

RADIOLOGY SEC B PHYSIOLOGY, 2ND SEMESTER MAM KOUSAR SHAH JEHAN STUDENT NAME: MOHAMMAD RAUF ID_16877

Attempt all questions. Every question carry 10 marks.

Q1. Write the functions and composition of blood?

Functions of blood

The prime role of blood is to supply oxygen and nutrients to, and remove wastes from the body cells. The particular functions of blood also incorporate defense, distribution of heat, and protection of homeostasis.

Nutrients from the foods are absorbed in the digestive tract. Most of these travel in the bloodstream directly to the liver, where they are treated and released back into the bloodstream for supply to body cells. Oxygen from the air we breathe disperses into the blood, moves from the lungs to the heart, which then propels it to the rest of the body. Furthermore, endocrine glands sprinkled throughout the body release hormones into the bloodstream, which carries them to distant target cells. Blood also picks up cellular wastes and byproducts, and transmits them to various organs for removal. For example, blood transfers carbon dioxide to the lungs for exhalation from the body, and numerous waste products are transported to the kidneys and liver for excretion from the body in the form of urine or bile.

Many kinds of WBCs guard the body from outside threats, such as disease-causing bacteria that have entered the bloodstream in a wound. Other WBCs find out and destroy internal threats, for example cells with transmuted DNA that could multiply to become cancerous, or body cells infested with viruses.

When damage to the vessels ends in bleeding, blood platelets and certain proteins dissolved in the plasma, unite to create clots which block the broken areas of the blood vessels involved.

This defends the body from extra blood loss.

Composition of blood

Blood is a body fluid in humans and other animals that transports essential constituents such as oxygen and nutrients to the cells and transmits metabolic waste products away from those same cells.

In vertebrates, it is comprised of blood cells hovering in blood plasma. Plasma comprises 55% of blood fluid, is mostly water (92% by volume), and comprises glucose, proteins, hormones, mineral ions, carbon dioxide, and blood cells. Albumin is the key protein in plasma, and its job is to control the colloidal osmotic pressure of blood. The blood cells are chiefly red blood cells (RBCs or erythrocytes), white blood cells (WBCs or leukocytes) and platelets (thrombocytes). The most plentiful cells in vertebrate blood are red blood cells which contain hemoglobin, a protein containing iron, which enables oxygen transport by reversibly binding to this respiratory gas and greatly increasing its solubility in blood.

Vertebrate blood is bright red when its hemoglobin is oxygenated and dark red when it is deoxygenated. Some animals, for example mollusks and crustaceans, use hemocyanin to carry oxygen, instead of hemoglobin. Insects and some mollusks use a fluid called hemolymph in place of blood, the difference is that hemolymph is not contained in a closed circulatory system. In many insects, the blood does not contain oxygen-carrying molecules such as hemoglobin because their bodies are small enough for their tracheal system to serve for supplying oxygen.

Q2. What is erythrocyte, erythropoiesis, erythrocytosis and erythropenia?

Erythrocyte

A red blood cell in humans is normally a biconcave disc without a nucleus. Erythrocytes include the pigment haemoglobin, which gives the red colour to blood, and transport oxygen and carbon dioxide to and from the tissues.

This type of blood cell is made in the bone marrow and is found in the blood. Erythrocytes contain a protein called hemoglobin, which carries oxygen from the lungs to all parts of the body. Checking the number of erythrocytes in the blood is typically part of a complete blood cell (CBC) test. It is often used to look for conditions such as dehydration, anemia, malnutrition, and leukemia. It is also called RBC and red blood cell.

A process whereby a portion of primitive multipotent HSCs becomes dedicated to the red-cell lineage. It involves highly specified functional differentiation and gene expression. The key role of RBCs is to carry O₂ in the blood by the hemoglobin molecule. Hence, erythropoiesis needs to be tightly controlled to preserve homeostasis and to meet changes in O₂ supply and demand.

The main factor in the regulation of erythropoiesis is the hormone erythropoietin (Epo), vital for definitive erythropoiesis in all vertebrates. Epo combines with the erythropoietin receptor (EpoR) on erythroid progenitors, energizing a conserved intracellular signaling program that regulates vertebrate erythropoiesis. In fish, Epo and its receptor have low amino-acid sequence character compared with mammalian species. All the same, the critical functional remains and the physiological role in the regulation of erythropoiesis are well preserved.

Erythrocytosis

Erythrocytosis is a state in which our body makes too many red blood cells (RBCs), or erythrocytes. RBCs transmit oxygen to our organs and tissues. Too many of these cells makes our blood thicker than normal and results in blood clots and other complications.

There are two types of erythrocytosis:

- Primary erythrocytosis. This type is caused by a problem with cells in the bone marrow, where RBCs are produced. Primary erythrocytosis is sometimes inborn.
- Secondary erythrocytosis. A disease or the usage of some drugs can cause this type. The number of people with secondary erythrocytosis may be higher, but it's tough to get an exact number because there are so many possible causes.

Erythropenia

A decrease in the number of erythrocytes linked with anemia.

Q3. What is platelets and write about clotting mechanism and its all steps?

Platelets

Platelets are minute blood cells that help our body form clots to cease bleeding. If one of our blood vessels gets damaged, it sends signals to the platelets. The platelets then haste to the site of damage. They form a plug (clot) to repair the damage.

The process of scattering across the surface of a broken blood vessel to stop bleeding is called adhesion. This is because when platelets goes to the site of the injury, they grow adhesive tentacles that help them stick to one another. They also send chemical signals to appeal more platelets. The additional platelets accumulate onto the clot is a process called aggregation.

Clotting mechanism and its all steps

Clot is blood that has been converted from a liquid to a solid state. It is also called a thrombus. The process by which a blood clot is formed is termed as coagulation. A blood clot or thrombus is static within a vessel or the heart.

The process works as follows:

- Injury
A minor tear in a blood vessel wall (a cut on the skin or an internal injury) causes bleeding.

- Vessel constriction
To control blood loss, the blood vessel narrows (also called constriction), limits blood flow through the vessel.
- Platelet plug
In reply to the injury, tiny cells in the blood called platelets are activated. The platelets adhere to one another and to the wound site and forms a plug. The protein von Willebrand factor (VWF) helps the platelets stick to one another and to the blood vessel wall.
- Fibrin clot
Then, clotting factor proteins activate production of fibrin, which is a strong substance that forms a fibrin clot, a mesh-like net that keeps the plug stable and firm. Over the next several days to weeks, the clot improves and then melts as the wounded blood vessel wall cures.

Q4. Write a detail note on ABO system?

ABO blood group system is the sorting of human blood which is based on the inherited properties of red blood cells (erythrocytes) determined by the presence or absence of the antigens A and B, which are carried on the surface of the red cells. Persons may have type A, type B, type O, or type AB blood. The A, B, and O blood groups were first recognized by Austrian immunologist Karl Landsteiner in 1901

Blood which contain red cells with type A antigen on their surface has in its serum (fluid) antibodies against type B red cells. If, in transfusion, type B blood is inserted into persons with type A blood, the red cells in the injected blood will be destroyed by the antibodies in the receiver's blood. In the same way, type A red cells will be destroyed by anti-A antibodies in type B blood. Type O blood can be inserted into persons with type A, B, or O blood unless there is incompatibility with respect to some other blood group system also present. Persons with type AB blood can receive type A, B, or O blood.

Blood group O is the most common blood type, especially among peoples of South and Central America. Type B is frequent in Asia, particularly in northern India. Type A is also common all over the world; the highest occurrence is among Australian Aboriginal peoples, the Blackfoot Indians of Montana, and the Sami people of northern Scandinavia.

The ABO antigens are grown well before birth and remain throughout life. Children acquire ABO antibodies inactively from their mother before birth, but by three months of age infants make their own; it is supposed that the stimulus for such antibody formation is from interaction with ABO-like antigenic substances in nature. ABO

mismatch, in which the antigens of a mother and her fetus are different enough to cause an immune reaction, occurs in a small number of pregnancies. Rarely, ABO incompatibility may give rise to erythroblastosis fetalis (hemolytic disease of the newborn), a type of anemia in which the red blood cells of the fetus are devastated by the maternal immune system. This state occurs most often when a mother is type O and her fetus is either type A or type B.

Q5.(i) A person fell down from a tree and become unconscious, with bleeding from head, what will you do as a first aid?

- I will approach him calmly and comfortingly be alert to any dangers to either me or the casualty
- I will not rush to move him. I will get onto the floor so that I am at the same level as him and immediately assess:
 - Is he responsive?
 - Not responsive – is he breathing?
 - He is breathing. I will look closely how he has fallen and carefully put him into the recovery position to keep his airway clear
 - He is not breathing: I will start CPR immediately and act according to our organization's emergency policy. I will request a defibrillator immediately if there is one available.
- If the person is responsive
 - I will talk to him and will try and determine how the accident happened
 - I will try and work out where it hurts most and look at him closely to see if there is any obvious bleeding, bashing or knotted limbs indicating a particular injury.
 - If he is conscious and if he has fallen from a height or has injured his neck or spine – I will not move him. I will try and keep him as still as possible and discourage him from twisting. I will phone an ambulance and calmly keep reassuring him until paramedics arrive.
 - If there is any bleeding, I will apply firm pressure with a clean pad whilst awaiting the First Aid kit.
 - If he starts to show signs of clinical shock – I will lie him back and raise his legs and get medical help
- If there is no obvious injury or medical cause for the fall
 - I will carefully and very slowly help him into a sitting position – watch him carefully for any signs of pain, distress or faintness
 - I will carefully assist him into a chair, or back to bed.
 - I will carefully and reassuringly check him over completely to ensure that there is no unseen injury.

I will monitor him carefully for the next 24 hours, inform his next of kin and fill in an accident form.

(ii) you have to meet with your friend and you came to know he is covid positive, what precautionary measures will you take?

- First of all I would like to stay at home because it is the best remedy to fight against the covid-19
- But, if I have to meet him, I would cover my face and nose with a mask.
- Before leaving home, I would wash my hands with a soap for 20 seconds
- After reaching at my friend's place, I would maintain a distance of about 6 feet
- I will avoid hand shake with him
- Before entering his place I will make sure that my hands are clean and my face and nose are covered with a mask
- I will make sure that I don't touch any of utensils which are used by him
- When I leave him, I will again wash my hands with a soap for 20 seconds.