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**ANSWER NO1:**

The circulatory system in human body is made up of the channels in which blood can flow called the blood vessels. These blood vessels contribute to our circulatory system by transporting important things like nutrients, oxygen, carbon dioxide etc. These vessels are the mean of transportation.

Our circulatory system consists of three types of vessels:

1. **Arteries**
2. **Veins**
3. **Capillaries**

**DIFFERENCE BETWEEN AETERIES, VEINS AND CAPILLARIES**

**ARTERIES**

Arteries are those bold vessels which carry oxygenated blood from the heart to different parts of the body.

The colour of the arteries is red due to the presence of oxygenated blood in them. All of the arteries carry oxygenated blood except pulmonary artery.

The largest artery of the body is aorta which arises from left ventricle and then divides and re-divides into smaller branches called arterioles.

The smallest arteries are the arterioles. They have a diameter ranging from 3 to 10 micrometres.

**Anatomy of Arteries**

The walls of arteries are composed of three layers:

1. **Tunica Externa**

Tunica Externa is the outer most layers of arteries and it consists of loose fibrous tissues called Tunica externa. These fibres give elasticity to the arteries to expand and withstand the blood pressure.

1. **Tunica Media**

It is the middle layer of arteries which consists of circular smooth muscles and elastic tissues called Tunica media.

1. **Tunica Interna**

It is the inner layer of arteries which consists of scale like epithelium tissues and a thin layer of connective tissues called Tunica interna.

**VEINS**

Veins are those blood vessels which carry all the deoxygenated blood from all parts of the body, except from pulmonary vein, which has oxygenated blood.

The colour of the vein is blue due to the presence of deoxygenated blood.

The average pressure in the veins is only 2mmHg.

The largest veins in human body are:

1. **Superior vana cava:** It brings deoxygenated blood from head and upper region of the body to right auricle.
2. **Inferior vana cava**: It brings the deoxygenated blood from lower parts of the body.

**Anatomy of Veins**

The wall of vein is made up of three layers:

1. **Tunica Externa:**

The outer layer of vein consists of loose fibrous tissues called Tunica externa.

1. **Tunica Media:**

The middle layer of vein consists of circular smooth muscle and elastic tissue called Tunica media. The middle layer is thinner and less elastic as compared to that of arteries.

1. **Tunica Interna:**

The inner layer of vein consists of epithelium tissues and thin layer of connective tissue called Tunica interna.

**CAPILLARIES**

These are the smallest microscopic blood vessels which are only one cell thick. A capillary is so thin that only one RBC can pass through it a time. The diameter of a capillary is little more than the RBC that is 7.5nano meter.

The function of capillary is to exchange nutrients, gases, hormones between the blood and tissue.

The flow of blood in capillary is adjusted by pre-capillary sphincter. It is a band of smooth muscle that encircles each capillary branch at the point where it branches off from arteriole. The contraction of pre-capillary sphincter can close the branches, stopping the blood flow.

**Structure of Capillaries:**

The capillaries wall is made up of only endothelial cells. Capillaries connect arterioles with venues.

**Answer no: 2**

An antibody is a protein which is produced by B lymphocytes in response to the presence of an antigen. Antibodies are Gama globulin in nature and they are also called Immuno-globulin. They form 20% of total plasma proteins. Antibodies enter almost all the tissues in the body.

**Classes of antibodies**

There are five classes of antibodies and they have different characteristics according to their H- chains:

1. Ig-G
2. Ig-M
3. Ig-A
4. Ig-E
5. Ig-D

**Ig Gamma**

Ig gamma is the most abundant antibody in the blood. It is found in blood, lymph and intestine. 70 to 75% of antibodies are these. They detoxify the harmful substances and are important in the recognition of antigen-antibody complexes by leukocytes and macrophages. IgG is the only class of antibodies which is transferred to the fetus through the placenta and protects it until its own immunity is developed.

**Ig Mu**

Ig Mu circulates in the blood and it is about 5 to 10% of all antibodies in our blood. It is also found in lymph. It is the largest Ig which is secreted first by the plasma cells. IgM has a j-chain and has penta-meric structure in which five basic Y-shaped molecules are linked together. IgM is the oldest immunoglobulin class. It is the first antibody which is synthesised by B cells in the fetus. IgM is 500-1000 times more effective than IgG in bacterial action but in neutralization of toxins and viruses it is less active than IgG.

**Ig Alpha**

Ig Alpha is abundant in serum. It is mainly found in sweat, tears, saliva, mucus, first milk secreted by a mother and gastrointestinal secretions. 10 to 15% of our antibodies are these. IgA in breast milk protects the gastrointestinal tract of new born babies from pathogens. Smaller quantities are present in blood and lymph. IgA has an extra polypeptide called a J-chain and extra protein known as secretory component. Levels decrease during stress, lowering resistance to infection. It provides localized protection in external secretions like tears against bacteria and viruses.

**Ig Epsilon**

Ig Epsilon is present in minute amounts in our bodies. They are just 0.001% of all antibodies in our bodies. It protects us against parasites. In regions where the parasitic infection is rare, IgE is involved in allergies.

**Ig Delta**

Ig Delta is less than 1% of antibodies in our body. IgD may be involved in the induction of antibody production in B cells, but its exact function is unknown.

**Characteristics of Antibodies**

1. **Long Memory:** They respond many years after their initial exposure due to memory T cells and B cells.
2. **Specific:** Their actions are specifically directed against antigens that initiate the response.
3. **Inflammatory Response:** The combine effect of cells like T cells, B cells, macrophages.
4. **20% of total plasma:** Antibodies account for 20% of the total blood plasma proteins.

**Answer No: 3**

A lymph duct is the lymphatic vessel a part of lymphatic duct that empties lymph into one of the subclavian vein.

There are two lymph ducts in our body which receive lymph from the lymph trunks. These are the largest lymph vessels.

1. **Right lymphatic duct**

The right lymphatic duct receives lymph from the right and upper halves of the body, including the right sides of the jugular, bronchomediastinal, and subclavian lymph trunks.

1. **Thoracic duct.**

The thoracic lymph duct is the largest lymph vessel in the body. It takes lymph from the lower and left halves of the body. Because the thoracic lymph duct drains the intestinal lymph trunks, it carries a mixture of lymph and emulsified fatty acids back in to the bloodstream. The thoracic duct drains into to the left subclavian vein while the right duct drains into the right subclavian vein, both at the junction between the vein and the jugular vein. The two subclavian veins then merge into the vena cava, the large vein that brings deoxygenated blood to the heart.

**Lymph valves**

Both of the lymph ducts have internal valves at their junction with the sub clavian vein. These lymphatic valves prevent venous blood from flowing into the lymph duct. This point is the end of lymph fluid flow through the lymphatic system.

**Significance**

The significance of the lymphatic ducts is that they carry the lymph. They are the means of transport in the lymphatic system.

**Answer No: 4**

**Clinical Manifestations of Kidney diseases**

1. **Cardiovascular**

Blood pressure and heart rate increases, the ECG changes and abnormal heart sounds are observed. Fluid retention with peripheral edema or pulmonary edema.

1. **Integumentary**

Bruises, pruritus, dry skin, skin color changes ashen grey to yellowish, dry brittle hair and nails are all a sign.

1. **Gastrointestinal**

Anorexia, nausea, vomiting, metallic taste in mouth, bleeding in gastrointestinal tract.

1. **Hematological**

Anemia, weakness, fatigue, pallor lethargy, bleeding due to impaired platelet aggregation.

1. **Neurological**

Peripheral neuropathy, restless legs, changes in level of consciousness, lethargy, confusion, encephalopathy, altered motor function.

1. **Renal**

Decreased urine output, azotemia, proteinuria, hematuria, hyperuricemia.

1. **Musculoskeletal**

Renal osteodystrophy and decreased calcium, vitamin D impairment, hyperparathyroidism and pathological fractures.

1. **Respiratory**

Increase respiratory rate, kussmaul respirations, crackers, decreased Po2.

1. **Immune**

There is an increased risk of infection.

**Functions of Kidney**

Kidneys are an organ of the urinary system which has four types of functions:

1. **Excretory function**

The excretory function is formation and excretion of urine. Following are the main steps involved:

* Glomerular filtration

It is primary function in making urine. In this process, kidneys filter excess fluid and waste products out of the blood into urine collecting tubules of the kidney, to eliminate from your body.

* Tubular reabsorption

It is a process that moves solutes at water out of filtrate and back into bloodstream. This process is known as reabsorption because it absorbs in the blood again.

* Tubular secretion

It is opposite of reabsorption process this is caused by active transport and passive diffusion. The material is transferred from tubular capillaries to the renal tubular lumen. Very few substances are secreted and typically waste products.

1. **Homeostatic function**

Following are the homeostatic functions:

* **Regulate blood volume and blood pressure:**

It adjusts the volume of water last in urine and releases erythropoietin and renin.

* **Regulating plasma ion concentration:**

By controlling quantities lost in urine they regulate sodium, potassium and chloride ions. They also maintain the level of calcium ions.

* **Help stabilize blood pH:**

It helps to stabilize blood pH by controlling loss of hydrogen ions and bicarbonate ions in urine.

* **Conserve valuable nutrients:**

By prevention of excreting organic waste products, they conserve valuable nutrients.

* It also helps to assist liver to detoxify poisons.
1. **Endocrine function**

Kidneys have primary endocrine function they produce hormones. The kidneys are site of degradation for hormones such as insulin and aldosterone the kidney produce erythropoietin, renin, and prostaglandin. When the oxygen content in the blood is lowered kidney secretes erythropoietin. It acts on bone marrow and stimulates the production of red blood cells. Renin is released into circulation by the kidney. It stimulates the formation of angiotensin in the blood and tissues. The release of renin includes reduction of renal pressure and hypernatremia. Kidney releases aldosterone, it is on distal tubular network. It increases the effect in sodium reabsorption in exchange of potassium.

1. **Metabolic functions:**

During the times of starvation kidney performs a function known as gluconeogenesis. It is the formation of glucose within our body by liver and kidney using amino acids from proteins, glycerol from fats, or lactate produced by muscle during anaerobic glycolysis.

**Answer No: 5**

The circulatory system occurs in two circuits and the blood is passes through the heart two times. One circuit is called Systemic Circulation and the other one is Pulmonary Circulation.

**Difference between Systemic and Pulmonary Circulation**

|  |  |
| --- | --- |
| **SYSTEMIC CIRCULATION**1. The systemic circulation carries oxygenated blood from the left ventricle of the heart to the rest of the body through aorta.
2. It carries deoxygenated blood from the body to the right atrium of the heart by the superior and inferior vena cava.
3. It is composed of inferior and superior vena cava, aorta and other small blood vessels.
4. It carries blood throughout the body.
5. It helps to provide nutrients and oxygen to the metabolizing cells in the body.
 |  **PULMONARY CIRCULATION**1. The pulmonary circulation carries deoxygenated blood from the right ventricle of the heart to the lungs through pulmonary artery.
2. It carries oxygenated blood from the lungs to the left atrium of the heart by the pulmonary vein.
3. It is composed of pulmonary vein and pulmonary artery.
4. It carries blood to the lungs.
5. It helps to release Carbon dioxide from the blood and dissolve oxygen in the blood.
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**Myocardial Infraction**

The word **Infraction** means “to plug up or cram” it refers to the clogging of the artery. Myocardial infraction is a heart attack. It occurred when blood flow increases or stops to the part of heart. It causes damage to the heart muscles.

**Signs and Symptoms of Myocardial Infraction**

The symptoms of heart attack include:

1. Pressure and tightness ,
2. Squeezing or aching sensation on the chest or arms.
3. Pain which can spread on our neck back or jaw.
4. Shortness of breath
5. Fatigue
6. Cold sweat
7. Nausea, in-digestion and abdominal pain.
8. Sudden dizziness
9. You may feel pain during heavy work and anxious face would be prominent.