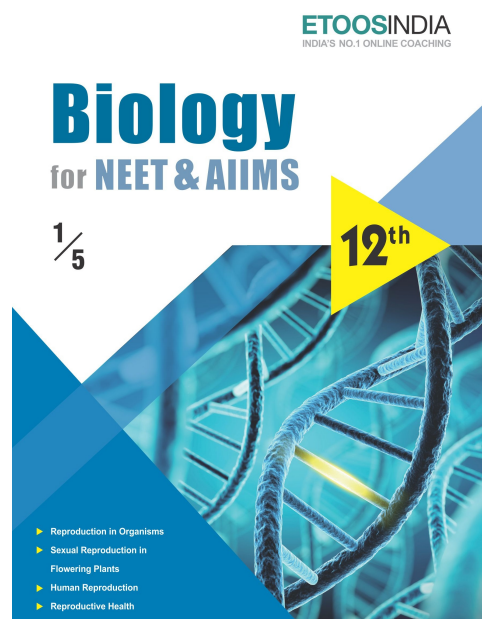
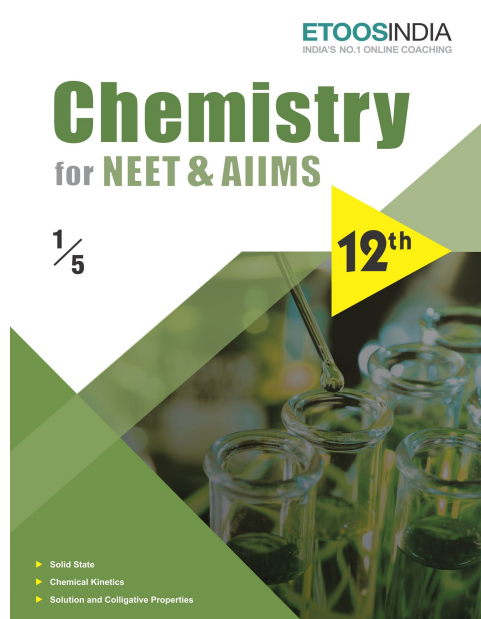
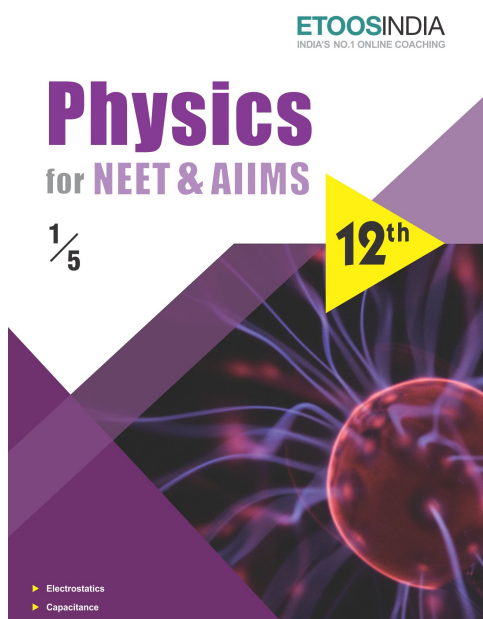
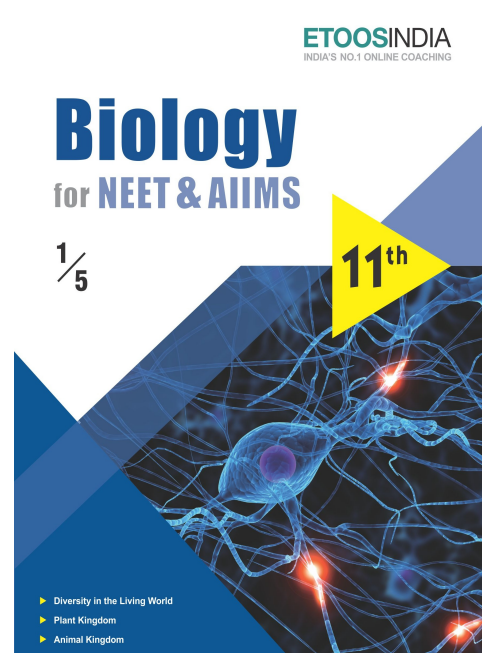
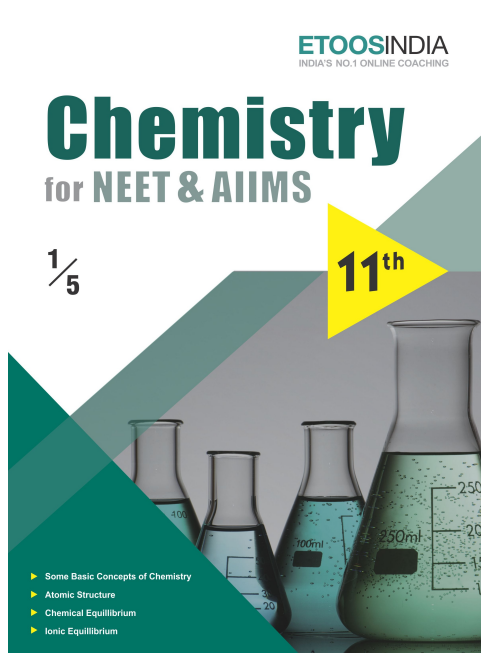
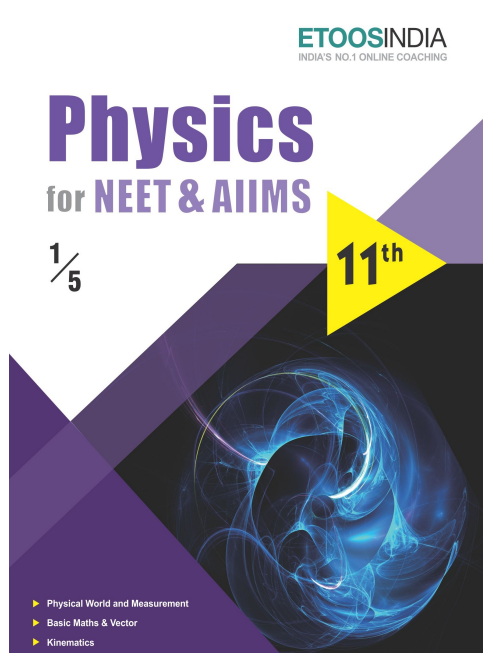


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BODY FLUIDS AND ITS CIRCULATION

“Owing to the difficulty of dealing with substances of high molecular weight we are still a long way from having determined the chemical characteristics and the constitution of proteins, which are regarded as the principal constituents of living organisms.”

“KARL LANDSTEINER (1868-1943)”

INTRODUCTION

All living cells have to be provided with nutrients and other essential substances. Some waste or harmful substance produced, have to be removed continuously to carry proper and healthy functioning of tissues. Therefore, it is essential to have efficient mechanisms for the movement for these substances to the cells and from the cells. In complex organisms, special fluids are present within their bodies for the transportation of such materials. As in simple organisms like sponges and coelentrates circulate water from their surroundings through their body cavities to facilitate the cells to exchange these substances.

Blood is commonly used body fluid to transport materials within body by higher organisms including humans. Another body fluid is Lymph, which help in transport of certain substances.

BODY FLUIDS & ITS CIRCULATION**INTRODUCTION**

Each and every cell of the body requires consistent supply of O_2 , food etc. for energy. Similarly toxic substances like CO_2 , ammonia, urea, uric acid are needed to get removed from the body. In lower organism cell is in direct contact of surrounding medium and there is direct exchange of material in between cell and the medium so, circulatory system is not needed. In higher and multicellular organism due to its complex form a specialized system is needed to supply useful, substance to the body cell and to remove, harmful substance out of the body. This specialized, system is called **circulatory system**. Components involved in circulatory system originate from **mesoderm** of embryo. Except the inner lining of blood vessels and capillaries which are endodermal in origin.

TYPES OF CIRCULATION

Numerous types of fluid circulation are found in animals which are as follows-

1. Intracellular circulation

- (i) It also plays important role in amoeboid locomotion found in certain protozoans like *Amoeba* and WBC.
- (ii) Streaming movement of the cytoplasm which is called cyclosis is the **intracellular circulation**.
- (iii) Cyclosis helps in uniform distribution of material like O_2 , food within the cell.
- (iv) In all living cells and unicellular organism intracellular circulation is found.

2. Extracellular circulation

- (i) Circulation which occurs outside of the cell is called extracellular circulation.
- (ii) Such type of circulation is found in **multicellular organism**.

It is of numerous types which are as follows-

Water circulation : Such type of circulation is found in **sponges** and **Hydra**.

Pseudocoelomic fluid circulation : Such type of circulation is found in **roundworm**.

Parenchymal circulation : Such type of circulation is found in **flatworm**.

Blood vascular system

- (i) Blood vascular system is present in higher invertebrates from the **Annelida** to the **Echinodermata** and all the **Chordates**.

Note :

- (i) Annelida are the 1st metazoans to have a well developed circulatory system.
- (ii) **Nereis** among Annelida and **Amphioxus** among the **Chordata** have well developed circulatory system but lacks heart.

The blood vascular system may be **open or closed circulatory system**.

I- Open circulatory system

- (i) When the circulating fluid is present in a central cavity called Haemocoel or it flows into spaces called sinuses in the tissue, it is termed as the **open circulatory system**.
- (ii) Animals in which circulatory system is open are Arthropoda (Prawn, lobsters, crabs, insects and spiders) and Mollusca (snails, oysters).

II- Closed circulatory system

- (i) When the blood remains confined to the blood vessel it is called **closed circulatory system**.
- (ii) In invertebrate, closed circulatory system is found in some annelida like earthworm and some mollusca like, squid.
- (iii) In all vertebrate animals closed circulatory system is found.
- (iv) The circulation of blood in the closed circulatory system was at first discovered and demonstrated by William Harvey who is known as father of angiology. He called heart as the "Pumping station of body"

REGULATION OF HEART BEAT

The rate of heart beat is regulated by two mechanism.

- Nervous regulation
- Hormonal regulation

NERVOUS REGULATION

The cardiac centre lies in the upper part of ventral wall of the medulla oblongata.

Cardiac centre is composed of-

- Cardioinhibitory centre (CIC)
- Cardioacceleratory centre (CAC)

Cardioinhibitory centre

- (i) It decreases rate of heart beat.
- (ii) The cardio-inhibitor is connected with SA node through vagus nerve or parasympathetic nerve fibre.
- (iii) It decreases the rate of heart beat (about 20 to 30 times/minute) as well as strength of heartbeat (by 20 to 30 percent).

Cardioacceleratory centre

- (i) It accelerates the rate of heart beat.
- (ii) Cardio acceleratory centre is associated with SA node through sympathetic nerve fibre.
- (iii) It increase rate of heart beat.

HORMONAL REGULATION

- (i) Heart beat is mainly regulated by **adrenaline** (epinephrine) and **non adrenaline** (nor epinephrine). Both hormones are secreted by medulla of adrenal gland.
- (ii) **Nor adrenaline** and **adrenaline** both accelerate the rate of heart beat but operate in different conditions. Adrenaline increase the heart beat during emergency conditions, whereas non adrenaline increase the heart beat during normal conditions.

CHECKPOINT:Thyroxine hormone indirectly increase the heart beat because thyroxine increases oxidative metabolism of the body cell, so body cells require more oxygen.



ETOOS KEY POINTS

Hormonal control	Adrenaline	–	↑ Rate
	Nor adrenaline	–	↑ Rate
Autonomic Nervous System	Vagal stimulation releases Acetyl choline	–	↓ Rate
	Sympathetic	–	↑ Rate
	Parasympathetic	–	↓ Rate

Tachycardia. It is the condition where heart rate exceeds 90 per minute for an average adult.

Common causes of tachycardia :

- (i) **Tachycardia.** Rate of heart beat increases. Fever causes tachycardia because increased body temperature increases the rate of metabolism of the sinus node, which in turn directly increases its excitability and rhythm.
- (vi) **Sinus tachycardia.** Increased frequency of impulse discharges from the SA node will in run increase the heart rate.
- (ii) **Stimulation by sympathetic nerves.** Stimulation of the sympathetic nerves releases the hormone norepinephrine at the sympathetic nerve endings. Therefore this leads to increase in the heart rate.

Etoos Tips & Formulas

→ Two types of circulatory patterns are :

- | Open | Closed |
|---|--|
| (a) Blood flows through open spaces called sinuses. | (a) Blood flows through closed network of blood vessels. |
| (b) e.g. Arthropods, Molluscs | (b) e.g. Annelids Vertebrates |

→ All vertebrates possess a muscular chambered heart :

	Fishes	Amphibians	Reptiles	Crocodile	Birds	Mammals
Number of chambers	2	3	3	4	4	4
Atria	1	2	2	2	2	2
Ventricles	1	1	1	2	2	2

→ Human circulatory system = heart + blood vessels + blood

→ Human heart:

- (a) Origin : mesodermal
- (b) Position : Situated in the thoracic cavity, in between the two lungs, slightly tilted to the left.
- (c) Covering : double walled pericardium.

→ Cardiac cycle : Sequential events in the heart which is cyclically repeated called cardiac cycle. Time of cardiac cycle = 0.8 second.

→ Disorders of circulatory system :

- (a) High blood pressure (Hypertension) :
Normal BP is 120/80 mm of Hg
120 is systolic pressure.
80 is diastolic pressure.
If BP increases more than 140/90 mm of Hg than called hypertension.
- (b) Coronary heart disease: often referred to as atherosclerosis. Caused by deposition of Ca^{+2} , Fats, cholesterol and fibrous tissues in arteries.
- (c) Angina pectoris is pain in heart muscles.
- (d) Heart failure is the condition when heart is not pumping blood effectively to meet the needs of the body. (e) Cardiac arrest : Heart stops beating .
- (f) Heart attack : Death of heart muscles due to an inadequate blood supply.

SOLVED EXAMPLE

- Ex.1** Systemic heart refer to
 (A) The two ventricles together in humans
 (B) The heart that contracts under stimulation from nervous system
 (C) Left auricle and left ventricle in higher vertebrates
 (D) Entire heart in lower vertebrates

Sol. (C)

- Ex.2** The problem of electrical discontinuity caused in the normal heart by the connective tissue separating the atria from the ventricles is solved by
 (A) Coordinating electrical activity in the atria with electrical activity in the ventricles by connecting them via the Bundle of His
 (B) Having the A-V node function as a secondary pacemaker
 (C) Having an ectopic pacemaker
 (D) Coordinating electrical activity in the atria with electrical activity in the ventricles by connecting them via the vagus nerve

Sol. (A)

- Ex.3** What is total diastolic time of ventricle in cardiac cycle
 (A) 0.30 second (B) 0.40 second
 (C) 0.50 second (D) 0.10 second

Sol. (B)

- Ex.4** In the heart of mammals the bicuspid valve (mitral valve) is situated between
 (A) Left auricle and left ventricle
 (B) Post caval and right caval
 (C) Right auricle and left auricle
 (D) Right ventricle and pulmonary aorta

Sol. (D) : The bicuspid valve is a valve consisting of two membranous flap or cusps situated between the atrium and ventricle of the left side of the heart in mammals.

- Ex.5** The T-wave in an ECG represents
 (A) Depolarisation of ventricles
 (B) Electrical excitation of atria
 (C) Beginning of systole
 (D) Return of the ventricles from excited state

Sol. (D)

- Ex.6** Heart beat can be initiated by
 Or

The cardiac pacemaker in a patient fails to function normally. The doctors find that an artificial pacemaker is to be grafted in him. It is likely that it will be grafted at the site of

- (A) Sino-auricular node
 (B) Atrio-ventricular node
 (C) Sodium ion
 (D) Purkinje's fibres

Sol. (A)

- Ex.7** Read the statements regarding the cardiac system and choose the right option

- A. Human heart is an ectodermal derivative
 B. Mitral valve guards the opening between the right atrium and left ventricle
 C. SAN is located on the left upper corner of the right atrium
 D. Stroke volume \times Heart rate = Cardiac output

- (A) A alone is correct
 (B) A and B alone are correct
 (C) Band C alone are correct
 (D) D alone is correct

Sol. (D) : The amount of blood flowing from the heart over a given period of time is known as the cardiac output. It depends upon the heart rate and stroke volume.

Cardiac output = stroke volume \times heart rate

- Ex.8** Circulatory system does not help in

- (A) Transport in respiratory gases
 (B) Transport of hormones
 (C) Transport of food materials
 (D) Transfer of impulses

Sol. (D)

- Ex.9** The increase in blood flow to heart stimulates secretion of

- (A) Renin
 (B) Oxytocin
 (C) Antidiuretic hormone
 (D) Atrial natriuretic factor

Sol. (D)

Exercise # 1**SINGLE OBJECTIVE****NEET LEVEL**

1. Systolic pressure is higher than diastolic pressure due to :-
(A) Volume of blood in the heart is greater during systole
(B) Arteries contract during systole
(C) Blood vessels offer resistance to flowing blood during systole
(D) Blood is forced into arteries during systole.
2. First heart transplant was performed by :-
(A) William Harvey (B) Watson
(C) Christian Bernard (D) Khorana
3. When heart beat is decreased than normal is called
(A) Bradycardia (B) Tachycardia
(C) Hypocardia (D) Nicocardia
4. Which artery supplies blood to the diaphragm :-
(A) Phrenic (B) Splenic
(C) Renal (D) Caudal
5. Which one of the following organ can be called a sort of "blood bank":-
(A) Heart (B) Liver
(C) Spleen (D) Lungs
6. Blood of which vessel in mammals carries least percentage of urea :-
(A) Dorsal aorta (B) Renal vein
(C) Renal artery (D) Posterior vena cava
7. All arteries carry oxygenated blood except :-
(A) Systemic (B) Hepatic
(C) Pulmonary (D) Cardiac
8. Heart beat in vertebrates is :-
(A) Neurogenic (B) Myogenic
(C) Both (D) None
9. Single heart circuit occurs in :-
(A) Fishes (B) Frog
(C) Reptiles (D) Man
10. Pain in heart muscle is :-
(A) Angina cardius (B) Angina pericardius
(C) Angina pectoris (D) None
11. Study of blood circulation system is called :-
(A) Angiology (B) Cardiology
(C) Haematology (D) Osteology
12. "Vasa Vasorum" refers to :-
(A) Jugular anastomosis
(B) A network of blood vessels in an organ
(C) "Vessels of vessels" nutritive in function
(D) Carotid labyrinth regulating pressure of blood vessels
13. Coronary artery supplies blood to :-
(A) Mammary glands (B) Rib muscles
(C) Skin (D) Heart
14. When there is a sudden loss of blood from the body the organ which supplies blood is :-
(A) Spleen (B) Heart
(C) Liver (D) Lung
15. Carotico - systemic arch arises from :-
(A) Right auricle (B) Right ventricle
(C) Left auricle (D) Left ventricle
16. The colour of lymph is :-
(A) White (B) Pale yellow
(C) Colourless (D) Milky
17. Coagulation of lymph is :-
(A) Faster than blood (B) Not possible
(C) Slower than blood (D) A passive process
18. The most important center of lymph formation is -
(A) Liver (B) Spleen
(C) Bone marrow (D) Mucosa of ileum
19. The spleen of Human serves to :-
(A) Generate all blood cells in early foetal life
(B) Produce lymphocytes, monocytes and antibodies in adult stage
(C) Acts as blood bank for the period of emergency and control blood volume in adults
(D) All of the above
20. Removal of which organ will have least effect in an adult Human :-
(A) Spleen (B) Liver
(C) Pancreas (D) Pituitary
21. Contraction of heart is called :-
(A) Peristalsis
(B) Systole
(C) Diastole
(D) Voluntary contraction
22. Mitral valve is the other name of :-

Exercise # 2

SINGLE OBJECTIVE

AIIMS LEVEL

1. Cells forming the wall of blood capillaries are called
(A) Oxyntic cells (B) Endothelium cells
(C) Parietal cells (D) Haemocytes
2. Blood pressure and heart beat is regulated by:-
(A) Insulin (B) Adrenalin
(C) Optic nerve (D) Growth hormone
3. Heart beat is controlled by which cranial nerve :-
(A) Xth (B) IXth
(C) IIIrd (D) Vth
4. Blood Capillaries are made of :-
(A) Endothelium and thin coat of connective tissue
(B) Endothelium and thin coat of muscle fibres
(C) Endothelium and thin coat of connective tissue and muscle fibres.
(D) Only endothelium
5. The heart sound "DUP" is produced when :-
(A) Mitral valve opens
(B) Mitral valve closes
(C) Semilunar valve at the base of aorta closes
(D) Tricuspid valve opens
6. Red pulp and white pulp are histological structure found in :-
(A) Tooth (B) Spleen
(C) Bone (D) Liver
7. Where is the pace maker situated :-
(A) In left auricle near opening of pulmonary vein
(B) In right auricle near eustachian valve
(C) On inter - auricular septum
(D) On inter-ventricular septum
8. Papillary muscles are found in :-
(A) Haemocoel of cockroach
(B) Auricles of heart
(C) Ventricles of heart
(D) Arm
9. In mammalian embryo the pulmonary aorta communicates with carotico-systemic aorta by a narrow ductus arteriosus, in the adult this connection closes leaving :-
(A) Fossa - ovalis
(B) Carotico pulmonary aperture
(C) Ligamentum arteriosus
(D) None of these
10. Blood circulation take following course in heart of man
(A) Left auricle - left ventricle - body - right auricle - right ventricle
(B) Right auricle - left ventricle
(C) Left auricle - left ventricle - lungs-right auricle - right ventricle
(D) None of them
11. Pulmonary veins are those which :-
(A) Carry impure blood from lungs to heart
(B) Carrying pure blood from lungs to heart
(C) Carry impure blood from heart to lung
(D) Carry pure blood from heart to lungs
12. How many contraction nodes are found in heart of Human :-
(A) One (B) Two
(C) Many (D) None
13. Characteristics of cardiac muscles are that they :-
(A) Contract quickly and get fatigued
(B) Contract quickly and do not get fatigued
(C) Contract slowly and get fatigued
(D) Contract slowly and do not get fatigued
14. Largest amount of urea in blood is found in:-
(A) Hepatic portal vein (B) Hepatic Artery
(C) Coeliac artery (D) Renal Artery
15. Lymph can be defined as :-
(A) Blood minus corpuscles
(B) Blood minus Plasma
(C) Blood minus WBC
(D) Blood minus RBC & Platlates
16. Sphygmomanometer measures :-
(A) Blood pressure (B) Pulse rate
(C) Rate of heart beat (D) All
17. Chordae tendinae are found in :-
(A) Ventricles of brain
(B) Ventricles of heart
(C) Auricles of heart
(D) Connection between bone
18. A Pace maker or S.A. Node is found in :-
(A) Lungs (B) Brain
(C) Spleen (D) Heart

Exercise # 3**PART - 1****MATRIX MATCH COLUMN**

1. Match Column - I with Column - II and select the correct option from the codes give below.

Column - I

- A. Factor II
B. Factor III
C. Factor VIII
D. Factor XII
(A) A-iii, B-iv, C-ii, D-i
(C) A-ii, B-i, C-iv, D-iii

Column - II

- i. Thromboplastin
ii. Prothrombin
iii. Hageman factor
iv. Antihæmophilic globulin
(B) A-iv, B-iii, C-ii, D-i
(D) A-i, B-ii, C-iii, D-iv

2. Match the types of WBC listed under Column - I with the shape of nucleus given under column - II and select the correct option from codes given below.

Column - I

- A. Neutrophils
B. Eosinophils
C. Basophils
D. Monocytes
(A) A-iii, B-v, C-i, D-ii
(C) A-ii, B-i, C-v, D-iii

Column - II

- i. Kidney-shaped
ii. S-shaped
iii. 3 to 5 lobes
iv. 2 lobes
v. Disc-shaped
(B) A-v, B-iii, C-i, D-iv
(D) A-iii, B-iv, C-ii, D-i

3. Match Column - I with Column - II and select the correct option from the codes given below.

Column - I

- A. Fibrinogen
B. Globulins
C. Albumins
(A) A-iii, B-i, C-ii
(C) A-iii, B-ii, C-i

Column - II

- i. Defence mechanism
ii. Osmotic balance
iii. Coagulation of blood
(B) A-i, B-iii, C-ii
(D) A-ii, B-i, C-iii

4. Match Column - I with Column - II and select the correct option from the codes given below.

Column - I

- A. Superior vena cava
B. Inferior vena cava
C. Pulmonary artery
D. Pulmonary vein
(A) A-ii, B-iv, C-iii, D-i
(C) A-iv, B-iii, C-i, D-ii

Column - II

- i. Carries deoxygenated blood to lungs
ii. Carries oxygenated blood from lungs
iii. Brings deoxygenated blood from lower part of body to right atrium
iv. Bring deoxygenated blood from upper part of body to right atrium
(B) A-iv, B-i, C-ii, D-iii
(D) A-iv, B-i, C-iii, D-ii

Exercise # 4

PART - 1

PREVIOUS YEAR (NEET/AIPMT)

1. Pulmonary artery is different from pulmonary vein because it has [CBSE AIPMT 2000]
 - (A) large lumen
 - (B) thick muscular walls
 - (C) no endothelium
 - (D) valves
2. What is correct regarding leucocytes ? [CBSE AIPMT 2000]
 - (A) These can squeeze out through (can cross) thin capillary walls
 - (B) These are enucleate
 - (C) Sudden fall in their number indicates cancer
 - (D) These are produced in thymus
3. What is correct for Blood group 'O' :- [CBSE AIPMT 2001]
 - (A) No antigens but both a and b antibodies are present
 - (B) A antigen and b antibody
 - (C) Antigen and Antibody both absent
 - (D) A and B antigens and a, b, antibodies
4. Continuous bleeding from an injured part of body is due to deficiency of :- [CBSE AIPMT 2001]

(A) Vitamin -A	(B) Vitamin -B
(C) Vitamin -K	(D) Vitamin -E
5. Which of the following statement is true for Lymph :- [CBSE AIPMT 2002]
 - (A) WBC and serum
 - (B) All components of blood except RBCs and some proteins
 - (C) RBCs, WBCs and Plasma
 - (D) RBCs, Proteins and Platelets
6. Bundle of His is a network of :- [CBSE AIPMT 2003]
 - (A) Muscle fibres found only in the ventricle wall
 - (B) Nerve fibres distributed in ventricles
 - (C) Nerve fibres found throughout the heart
 - (D) Muscle fibres distributed throughout the heart walls
7. Systemic heart refers to :- [CBSE AIPMT 2003]
 - (A) Left auricle and left ventricle in higher vertebrates
 - (B) Entire heart in lower vertebrates
 - (C) The two ventricles together in humans
 - (D) The heart that contracts under stimulation from nervous system
8. You are required to draw blood from a patient and to keep it in a test tube for analysis of blood corpuscles and plasma. You are also provided with the following four types of test tubes. Which of them will you not use for the purpose? [CBSE AIPMT 2004]
 - (A) Test tube containing calcium bicarbonate
 - (B) Chilled test tube
 - (C) Test tube containing heparin
 - (D) Test tube containing sodium oxalate
9. In the ABO system of blood groups if both antigens are present but no antibody, the blood group of the individual would be :- [CBSE AIPMT 2004]

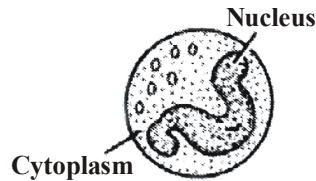
(A) B	(B) O
(C) AB	(D) A
10. Which of the following substances, if introduced into the blood stream, would cause coagulation of blood at the site of its introduction - [CBSE AIPMT 2005]

(A) Fibrinogen	(B) Heparin
(C) Prothrombin	(D) Thromboplastin
11. Antibodies in our body are complex- [CBSE AIPMT 2006]

(A) Lipoproteins	(B) Steroids
(C) Prostaglandins	(D) Glycoproteins
12. Examination of blood of a person suspected of having anemia, shows large, immature, nucleated erythrocytes without haemoglobin. Supplementing his diet with which of the following is likely to alleviate his symptoms ? [CBSE AIPMT 2006]
 - (A) Thiamine
 - (B) Folic acid and cobalamine
 - (C) Riboflavin
 - (D) Iron compounds





MOCK TEST

- Name the blood cells, whose reduction in number can cause clotting disorder, leading to excessive loss of blood from the body.
 (A) Erythrocytes (B) Leucocytes (C) Neutrophils (D) Thrombocytes
- Serum differs from blood in
 (A) lacking globulins (B) lacking albumins (C) lacking clotting factors (D) lacking antibodies
- The granulocytes which secretes histamine, serotonin and heparin are
 (A) neutrophils (B) basophils (C) eosinophils (D) lymphocytes
 (E) monocytes
- Mature RBCs lose their ability for
 (A) DNA replication
 (B) Anaerobic respiration
 (C) Aerobic respiration and DNA replication
 (D) Aerobic respiration, DNA replication and RNA synthesising machinery.
- The figure shows a human blood cell. Identify it and give its characteristics.

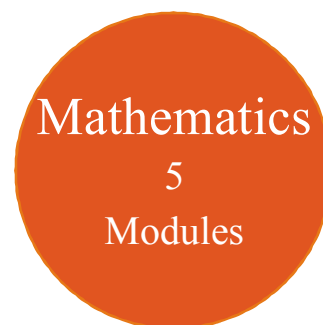
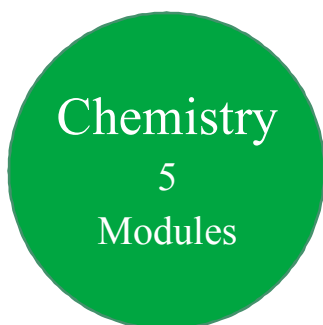
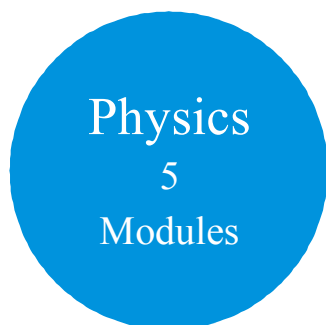


Blood cell	Characteristics
(A) Basophil	Secretes serotonin, inflammatory response
(B) B-lymphocyte	Forms about 20% of blood cells involved in immune response
(C) Neutrophil	Most abundant blood cells, phagocytic
(D) Monocyte	Life span of 3 days, produces antibodies

- Select the option having all the correct characteristics.

	Structure	Percentage	Function
(A)		0.3–0.5	Phagocytic
(B)		0.5–1.0	Secrete histamine and serotonin
(C)		30–40	Defence against parasites
(D)		30–40	Allergic reactions

11th Class Modules Chapter Details



PHYSICS	CHEMISTRY	BIOLOGY
<p>Module-1</p> <ol style="list-style-type: none"> 1. Physical World & Measurements 2. Basic Maths & Vector 3. Kinematics <p>Module-2</p> <ol style="list-style-type: none"> 1. Law of Motion & Friction 2. Work, Energy & Power <p>Module-3</p> <ol style="list-style-type: none"> 1. Motion of system of particles & Rigid Body 2. Gravitation <p>Module-4</p> <ol style="list-style-type: none"> 1. Mechanical Properties of Matter 2. Thermal Properties of Matter <p>Module-5</p> <ol style="list-style-type: none"> 1. Oscillations 2. Waves 	<p>Module-1(PC)</p> <ol style="list-style-type: none"> 1. Some Basic Concepts of Chemistry 2. Atomic Structure 3. Chemical Equilibrium 4. Ionic Equilibrium <p>Module-2(PC)</p> <ol style="list-style-type: none"> 1. Thermodynamics & Thermochemistry 2. Redox Reaction 3. States Of Matter (Gaseous & Liquid) <p>Module-3(IC)</p> <ol style="list-style-type: none"> 1. Periodic Table 2. Chemical Bonding 3. Hydrogen & Its Compounds 4. S-Block <p>Module-4(OC)</p> <ol style="list-style-type: none"> 1. Nomenclature of Organic Compounds 2. Isomerism 3. General Organic Chemistry <p>Module-5(OC)</p> <ol style="list-style-type: none"> 1. Reaction Mechanism 2. Hydrocarbon 3. Aromatic Hydrocarbon 4. Environmental Chemistry & Analysis Of Organic Compounds 	<p>Module-1</p> <ol style="list-style-type: none"> 1. Diversity in the Living World 2. Plant Kingdom 3. Animal Kingdom <p>Module-2</p> <ol style="list-style-type: none"> 1. Morphology in Flowering Plants 2. Anatomy of Flowering Plants 3. Structural Organization in Animals <p>Module-3</p> <ol style="list-style-type: none"> 1. Cell: The Unit of Life 2. Biomolecules 3. Cell Cycle & Cell Division 4. Transport in Plants 5. Mineral Nutrition <p>Module-4</p> <ol style="list-style-type: none"> 1. Photosynthesis in Higher Plants 2. Respiration in Plants 3. Plant Growth and Development 4. Digestion & Absorption 5. Breathing & Exchange of Gases <p>Module-5</p> <ol style="list-style-type: none"> 1. Body Fluids & Its Circulation 2. Excretory Products & Their Elimination 3. Locomotion & Its Movement 4. Neural Control & Coordination 5. Chemical Coordination and Integration

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12th Class Modules Chapter Details

Physics
5
Modules

Chemistry
5
Modules

Mathematics
5
Modules

PHYSICS	CHEMISTRY	BIOLOGY
<p>Module-1</p> <ol style="list-style-type: none"> 1. Electrostatics 2. Capacitance <p>Module-2</p> <ol style="list-style-type: none"> 1. Current Electricity 2. Magnetic Effect of Current and Magnetism <p>Module-3</p> <ol style="list-style-type: none"> 1. Electromagnetic Induction 2. Alternating Current <p>Module-4</p> <ol style="list-style-type: none"> 1. Geometrical Optics 2. Wave Optics <p>Module-5</p> <ol style="list-style-type: none"> 1. Modern Physics 2. Nuclear Physics 3. Solids & Semiconductor Devices 4. Electromagnetic Waves 	<p>Module-1(PC)</p> <ol style="list-style-type: none"> 1. Solid State 2. Chemical Kinetics 3. Solutions and Colligative Properties <p>Module-2(PC)</p> <ol style="list-style-type: none"> 1. Electrochemistry 2. Surface Chemistry <p>Module-3(IC)</p> <ol style="list-style-type: none"> 1. P-Block Elements 2. Transition Elements (d & f block) 3. Co-ordination Compound 4. Metallurgy <p>Module-4(OC)</p> <ol style="list-style-type: none"> 1. HaloAlkanes & HaloArenes 2. Alcohol, Phenol & Ether 3. Aldehyde, Ketone & Carboxylic Acid <p>Module-5(OC)</p> <ol style="list-style-type: none"> 1. Nitrogen & Its Derivatives 2. Biomolecules & Polymers 3. Chemistry in Everyday Life 	<p>Module-1</p> <ol style="list-style-type: none"> 1. Reproduction in Organisms 2. Sexual Reproduction in Flowering Plants 3. Human Reproduction 4. Reproductive Health <p>Module-2</p> <ol style="list-style-type: none"> 1. Principles of Inheritance and Variation 2. Molecular Basis of Inheritance 3. Evolution <p>Module-3</p> <ol style="list-style-type: none"> 1. Human Health and Disease 2. Strategies for Enhancement in Food Production 3. Microbes in Human Welfare <p>Module-4</p> <ol style="list-style-type: none"> 1. Biotechnology: Principles and Processes 2. Biotechnology and Its Applications 3. Organisms and Populations <p>Module-5</p> <ol style="list-style-type: none"> 1. Ecosystem 2. Biodiversity and Conservation 3. Environmental Issues

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