

Chapter - 18 Body Fluids and Circulation

Question-1

A cardiologist observes an enlarged QR wave in the ECG of a patient? What does this indicate?

Solution:

The enlarged QR wave indicates myocardial infraction.

Question-2

What is joint diastole?

Solution:

During blood circulation, when both the atria and ventricles are in the relaxed phase, it is called joint diastole.

Question-3

Define pulse rate. Describe the factors involved in maintaining the pulse pressure.

Solution:

The number of times the heart beats in a minute is known as pulse rate. It has been observed that the pulse beats at the same rate as the heart beats. Hence the average pulse rate is 72 beats per minute. The factors involved in maintaining the pulse pressure are as follows:

- (i) The amount of blood in the arteries.
- (ii) The cardiac output.
- (iii) The elasticity of the arterial walls.
- (iv) The viscosity of the blood.

Question-4

What transmits the cardiac impulse from the atria to the ventricles?

Solution:

Atrioventricular Node (AV Node) collects the wave of contraction generated by SA Node and passes down to ventricles. SA node determines the rate of heart beat, so it is called pacemaker of the heart.

Question-5

What is SA node? Where is it located and what is its function? What is the other name for SA node?

Solution:

The sinuauricular node is the point where the heart beat is initiated. It is located near the junction of the superior vena cava and the right auricle. It acts as a pacemaker. The other name for the SA node is the pacemaker or pace setter of the heart.

Question-6

Where does the cardiac impulse originate?

Solution:

The cardiac impulse originates in the cardiac muscle fibres and is not transmitted to the heart through any nerves. Hence the origin of cardiac impulse is said to be myogenic.

Question-7

From which cells do platelets originate? What is their life span? How do they act when blood vessels get injured?

Solution:

Platelets are produced from megakaryocytes present in the bone marrow. The life span of platelets is 3 to 7 days only. They are destroyed by phagocytes in the blood. When a blood vessel is damaged, the clotting process is initiated in mammals. They form a plug at which point thromboplastin is secreted. Thromboplastin helps in blood clotting.

Question-8

What is haemolysis?

Solution:

Haemolysis is the destruction of RBC.

Question-9

How are allergies related to the body's immune system?

Solution:

Allergy occurs when the antigen and antibody reaction takes place inside the tissues. The agent, which causes the allergy is known as an allergen. Allergens trigger the formation of antibodies in the body. If the body's immune system is weak, then enough antibodies are not produced. This makes the body susceptible to various allergies. The first exposure of an allergen to the body does not produce symptoms of allergy but it stimulates the formation of antibodies. But in case of a second exposure, the allergen combines with the antibody-bound mast cells. This reaction causes the cell to burst and subsequently histamine is released causing an inflammatory response.

Question-10

RBC of mammals are nucleated or without nucleus?

Solution:

RBC of mammals are without nucleus.

Question-11

What is Rh factor? In which animal was it first discovered? How is the foetus with Rh-positive blood affected if the mother is Rh-negative?

Solution:

Besides A and B, another antigen called Rh factor was found in the erythrocytes of certain persons. The Rh factor was discovered by Landsteiner in Rhesus monkeys. About 85% of the people are Rh⁺. They have Rh⁺ antigens. Rh factor is expressed by the dominant R gene. Rh positive individuals are RR or Rr, while Rh negative are rr. Disorders may arise as a result of incompatibility of gene products in the blood of newborns and their mothers. The incompatibility may lead to hemolytic disorders in the child and may even be fatal if not attended to.

If a woman is Rh⁻ and her husband is Rh⁺, then the child may be Rh⁺. Blood from the foetus may pass into the maternal blood stream and stimulate the formation of antibodies. When the same woman becomes pregnant a second time, some of these antibodies may pass into the child's blood stream and cause clumping of RBC cells. This is called erythroblastosis foetalis. In extreme cases, many red cells are destroyed that the foetus dies before birth. More frequently, it is born alive but dies after birth.

Question-12

In which mammal, is the RBC found to nucleated?

Solution:

In the camel the RBC is found to be nucleated.

Question-13

Name the smallest blood vessel and largest artery in the body.

Solution:

Smallest - Capillary,

Largest - Aorta

Question-14

Differentiate between erythrocytes and leucocytes.

Solution:

Erythrocytes	Leucocytes
(1) These are called RBCs.	(1) These are called WBCs.
(2) Their number is about 4.5 to 5 million per mm ³ .	(2) Their number is about 5000 to 8000 per mm ³ .
(3) They are red coloured.	(3) They are colourless.
(4) They are enucleated.	(4) They are nucleated.
(5) They do not play a role in the defence and immunity of the body.	(5) They play an important role in the defence and immunity of the body.
(6) Their size is about 8-9μ m.	(6) Their size is about 11-20μ m.
(7) They are of one type.	(7) They are of five types.
(8) Their life span is for 120 days.	(8) Their life span ranges from a few hours to many years.
(9) Cell organelles are mostly absent. E.g. mitochondria are absent.	(9) Cell organelles are mostly present.
(10) Erythrocytes have haemoglobin.	(10) Leucocytes have no haemoglobin.
(11) They are circular and biconcave in shape.	(11) They are rounded or amoeboid in shape.

Question-15

What happens when the rate of formation of lymph exceeds the rates of its return to the blood?

Solution:

When the rate of formation of lymph exceeds its return to the blood, it accumulates around the cells causing the swelling of a tissue or organ called oedema or dropsy.

Question-16

Which two organelles other than the nucleus are lacking in a mature mammalian red blood corpuscles?

Solution:

- (i) Mitochondria, and
- (ii) Golgi bodies.

Question-17

What is pace setter of the heart?

Solution:

SA node (Sinuatrial node).

Question-18

What is pulmonary circulation?

Solution:

Pulmonary circulation is concerned with the circulation of blood from the heart to the lungs and back to the heart. When the right ventricle contracts, it pumps the deoxygenated blood to the lungs for aeration through the pulmonary artery. The oxygenated blood from each lung is returned to left the auricle by the pulmonary vein

Question-19

What is bundle of His?

Solution:

AV Node (Auriculo Ventricular Node).

Question-20

What is a cardiac cycle?

Solution:

The rhythmic contraction and relaxation of cardiac muscles is known as cardiac cycle or heart beat. It is involuntary. The contraction and relaxation of heart muscles are called systole and diastole respectively. One complete cardiac cycle occurs in 0.8 sec. The three stages of a cardiac cycle are arterial systole, ventricular systole and joint diastole.

Question-21

What are the advances of mammalian heart over that of frog's heart?

Solution:

A striking development in mammalian heart is the double circulation. Hence the pulmonary and the systematic circulations have different pressure. As such the lungs are saved from the harmful effects of high pressure required by the later circulation. The ventricle is completely divided into two chambers. This ensures the separation of oxygenated and deoxygenated blood.

Question-22

Why is a closed circulatory system more efficient than an open circulatory system?

Solution:

The closed circulatory system is more efficient due to increase in speed, precision and efficient circulation.

Question-23

Name the groups of animals which possess blood circulatory system?

Solution:

Higher invertebrates and all vertebrates.

Question-24

How is the rate of beating of the heart regulated?

Solution:

The beating of human heart is regulated by two nerves, one from the brain and the other from the spinal cord. The stimulation of the former decreases the heart beat while that of the later increases the frequency of the heartbeats.

Question-25

Why do doctors frequently make a red blood count of patients who are pale and feel tired very soon?

Solution:

The patients who are pale and feel tired easily, may be victims of anaemia. Anaemia is a condition in which RBC are not adequately replenished due to improper nourishment. A very severe attack of anaemia may eventually cause death since enough oxygen does not go round the body. To know this, the doctors test and make a red blood count of such patients.

Question-26

Which of the four chambers of the human heart has the thickest muscular walls?

Solution:

Left ventricle has the thickest muscular walls.

Question-27

What do you understand by joint diastole?

Solution:

During blood circulation when both the atria and ventricles are in relaxed phase it is joint diastole. During this phase the blood flows into the auricles from the superior and inferior vena cava. The blood also flows from the auricles to the ventricle of its own side through A.V. aperture.

Question-28

Where does the cardiac impulse originate?

Solution:

The cardiac impulse originates in cardiac muscle fibres and is not brought to the heart by any nerve fibres. The origin of cardiac impulse is said to be myogenic.

Question-29

Which blood vessel carries blood from the intestines to the liver?

Solution:

The blood vessel carrying blood from the intestine to the liver is called hepatic portal vein.

Question-30

Why is swelling of feet or leg caused when a person stands immobile for a long time?

Solution:

When a person stands immobile for a long time, the flow of blood to the leg and feet is reduced temporarily. This is because of accumulation of fluid in the leg and feet tissues. When there is swelling in leg and feet tissues, there will be less circulation of blood. But this swelling will subside when he moves for short time because blood starts circulating again in the veins normally.

Question-31

How is flow of blood maintained in single direction in blood circulatory system?

Solution:

The valves located in the heart and blood vessels maintain the flow of blood in a single direction in the blood circulatory system.

Question-32

What is the function of valves in the heart?

Solution:

In the heart there are a number of openings through which blood passes from one chamber to another. These openings are guarded by valves, which regulate the flow of blood in desired direction. For example, the bicuspid valves and tricuspid valves are present guarding the auriculo ventricular apertures in between the auricles and ventricles on the left and right sides. These valves open into the ventricles and prevent the back flow of the blood. A set of semi-lunar valves are also present at the base of aorta in the ventricle. These allow the blood only in the direction on aorta when the left ventricle contracts. Hence, the function of these valves is to regulate the flow of blood in a desired direction.

Question-33

Name any two substances that prevent the blood coagulation in uninjured blood vessels? How do they act?

Solution:

- (i) The anticoagulant Heparin prevent the blood from clotting.
 - (ii) The uninjured platelets don't form thromboplastin.
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Question-34

Name the vertebrate which contains deoxygenated blood in all the chambers of heart.

Solution:

Fish is the vertebrate which contains deoxygenated blood in all the chambers of heart.

Question-35

Name the prime mineral anion in extra cellular fluid.

Solution:

Chlorine ion is the prime mineral anion in extra cellular fluid.

Question-36

Differentiate between neurogenic and myogenic heart.

Solution:

Neurogenic heart	Myogenic heart
The heartbeats are triggered by nerve impulses originating from the ganglionic heart.	The heartbeats are triggered either through the modified muscles or through the myogenic muscles regulated by nerves.
Example – frog's heart	Example – Human heart

Question-37

How does the blood flow through the heart during the different phases of the cardiac cycle?

Solution:

The action or beat of the human heart consists of a series of events, which follow one another with great rapidity.

Main events in cardiac cycle are

(i) Auricular systole,

(ii) Ventricular systole and

(iii) Joint diastole.

Thus, we can say that the contraction of the heart and its relaxation constitute cardiac cycle or heart beat. The duration of the cardiac cycle varies inversely with the cardiac rate. The heartbeat is 72 times per minute in man. Single heartbeat lasts for 0.8 of a second. In such heart beats blood comes to heart and then is propelled from auricles to ventricles and then to arteries. The number of heartbeats per minute is very much influenced by age, size, sex, temperature.

Question-38

- Differentiate the following:- (a) Systolic pressure and diastolic pressure
(b) Myogenic heart and neurogenic heart
(c) Lymphatic capillaries and blood capillaries
(d) Granulocytes and agranulocytes
(e) Atrial systole and ventricular systole

Solution:

- (a) Systolic pressure and diastolic pressure

Systolic pressure	Diastolic pressure
a) It is about 120 mmHg	a) It is about 80mmHg
b) It is recorded at the first sound	b) it is recorded at the time of the loud sound

- (b) Myogenic heart and neurogenic heart

Myogenic heart	Neurogenic heart
a) In myogenic heart the initiation of heart beat is under muscular control	a) In neurogenic heart the initiation of heart beat is under nervous control
b) Seen in molluscs and vertebrates	b) seen in insects, crustaceans and annelids

- (c) Lymphatic capillaries and blood capillaries

Lymphatic capillaries	Blood capillaries
a) They are colourless	a) red in colour
b) They convey lymph	b) They convey blood
c) They are wider than the blood capillaries	c) They are narrower than the lymph capillaries

(d) Granulocytes and agranulocytes

Granulocytes	Agranulocytes
a) Their cytoplasm is granular	a) Their cytoplasm is devoid of granules
b) Their nucleus is polymorphic	b) Their nucleus is large, spherical as well as bilobed

(e) Atrial systole and ventricular systole

Atrial systole	Ventricular systole
a) It is the contraction of auricles	a) It is the contraction of ventricles
b) Precedes ventricular systole	b) follows atrial systole
c) Blood is pushed into ventricles	c) Blood is pumped to the lungs from right ventricle and into the aorta from the left ventricle.
d) pressure is lower	d) pressure is higher.

Question-39

Who discovered the existence of capillaries?

Solution:

Malpighi in 1661 after Harvey's death.

Question-40

What is a cardiac cycle?

Solution:

The rhythmic contraction and relaxation of the heart muscles is known as cardiac cycle or the heart beat. The contraction of the heart muscle is called systole while the relaxation is known as the diastole. It takes 0.8 sec for one cardiac cycle to be completed. The three main stages of the cardiac cycle are (a) the arterial systole (b) ventricular systole (c) the joint diastole

Question-41

Who discovered the circulation of blood for the first time?

Solution:

William Harvey.

Question-42

Explain the disorders of circulatory system?

Solution:

The improper functioning of the heart may lead to certain disorders such as

(a) Hypertension:- A continuous or sustained rise in the arterial blood pressure is known as hypertension. The normal pressure in a healthy individual is 120/80mmHg. But increase in the blood pressure beyond 140/90mmHg is referred to as hypertension. High blood pressure can harm the vital organs. It compels the heart to work excessively, due to which congestive heart disease may set in.

(b) Coronary heart disease:- (CAD) It is also known as atherosclerosis. It affects the blood vessels that supply blood to the heart muscles. This is due to the deposition of fat, cholesterol and Ca^{+} and fibrous tissues on the walls of the arteries which results in the narrowing of the arterial lumen.

(c) Angina:- It is also known as "angina pectoris" The symptom is acute chest pain. When adequate quantity of oxygen donot reach the heart muscular pain occurs.

(d) Heart failure:- It is the state of heart which is not able to pump the blood effectively enough to meet the body needs. As congestion of the lungs is the main reason for this heart failure it is also known as congestive heart failure

Question-43

What are the important functions of the circulatory system?

Solution:

- (i) The circulatory system supplies food, oxygen, enzymes, hormones and other substances to the different cells of the body.
- (ii) It carries the end products of metabolism to the organs which excrete them.
- (iii) It provides a strong defence to the body in prevention against invasion of infectious microorganisms.
- (iv) It maintains body temperature, homeostasis of the tissue fluids and acid base balance.

Question-44

What is the function of valves in the heart?

Solution:

Valves help in flow of blood only in one particular direction.

Question-45

Which part of the heart receives oxygenated blood from the lungs?

Solution:

Left auricle receives oxygenated blood from the lungs.

Question-46

What are SA and AV nodes? What are their functions?

Solution:

Sinu-auricular node is also known as the pace setter or the pace maker. It is located on the right wall of the right atrium.

Functions:- (a) It originates the cardiac impulses. AV node:- The Auriculo ventricular node is situated at the junction of the auricle and the ventricle.

Question-47

What is ABO blood grouping?

Solution:

Blood grouping is done based on the presence or the absence of surface antigen on RBC's. The four different blood groups are A,B,AB, and O

Question-48

Define antigen.

Solution:

Antigen is the substance that triggers the immune system.

Question-49

Define acquired immunity.

Solution:

Immunity that an organism acquires during its life time is called acquired immunity.

Question-50

Give one function of right auricle.

Solution:

Right auricle receives deoxygenated blood from all parts of the body.

Question-51

Which fluid in the human body wets the internal organs?

Solution:

Lymph is the fluid in the human body wets the internal organs.

Question-52

What is formed by the joining of capillaries?

Solution:

Venules is formed by the joining of capillaries.

Question-53

RBCs in mammals are biconcave in shape. Is this shape advantageous?

Solution:

Yes, biconcave shape of red blood corpuscles is advantageous because it helps in transportation of RBC in blood stream.

Question-54

State whether arteries or veins are full of blood after the death of an animal?

Solution:

Veins are full of blood after the death of an animal.

Question-55

What is the rate of heart beat?

Solution:

The human heart beats for 70 to 80 times in a minute. The average rate of heart beat is 72 times/minute.

Question-56

Which system of the body controls the heart beat?

Solution:

The nervous and endocrine systems control the heart beat.

Question-57

State the presence or absence of sinus venous in a fish and a mammal.

Solution:

Fish – Sinus venosus absent.

Mammal – Sinus venosus absent.

Question-58

Define cardiac diastole.

Solution:

After contraction of the ventricles the heart rests for 0.4 of a second and this period is known as cardiac diastole.