Exhales the air from the body
(d) All of the above

**14. Which of these statements is true about internal respiration?**
(a) Production of ATP
**(b) Exchange of gases between the bloodstream and tissue cells**
(c) Exchange of gases between alveoli and the bloodstream
(d) Breathing between the atmosphere and the alveoli

**15. Which of the following organs functions as an air conditioner?**
(a) Larynx
(b) Pharynx
**(c) Nasal chambers**
(d) All of the above

**16. The gas which stimulates respiration is**
(a) Nitrogen
(b) Oxygen
**(c) Carbon dioxide**

**17. The maximum amount of air that can be expired after the deepest inspiration is called**
**(a) Vital capacity**
(b) Tidal volume
(c) Peak inspiratory volume

**18. Lecithin is a substance present in**

(a) Oropharynx
(b) Bronchial tubes
**(c) Alveoli**

**19. Smoking is one of the causes of**
(a) Hypoxia
**(b) Emphysema**
(c) Narcosis

**20. The most important factor in determining the percent oxygen saturation of hemoglobin is**
**(a) The partial pressure of $O_2$**
(b) Acidity
(c) The partial pressure of $CO_2$

**21. The internal lining of the trachea has a membrane of**
**(a) Ciliated endothelium**
(b) Squamous epithelium
**(c) Connective tissue cells**
(d) Mucous cells

**22. The mediastinum is the name of**
(a) Left lung
(b) Cartilage in the larynx
**(c) Fold in between the Lungs**
(d) Covering on the lungs

**23. During normal breathing, the amount of air that moves into the lungs and comes out is called**
(a) IRV
(b) Residual volume
(c) ERV
**(d) TV**

**24. $PO_2$ stands for:**
(a) Pure oxygen
(b) Partial oxygen
(c) Pressure of oxygen
**(d) Partial pressure of oxygen**

**25. Conchae are present in the**
(a) Cardiac notch
(b) Voicebox
(c) Diaphragm
**(d) Nasal cavity**

**26 . This is the reason why the SA node acts as heart's pacemaker**
(a) because it has a poor cholinergic innervation
(b) because it has a rich sympathetic innervation
(c) because of its capability of generating impulses
**(d) because it generates impulses at the highest rate**

**27. This about second heart sound is incorrect**

(a) it is occasionally split
(b) it is due to the closure of semilunar valves
(c) indicates the commencement of diastole
**(d) it has a longer duration than the first sound**

**28. The reason for the dicrotic notch on the aortic pressure curve is**
(a) contraction of aorta
**(b) closure of the aortic valve**
(c) rapid filling of the left ventricle
(d) closure of the pulmonary valve

**29. Rise in the carotid sinus pressure leads to**
(a) reflex hypercapnia
(b) reflex hyperpnea
**(c) reflex bradycardia**
(d) reflex tachycardia

**30. Peripheral vascular resistance can be best given by**
(a) pulse pressure as it corresponds to aortic compliance and stroke volume
(b) mean arterial pressure as it supplies blood to organs
**(c) diastolic blood pressure as it leads to the decrease till mid-thoracic aorta**
(d) systolic pressure as it causes an increase in the descending aorta

**31. Duration of the absolute period, i.e., when the whole of heart is in diastole is**
**(a) 0.2 seconds**
(b) 0.1 seconds
(c) 0.4 seconds
(d) 0.7 seconds

**32. This sets glomerular capillary pressure apart from other capillaries found in the body**
(a) Lower filtration pressure
**(b) Higher filtration pressure**
(c) Both (a) and (b)
(d) none of these

**33. The ventricular muscles accepts impulses directly from**
(a) AV node
(b) Bundle of His
(c) Right and left bundle branches
**(d) Purkinje system**

**34. This is the similarity between pulmonary and systemic circulation**
(a) total capacity
(b) pulse pressure
(c) peripheral vascular resistance
**(d) volume of the circulation per minute**

**35. On the heart, the impact of adrenaline is all of these except that**
(a) it increases the uptake of oxygen by the heart
(b) it increases the contraction force
**(c) it decreases the myocardial irritability**
(d) it increases the heart rate

**36. ECG (Electrocardiogram) was developed first by**
(a) Wilhelm His
(b) Steward
(c) Hubert Mann
(d) Willem Einthoven

**37. This is the classic ECG change in MI (myocardial infarction)**
(a) ST-segment elevation
(b) T-wave inversion
(c) Development of an abnormal Q wave
**(d) All of these**

**38. In which of these conditions can widen QRS and Tall-tented T waves be observed?**
(a) Hyponatremia
**(b) Hyperkalemia**
(c) Hyperglycemia
(d) Hyperphosphatemia

**39. Hypokalemia is the condition of low potassium levels in your blood. Hypokalemia ECG changes are observed by**
(a) ST segment elevation
**(b) U wave (a position deflection after the T wave)**
(c) Tall peaked T waves
(d) Widening of the QRS complex and increased amplitude

**40. A normal ECG report must consist of the following information**
(a) Rhythm, cardiac axis
(b) Conduction intervals
(c) Description of the ST segments, QRS complexes, T-waves
**(d) All of these**

**41. For the normal heartbeat, depolarization stimulus originates in**
(a) His-bundle areas
(b) Epicardium
**(c) Sinoatrial (SA)node**
(d) Atrioventricular (AV) node

**42. The characteristics – slurring of the initial QRS deflection, shortened PR interval, and prolonged QRS duration are of this condition**
(a) Atrial tachycardia
(b) Left bundle branch block
**(c) WPW (Wolff-Parkinson-White) syndrome**
(d) Myocardial ischemia

**8. P wave indicates**
(a) Depolarization of right ventricle
(b) Depolarization of left ventricle
**(c) Depolarization of both atria**
(d) Atria to ventricular conduction time

**43. Ventricular muscle depolarization is indicated by**

(a) PR interval
(b) P wave
(c) U wave
**(d) The QRS complex**

**44. ECG identified by the PR interval tends to become longer with every succeeding ECG complex until there is a P wave not followed by a QRS is observed in**
(a) Third-Degree Atrioventricular Block
(B) Second-Degree Atrioventricular Block, Type II
**(C) Second-Degree Atrioventricular Block, Type I**
(D) First-Degree Atrioventricular Block, Type II

**45. In which part of the respiratory system, gaseous exchange takes place?**
**(a) Alveoli**
(b) Pharynx
(c) Larynx
(d) Trachea

**46. _____ is located between two pleural sacs and is the central compartment of the thoracic cavity?**
(a) Hilum
(b) Pleura
**(c) Mediastinum**
(d) Thoracic cage

**47. Which of the following statements is true about involuntary breathing?**
(a) It is controlled by the bronchioles
(b) It is controlled by the pulmonary arterioles
(c) It is controlled by the alveolar-capillary network
**(d) It is controlled by the neurons, located in the medulla and pons**

**48. Which of the following are parts of the human respiratory system?**
(a) Trachea
(b) Diaphragm
(c) The lungs
**(d) All of the above**

**49. Which of the following gas is released out during the process of respiration?**
(a) Oxygen
(b) Hydrogen
**(c) Carbon dioxide**
(d) None of the above
Sol. (c) Carbon dioxide.

**50. The tiny air sacs present in human lungs is called_____.**
**(a) Alveoli**
(b) Bronchus
(c) Bronchioles
(d) All of the above

**51. Which of the following functions by filtering and keeping the mucus and dirt away from our lungs?**

**(a) Cilia**
(b) Bronchioles
(c) Hairs in the lungs
(d) All of the above

**52. The total number of alveoli present in the human lungs is estimated to be around _____.**
(a) 1 billion
(b) 800 million
**(c) 500 million**
(d) 1500 million

**53. The exchange of gases between the external environment and the lungs_____.**
(a) Respiration
**(b) External respiration**
(c) Cellular respiration
(d) None of the above

**54. Which one of the following statements is false about the trachea?**
(a) Has C-shaped rings
**(b) It is covered by epiglottis**
(c) It splits into the right and left lungs
(d) None of the above

**55. The maximum volume of air contained in the lung by a full forced inhalation is called _____.**
(a) Tidal volume
(b) Vital capacity
(c) Ventilation rate
**(d) Total lung capacity**

**56. Which one of the following is correct regarding larynx?**
(a) It houses the vocal cords
(b) It prevents the invading pathogens into the trachea
(c) It is an organ made of cartilage and connects the pharynx to the trachea
**(d) All of the above.**

**57. Which of the following is the function of the trachea?**
(a) Gaseous Exchange
**(b) Filters the air we breathe**
(c) Exhales the air from the body
(d) All of the above

**58. Which of these statements is true about internal respiration?**
(a) Production of ATP
**(b) Exchange of gases between the bloodstream and tissue cells**
(c) Exchange of gases between alveoli and the bloodstream
(d) Breathing between the atmosphere and the alveoli

**59. Which of the following organs functions as an air conditioner?**
(a) Larynx
(b) Pharynx
**(c) Nasal chambers**

(d) All of the above

**60. The normal breathing process is controlled by _____.**
(a) Lungs
(b) Ventral respiratory group
(c) Dorsal respiratory group
**(d) Both (b) and (c)**

**61. In Aves, the exchange of gases occurs within the _____.**
**(a) Lungs**
(b) Air sacs
(c) Air sacs and Lungs
(d) None of the above

**62. Which of the following statements is true about the entry of air into the lungs?**
**(a) Air enters the body and travels to the lungs through the mouth and the nose**
(b) Air enters the body and travels to the lungs through the oesophagus and gullet
(c) Air enters the body and travels to the lungs through the windpipe and the pores
(d) Air enters the body and travels to the lungs through the nose and the nervous system.

**63. The windpipe is also called the _____.**
(a) Larynx
(b) Lungs
**(c) Trachea**
(d) Oesophagus

**64. In Earthworms, the process of respiration is through _____.**
**(a) Skin**
(b) Head
(c) Lungs
(d) Pores on its anterior end

**65. The enzymes present in pancreatic juice are**
(a) Amylase, Trypsinogen, Peptidase, Rennin
**(b) Trypsinogen, Lipase, Amylase, Procarbo-xypeptidase**
(c) Peptidase, Pepsin, Amylase, Rennin
(d) Maltase, Amylase, Trypsinogen, Pepsin

**66. Which of the following hormones stimulates the production of pancreatic juice and bicarbonate?**
(a) Insulin and glucagon
**(b) Cholecystokinin and secretin**
(c) Gastrin and insulin
(d) Angiotensin and epinephrine

**67. Infants' gastric juice contains**
(a) nuclease, pepsinogen, lipase
(b) maltase, pepsinogen, rennin
(c) amylase, rennin, pepsinogen
**(d) pepsinogen, lipase, rennin**

**68. The absorption of fructose by intestinal mucosa is**

(a) co--transport mechanism
(b) simple diffusion
**(c) facilitated transport**
(d) active transport

**69. Carboxypeptidase requires _____ for its activity**
(a) copper
(b) niacin
(c) iron
**(d) Zn**

**70. Na+ and other carrier ions facilitate absorption of**
(a) amino acids and fructose
(b) fatty acids and glycerol
(c) fatty acids and glucose
**(d) amino acids and glucose**

**71. Secretin and cholecystokinin are secreted in**
(a) pyloric region
(b) Ileum
**(c) duodenum**
(d) Oesophagus

**72. Which of the following hydrolytic enzymes act in low pH?**
(a) Peroxidases
(b) Hydrolases
(c) Amylases
**(d) Proteases**

**73. Which of the following is synthesized and stored in the liver cells?**
(a) Galactose
(b) Lactose
**(c) Glycogen**
(d) Arabinose

**74. The disease caused due to deficiency of nicotinic acid is**
(a) anaemia
(b) osteomalacia
(c) xerophthalmia
**(d) pellagra**

**75. The small intestine has three parts. The first part is called**
**a) Duodenum**
b) Oesophagus
c) Larynx
d) None of the above

**76._____ is a characteristic feature of epithelial cells of the intestine**
a) Glottis
b) Pilus
c) Bolus
**d) Microvilli**

**77. An infant feeding entirely on the mother's milk passes stools that are coloured yellow. What is the reason for this?**

a) Casein
**b) Bile pigments**
c) Pancreatic pigments
d) None of the above

**78. A dental condition that is characterized by hyper mineralization of teeth enamel due to excessive intake of _____. The teeth often appear mottled.**

a) Sodium
b) Calcium
**c) Fluoride**
d) Mercury

**79. Spicy food, coupled with anxiety, may lead to _____**

**a) Indigestion**
b) Hypotension
c) Seizures
d) None of the above

**80. One of the reasons why some people cough after eating a meal may be due to the improper movement of _____**

a) Larynx
b) Diaphragm
c) Neck
**d) Epiglottis**

**81. _____ is a protein deficiency disorder**

a) Scurvy
b) Anaemia
**c) Kwashiorkor**
d) None of the above

**82. In frogs, the surface of the attachment for the tongue is _____**

a) Tympanum
b) Palate
c) Pterygoid
**d) Hyoid apparatus**

**83. Doctors will suggest _____ if person is suffering form high blood cholesterol.**

a) Ghee
**b) Vegetable Oil**
c) Dalda
d) Lard

**84. Chymosin is also known as _____**

a) Lipase
b) Amylase
c) Trypsin
**d) Rennin**

**85. In humans, lacteals are found in _____**

**a) Ileum**
b) Oesophagus
c) Ear
d) None of the above

**86. Nyctalopia can occur due to the deficiency of**

**a) Vitamin A**
b) Vitamin C
c) Vitamin K
d) Vitamin B2

**87. Pancreatic juice is stimulated by the release of**

a) Secretin
b) Cholecystokinin
c) Enterokinase
**d) Both (1) and (2)**

**88. _____ stimulates the production of gastric juice in the stomach**

**a) Gastrin**
b) Enterokinase
c) Rennin
d) Digestin

**89. Enterokinase helps in the conversion of**

a) Lactose to Sucrose
**b) Trypsinogen into trypsin**
c) Pepsinogen into pepsin
d) Proteins into polypeptide

**90. What is the enzyme that breaks down lactose?**

a) Lipase enzymes
b) Pepsin
c) Amylase
**d) Lactase**