Chapter 4: The blood

Answers

1. Which of the following is responsible for keeping plasma fluid within the blood vessels?
   - Osmotic pressure

2. Which of the following plasma proteins is mainly responsible for exerting the pressure that keeps plasma fluid within the blood vessels?
   - Albumin

3. Which of the following is the most abundant plasma protein?
   - Albumin

4. Which of the following plasma proteins is involved in the clotting of blood?
   - Fibrinogen

5. Which of the following plasma proteins is involved in neutralising antigens?
   - Immunoglobulin

6. What is the most abundant component of plasma?
   - Water

7. What percentage of normal blood is made up of cells?
   - 45%

8. The fluid which remains after blood has clotted is known as _______.
   - Serum
9. How long does it take to make a red blood cell?
   - 7 days

10. Where in the body is the equation Hb+O₂⇌HbO₂ driven to the right?
   - In the lungs

11. Which of the following best describes the function of haemoglobin?
   - Carries respiratory gases

12. Which of the following would decrease the release of oxygen from oxyhaemoglobin?
   - Reduced tissue temperature

Correct Answer feedback: The oxygen-haemoglobin bond is very weak and breaks readily to release oxygen to tissues that need it most. Oxygen release is therefore increased in metabolically active tissues where carbon dioxide levels are high and the temperature has risen, but oxygen release is reduced in tissues that are less active and at normal body temperature.

13. Match the term with its description.
   - Myelocyte: Immature white blood cell
   - Polymorphonuclear: Term meaning irregularly shaped nucleus
   - Granulocyte: Generic term for a white cell with particles in its cytoplasm
   - Neutrophil: Leukocyte whose main function is phagocytosis
   - Eosinophil: White cell associated with allergy
   - Monocyte: Cell that differentiates into a macrophage
   - Langerhans cell: Fixed microphage of the skin
   - Basophil: White cell that synthesises histamine
   - Kupffer cell: Fixed microphage of the liver

14. Fill in the blanks to complete the paragraph on the ABO blood grouping system.

   Red blood cells have groups of proteins on their surface, called antigens. There are several of these protein groups, and clinically the most important is the ABO system. An individual’s blood grouping is determined by the antigens they possess. An individual with group O has neither antigen and both Anti-A and anti-B antibodies. An individual with group A has A antigens and anti-B antibodies, and someone with group B has B antigens and anti-A antibodies. A person with blood group AB has both A and B antigens and neither antibody. These blood groups are important in blood donation. Someone given the incorrect blood may suffer a transfusion reaction.
15. Enter a tick in the appropriate column to match the statements with the corresponding blood types.

<table>
<thead>
<tr>
<th>Statements</th>
<th>Group O</th>
<th>Group A</th>
<th>Group AB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sometimes referred to as the ‘universal donor’</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plasma contains anti-B antibodies only</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Red cells display A and B antigens</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Universal recipient</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Plasma contains neither anti-A nor anti-B antibodies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May be given to blood group B</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>May receive blood group AB</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

16. Identify whether the following events are associated with the extrinsic, intrinsic or the final common pathway.

<table>
<thead>
<tr>
<th>Events</th>
<th>Extrinsic pathway</th>
<th>Intrinsic pathway</th>
<th>Final common pathway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triggered by damage to vessel endothelium</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Fibrin is produced</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Activated within seconds of tissue damage</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prothrombin is converted to thrombin</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Triggered by damage to tissue outwith the circulation</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Requires thromboplastin</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Results in stable clot</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

17. Arrange the tiles describing the physiological response to hypoxia in the correct sequence.

- Step 1: Tissue hypoxia
- Step 2: Kidneys secrete erythropoietin into the blood
- Step 3: Division of stem cells in the bone marrow is stimulated
- Step 4: Red blood cell numbers rise
- Step 5: Oxygen-carrying capacity of the blood is increased
- Step 6: Tissue hypoxia is reversed
18. Match the statements to the relevant blood cell.

<table>
<thead>
<tr>
<th>Statements</th>
<th>Category A</th>
<th>Category B</th>
<th>Category C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transports oxygen</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Responsible for immunity</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Capable of phagocytosis</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>The most numerous blood cell</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contains a nucleus</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Responsible for clotting</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Contains haemoglobin</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

19. Match the blood disorder with its definition.

- Sickle cell anaemia: Causes abnormally shaped red blood cells due to abnormal haemoglobin
- Iron deficiency anaemia: A chronically bleeding duodenal ulcer is likely to lead to this
- Pernicious anaemia: Frequent consequence of gastrectomy
- Aplastic anaemia: Caused by complete bone marrow failure
- Acute myeloblastic leukaemia: Commonest form of this disease in adults
- Haemophilia B: Due to abnormal clotting factor IX
- Disseminated intravascular coagulation: Leads to the inappropriate activation of the clotting system
- Vitamin K deficiency: Underlying problem in haemorrhagic disease of the newborn
- Neutropenia: A consequence of agranulocytosis

20. Fill in the blanks to complete the paragraph on the haemolytic disease of the newborn.

In this disorder, the mother’s immune system makes antibodies to the baby’s red blood cells, leading to phagocytosis of fetal cells. The commonest antigen involved is the rhesus antigen. The problem only arises in second and subsequent pregnancies, and the mother is always negative for the antigen concerned, the father positive and the baby positive.

21. What are thrombocytes used for?

- Blood clotting

22. Which of the following are the most active phagocytes?

- Neutrophils and monocytes

23. Which of the following statements is true?

- Erythropoietin is a hormone that is released by the kidney to stimulate red blood cell formation.

24. Where are many types of blood cells produced?

- Red bone marrow