

Body Fluids and Circulation — NEET MCQs with Solutions

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Q1. The straw-coloured fluid obtained after a blood clot is allowed to form and is removed is called:

- (A) Plasma
- (B) Interstitial fluid
- (C) Lymph
- (D) Serum

Q2. Which plasma protein plays a direct role in blood coagulation by being converted into an insoluble form?

- (A) Albumin
- (B) Fibrinogen
- (C) Globulin
- (D) Heparin

Q3. The organ most commonly referred to as the graveyard of erythrocytes is:

- (A) Liver
- (B) Spleen
- (C) Lymph node
- (D) Kidney

Q4. The Rh antigen was first discovered during experiments involving which animal?

- (A) Rabbit
- (B) Rhesus monkey
- (C) Rat
- (D) Chimpanzee

Q5. During an incompatible blood transfusion, agglutination of donor RBCs is caused by:

- (A) Recipient plasma antibodies binding to donor RBC surface antigens
- (B) Donor platelets activating recipient clotting cascade
- (C) Donor plasma albumin reacting with recipient WBCs
- (D) Recipient haemoglobin denaturing donor haemoglobin

Q6. Which of the following correctly describes the role of basophils in inflammation?

- (A) Release histamine causing vasodilation and increased vascular permeability
- (B) Phagocytose pathogens at the site of infection
- (C) Produce IgE antibodies against allergens
- (D) Convert fibrinogen to fibrin at wound site

Q7. The approximate volume of lymph returned to blood circulation per day in a healthy adult is:

- (A) 100 to 200 mL
- (B) 500 mL
- (C) 1 litre
- (D) 2 to 4 litres

Q8. Lymph differs from blood plasma in that it normally lacks platelets. This is because:

- (A) Platelets are destroyed in lymph nodes before lymph enters circulation
- (B) Platelets are produced in lymph but immediately consumed by clotting
- (C) Platelets are anucleate cell fragments confined within blood vessels and do not cross intact capillary endothelium
- (D) Platelets are too negatively charged to enter lymphatic capillaries

Q9. Which animal lacks a pulmonary circuit and instead oxygenates blood through a branchial (gill) circuit?

- (A) Frog
- (B) Fish
- (C) Human
- (D) Pigeon

Q10. Which of the following correctly describes the hepatic portal system?

- (A) It carries oxygenated blood from liver to lungs
- (B) It is part of pulmonary circulation
- (C) It drains deoxygenated blood from systemic veins to heart
- (D) It carries nutrient-rich blood from intestine to liver before entering systemic circulation

Q11. Pericardial fluid, present between the two layers of pericardium, primarily functions to:

- (A) Increase the force of myocardial contraction
- (B) Supply nutrients to the cardiac muscle
- (C) Regulate the heart rate during exertion
- (D) Reduce friction between the heart wall and surrounding structures during cardiac movements

Q12. Coronary arteries, which supply blood to the myocardium, arise from the:

- (A) Pulmonary artery at its base
- (B) Aorta just above the aortic semilunar valve
- (C) Right ventricle directly
- (D) Pulmonary vein at its origin

Q13. Which of the following correctly identifies the largest artery and the largest vein in the human body?

- (A) Pulmonary artery — largest artery; Aorta — largest vein
- (B) Aorta — largest artery; Superior vena cava — largest vein
- (C) Pulmonary trunk — largest artery; Inferior vena cava — largest vein
- (D) Aorta — largest artery; Inferior vena cava — largest vein

Q14. Ventricular systole lasts for approximately:

- (A) 0.1 second
- (B) 0.3 second
- (C) 0.4 second
- (D) 0.8 second

Q15. Stroke volume is calculated as:

- (A) End-diastolic volume minus End-systolic volume
- (B) End-diastolic volume minus cardiac output
- (C) Systolic pressure minus diastolic pressure
- (D) Cardiac output divided by heart rate

Q16. The period between closure of AV valves and opening of semilunar valves is called:

- (A) Atrial systole
- (B) Ventricular ejection phase
- (C) Isovolumetric contraction
- (D) Rapid ventricular filling

Q17. The T wave in ECG indicates:

- (A) Atrial depolarization
- (B) Atrial repolarization
- (C) Ventricular depolarization
- (D) Ventricular repolarization

Q18. The flat TP segment between T wave and next P wave corresponds to:

- (A) Electrical silence during complete joint diastole
- (B) Ventricular repolarization period
- (C) Delay at the AV node
- (D) Atrial systole preparation phase

Q19. In pulmonary circulation, blood flows from:

- (A) Left ventricle to aorta to body
- (B) Right atrium directly to lungs
- (C) Left atrium to pulmonary veins
- (D) Right ventricle to lungs via pulmonary artery

Q20. Crocodiles are exceptional among reptiles because they possess:

- (A) Three-chambered heart with complete atrial septum
- (B) Single circulation due to aquatic lifestyle
- (C) Four-chambered heart with complete ventricular septum
- (D) Incomplete double circulation despite four chambers

Q21. The autonomic control of heart involves:

- (A) Somatic motor nerves only
- (B) Spinal cord reflexes without brain involvement
- (C) Endocrine regulation exclusively
- (D) Both sympathetic and parasympathetic divisions acting antagonistically

Q22. Which ion plays the most crucial role in triggering cardiac muscle contraction?

- (A) Sodium — drives action potential upstroke only
- (B) Potassium — maintains resting membrane potential
- (C) Calcium
- (D) Chloride — stabilizes membrane charge

Q23. Myocardial infarction is commonly known as:

- (A) Stroke
- (B) Hypertension
- (C) Heart attack
- (D) Cardiac arrest

Q24. Rheumatic heart disease primarily affects the:

- (A) Coronary arteries
- (B) Heart valves
- (C) Aorta
- (D) Vena cava

Answer key and explanations

Q1. Answer: (D) Serum

Serum is plasma minus clotting factors (primarily fibrinogen). When blood clots, fibrinogen polymerises into fibrin and is consumed; the remaining fluid is serum. Plasma, by contrast, still contains all clotting factors.

Q2. Answer: (B) Fibrinogen

Fibrinogen is converted into fibrin threads by the enzyme thrombin during coagulation, forming the clot mesh. Albumin maintains osmotic pressure; globulins are involved in immunity; heparin is an anticoagulant, not a plasma protein of this function.

Q3. Answer: (B) Spleen

Aged RBCs (after ~120 days) are recognised and phagocytosed by macrophages in the spleen. Haemoglobin is recycled — haem yields bilirubin (processed by liver), globin yields amino acids. The liver processes bilirubin but does not destroy RBCs primarily.

Q4. Answer: (B) Rhesus monkey

The Rh (Rhesus) factor was discovered by Landsteiner and Wiener when antibodies raised in rabbits against Rhesus monkey RBCs were found to agglutinate RBCs of approximately 85% of humans — these individuals were designated Rh positive. The name derives from the Rhesus monkey, not the experimental animal (rabbit).

Q5. Answer: (A) Recipient plasma antibodies binding to donor RBC surface antigens

Agglutination is an antigen-antibody reaction: recipient plasma antibodies (anti-A or anti-B) bind to the corresponding antigens on donor RBCs, crosslinking them into clumps. This triggers haemolysis and can cause fatal transfusion reactions. Option B is plausible but platelet-mediated clotting is a separate process unrelated to blood group incompatibility.

Q6. Answer: (A) Release histamine causing vasodilation and increased vascular permeability

Basophils (least numerous WBCs, <1%) release histamine and heparin from their granules during inflammatory and allergic responses. Histamine causes vasodilation and increased permeability, facilitating immune cell recruitment. Phagocytosis is primarily a neutrophil/macrophage function; IgE is produced by plasma cells; fibrin formation involves thrombin.

Q7. Answer: (D) 2 to 4 litres

Approximately 20 litres of fluid filters out of capillaries daily at the arterial end; about 17 litres is reabsorbed at the venous end. The remaining 2–4 litres — along with escaped plasma proteins — enters lymphatic capillaries and is returned to blood via the thoracic and right lymphatic ducts. This daily turnover maintains plasma volume and prevents progressive protein accumulation in tissues.

Q8. Answer: (C) Platelets are anucleate cell fragments confined within blood vessels and do not cross intact capillary endothelium

Platelets (thrombocytes) are small anucleate cell fragments (2–3 μm) derived from megakaryocytes. Like RBCs, they are normally confined within blood vessels and do not cross intact capillary endothelium into interstitial spaces. Their absence from lymph means lymph does not clot as rapidly as blood — though lymph does contain some clotting factors (fibrinogen) and can form a slow clot.

Q9. Answer: (B) Fish

Fishes use gill (branchial) circulation for oxygenation — there are no lungs or pulmonary vessels. Frogs are a trap here: adult frogs have both pulmonary and cutaneous gas exchange, so they do have a pulmonary component.

Q10. Answer: (D) It carries nutrient-rich blood from intestine to liver before entering systemic circulation

The hepatic portal system is a special venous pathway where blood from the intestines (rich in absorbed nutrients) is first delivered to the liver for processing before entering the general systemic circulation. Option C describes systemic venous return, not portal circulation.

Q11. Answer: (D) Reduce friction between the heart wall and surrounding structures during cardiac movements

Pericardial fluid acts as a lubricant within the pericardial cavity, minimising friction as the heart continuously contracts and relaxes. It does not supply nutrients (that is the role of coronary circulation) nor does it regulate rate (SA node does).

Q12. Answer: (B) Aorta just above the aortic semilunar valve

Coronary arteries arise from the aorta just above the aortic semilunar valve (at the sinuses of Valsalva), ensuring continuous oxygenated blood supply to cardiac muscle. Students often confuse this with pulmonary artery origin — the aorta is the correct vessel.

Q13. Answer: (D) Aorta — largest artery; Inferior vena cava — largest vein

The aorta is the largest artery, arising from the left ventricle. The inferior vena cava is the largest vein, draining blood from the lower body. The superior vena cava is larger than most veins but smaller than the inferior vena cava — a refined trap students miss.

Q14. Answer: (B) 0.3 second

Ventricular systole occupies 0.3 second during which blood is ejected into aorta and pulmonary artery. Option A (0.1 s) is atrial systole; option C (0.4 s) is joint diastole.

Q15. Answer: (A) End-diastolic volume minus End-systolic volume

$SV = EDV - ESV \approx 70 \text{ mL}$ at rest. Option C gives pulse pressure (not volume); option D gives SV only if cardiac output is already known — a circular trap.

Q16. Answer: (C) Isovolumetric contraction

Isovolumetric contraction: ventricles contract, pressure rises, but all valves are closed — volume unchanged. It ends when ventricular pressure exceeds arterial pressure, forcing semilunar valves open.

Q17. Answer: (D) Ventricular repolarization

T wave corresponds to ventricular repolarization, marking electrical recovery of ventricular muscle and onset of ventricular relaxation. Option B (atrial repolarization) is buried within the QRS complex.

Q18. Answer: (A) Electrical silence during complete joint diastole

The TP segment is electrically flat because all chambers are in diastole with no net depolarization or repolarization occurring — this is the electrical equivalent of joint diastole.

Q19. Answer: (D) Right ventricle to lungs via pulmonary artery

Right ventricle pumps deoxygenated blood through pulmonary artery to lungs. Option A describes systemic circulation; option C reverses pulmonary vein direction — both are common traps.

Q20. Answer: (C) Four-chambered heart with complete ventricular septum

Crocodiles have a fully divided four-chambered heart like birds and mammals, achieving complete double circulation. This makes them the only non-avian reptiles with complete separation of oxygenated and deoxygenated blood.

Q21. Answer: (D) Both sympathetic and parasympathetic divisions acting antagonistically

Both ANS divisions regulate heart rate and contractility in opposing directions. Neither somatic (A) nor purely endocrine (C) control is sufficient alone — the dual antagonistic model is the NCERT standard.

Q22. Answer: (C) Calcium

Calcium ions bind troponin C, enabling actin-myosin cross-bridge formation in cardiac muscle. Na^+ (A) initiates the action potential but does not directly trigger contraction — the $\text{Na}^+/\text{Ca}^{2+}$ distinction is the key trap.

Q23. Answer: (C) Heart attack

Myocardial infarction refers to death of cardiac muscle due to prolonged ischemia from coronary blockage. Cardiac arrest (D) is sudden cessation of pumping and is a consequence, not synonymous with MI.

Q24. Answer: (B) Heart valves

Rheumatic fever triggers an autoimmune response that damages heart valves, most commonly the mitral valve. Coronary arteries are affected in CAD, which is a separate pathology.

Blood and heart facts to remember

Topic	Key fact
Plasma	About 55% of blood; 90–92% water; proteins 6–8% — fibrinogen (clotting), globulins (defence), albumins (osmotic balance)
RBCs	5–5.5 million per mm^3 ; life span about 120 days; destroyed in the spleen (graveyard of RBCs); haemoglobin 12–16 g per 100 mL

WBCs	6000–8000 per mm ³ ; neutrophils most abundant (60–65%), basophils least (0.5–1%, secrete histamine, serotonin, heparin); eosinophils 2–3% (allergy); lymphocytes 20–25%
Platelets	1.5–3.5 lakh per mm ³ ; formed from megakaryocytes; involved in clotting
Blood groups	O is the universal donor; AB is the universal recipient
Rh incompatibility	Rh-negative mother with Rh-positive foetus → erythroblastosis foetalis, usually in later pregnancies
Clotting	Thrombokinase converts prothrombin to thrombin; thrombin converts fibrinogen to fibrin; calcium ions are essential
Lymph	Tissue fluid; lacteals in intestinal villi absorb fats
Conducting system	SAN (pacemaker, 70–75 per minute) → AVN → bundle of His → Purkinje fibres
Cardiac cycle	About 0.8 seconds; stroke volume about 70 mL; cardiac output about 5 litres per minute
Heart sounds	Lub: closure of AV valves; dub: closure of semilunar valves
ECG	P wave: atrial depolarisation; QRS complex: ventricular depolarisation; T wave: ventricular repolarisation
Hearts across vertebrates	Fishes 2 chambers; amphibians and reptiles 3 (crocodiles 4); birds and mammals 4
Disorders	Hypertension (140/90 or higher; normal 120/80); coronary artery disease; angina; heart failure