

## 1. General Characteristics of Blood

Write the answers that match the statements in the spaces at the right.

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|---|-------------------------------|
| 1) pH range of the blood.                                   | <u>7.35–7.45</u>              |
| 2) Liquid portion of blood.                                 | <u>Plasma</u>                 |
| 3) Blood cells and platelets.                               | <u>Formed elements</u>        |
| 4) Percentage of blood formed by liquid portion.            | <u>55%</u>                    |
| 5) Percentage of blood formed by RBCs, WCBs, and platelets. | <u>45%; &lt;1%</u>            |
| 6) Average range of blood volume in males.                  | <u>5–6 liters</u>             |
| 7) Average range of blood volume in females.                | <u>4–5 liters</u>             |
| 8) Basic function of blood.                                 | <u>Transport of materials</u> |

## 2. Red Blood Cells

Write the answers that match the statements in the spaces at the right.

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|---|-----------------------------------|
| 1) Shape of erythrocytes.                                       | <u>Biconcave disks</u>            |
| 2) Red pigment in erythrocytes.                                 | <u>Hemoglobin</u>                 |
| 3) Primary function of RBCs is transport of _____.              | <u>Oxygen and carbon dioxide</u>  |
| 4) Iron-containing portion of hemoglobin.                       | <u>Heme</u>                       |
| 5) Normal range of RBCs/mm <sup>3</sup> in males.               | <u>4.6–6.0 million</u>            |
| 6) Normal range of RBCs/mm <sup>3</sup> in females.             | <u>4.2–5.0 million</u>            |
| 7) Tissue-forming RBCs in children and adults.                  | <u>Red bone marrow</u>            |
| 8) Hormone-stimulating RBC production.                          | <u>Erythropoietin</u>             |
| 9) Organs releasing the hormone that stimulates RBC production. | <u>Kidneys, liver</u>             |
| 10) Organ producing intrinsic factor.                           | <u>Stomach</u>                    |
| 11) Vitamins required for RBC production.                       | <u>B<sub>12</sub>; folic acid</u> |
| 12) Intrinsic factor enables absorption of _____.               | <u>Vitamin B<sub>12</sub></u>     |
| 13) Cells from which RBCs originate.                            | <u>Hemocytoblasts</u>             |
| 14) Average life span of RBCs.                                  | <u>120 days</u>                   |
| 15) Organs where old RBCs are destroyed.                        | <u>Spleen; liver</u>              |
| 16) Phagocytic cells destroying RBCs.                           | <u>Macrophages</u>                |
| 17) Portion of heme that is recycled.                           | <u>Iron-containing portion</u>    |
| 18) Portion of heme that is excreted.                           | <u>Non-iron portion</u>           |
| 19) Organ where heme breakdown occurs.                          | <u>Liver</u>                      |

### 3. White Blood Cells

a. Write the answers that match the statements in the spaces at the right.

1) Cell from which WBCs originate.	<u>Hemocytoblast</u>
2) Normal range of WBCs/mm <sup>3</sup> of blood.	<u>5000–9000</u>
3) Basic function of WBCs is defense against _____.	<u>Disease</u>
4) Where most functions of WBCs occur.	<u>Tissues</u>
5) Group of WBCs with cytoplasmic granules.	<u>Granulocytes</u>
6) Group of WBCs lacking these granules.	<u>Agranulocytes</u>
7) WBCs with lavender-staining granules.	<u>Neutrophils</u>
8) WBCs with blue-staining granules.	<u>Basophils</u>
9) Largest leukocytes.	<u>Monocytes</u>
10) Smallest leukocytes.	<u>Lymphocytes</u>
11) WBCs with red-staining granules.	<u>Eosinophils</u>
12) Form 20% to 25% of WBCs.	<u>Lymphocytes</u>
13) Migrate into tissues to become macrophages.	<u>Monocytes</u>
14) First WBCs attracted from blood into damaged tissues.	<u>Neutrophils</u>
15) WBCs that move into tissues to complete clean-up of tissue damage.	<u>Monocytes</u>
16) Form 60% to 70% of leukocytes.	<u>Neutrophils</u>
17) Release histamine in allergic reactions.	<u>Basophils (mast cells)</u>
18) WBCs that neutralize histamine.	<u>Eosinophils</u>
19) Become mast cells after entering tissues.	<u>Basophils</u>
20) Destroy parasitic worms.	<u>Eosinophils</u>
21) Produce antibodies.	<u>Lymphocytes</u>
22) Compose 3% to 8% of leukocytes.	<u>Monocytes</u>
23) Compose 0.5% to 1.0% of leukocytes.	<u>Basophils</u>
24) Compose 2% to 4% of leukocytes.	<u>Eosinophils</u>
25) Two major phagocytic WBCs.	<u>Neutrophils</u>
	<u>Monocytes</u>

b. Use colored pencils to draw these white blood cells as they appear after staining.

**Neutrophil**

**Eosinophil**

**Basophil**

**Monocyte**

**Lymphocyte**

## 4. Platelets

Write the answers that match the statements in the spaces at the right.

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|--|---|
| 1) Alternate name for platelets.                     | <u>Thrombocytes</u>                                       |
| 2) Size compared to size of RBCs.                    | <u>Much smaller</u>                                       |
| 3) Number of platelets per mm <sup>3</sup> of blood. | <u>256,000–500,000</u>                                    |
| 4) Cells that fragment to form platelets.            | <u>Megakaryocytes</u>                                     |
| 5) Two functions of platelets.                       | <u>Plug broken vessels</u><br><u>Start clot formation</u> |

## 5. Plasma

Write the answers that match the statements in the spaces at the right.

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|--|------------------------|
| 1) Constitutes over 90% of plasma.   | <u>Water</u>           |
| 2) General term for dissolved substances.                                    | <u>Solutes</u>         |
| 3) Most abundant plasma proteins.  | <u>Albumins</u>        |
| 4) Plasma proteins that are antibodies.                                      | <u>Globulins</u>       |
| 5) Plasma protein converted into fibrin.                                     | <u>Fibrinogen</u>      |
| 6) Plasma proteins transporting lipids.                                      | <u>Globulins</u>       |
| 7) Plasma proteins helping to regulate pH and osmotic pressure of the blood. | <u>Albumins</u>        |
| 8) Organ forming most plasma proteins.                                       | <u>Liver</u>           |
| 9) Nitrogenous wastes of protein breakdown.                                  | <u>Urea; uric acid</u> |
| 10) Collective term for inorganic ions in the blood plasma.                  | <u>Electrolytes</u>    |

## 6. Hemostasis

Write the answers that match the statements in the spaces at the right.

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|--|--|
| 1) Three processes of hemostasis in order of occurrence.                             | <u>Blood vessel spasm</u><br><u>Platelet plug formation</u><br><u>Blood clot formation</u> |
| 2) Constriction of damaged blood vessel.   | <u>Blood vessel spasm</u>  |
| 3) Formed elements that temporarily plug break in damaged blood vessel.              | <u>Platelets</u>   |
| 4) Substance released by platelets and damaged tissues that starts clotting process. | <u>Prothrombin activator</u>   |
| 5) Electrolyte required for clotting to occur.                                       | <u>Ca<sup>++</sup></u>   |
| 6) Threadlike strands forming a blood clot.  | <u>Fibrin</u>  |
| 7) Cells that enter clot to form new connective tissue and repair damage.            | <u>Fibroblasts</u>   |
| 8) Enzyme converting fibrinogen into fibrin.   | <u>Thrombin</u>  |

## 7. Human Blood Types

Write the answers that match the statements in the spaces at the right.

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|---|---------------------------------|
| 1) Location of antigens used in blood typing.                                     | <u>On RBCs</u>                  |
| 2) Location of antibodies against blood typing antigens.                          | <u>In Plasma</u>                |
| 3) Antigen(s) in type A blood.  | <u>A</u>                        |
| 4) Antigen(s) in type AB blood.   | <u>AB</u>                       |
| 5) Antigen(s) in type O blood.  | <u>None</u>                     |
| 6) Antibodies in type B blood.  | <u>Anti-A</u>                   |
| 7) Antibodies in type AB blood.   | <u>None</u>                     |
| 8) Antibodies in type O blood.  | <u>Anti-A, anti-B</u>           |
| 9) Antibodies in Rh <sup>-</sup> blood of person sensitized to the Rh antigen.    | <u>Anti-Rh</u>                  |
| 10) Caused by maternal anti-Rh antibodies binding with Rh antigens on fetal RBCs. | <u>Erythroblastosis fetalis</u> |

## 8. Disorders of the Blood

Write the answers that match the statements in the spaces at the right.

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|--|---------------------------------|
| 1) Reduced ability to form blood clots.                        | <u>Hemophilia</u>               |
| 2) Reduced capacity to carry oxygen.                           | <u>Anemia</u>                   |
| 3) An excessive concentration of erythrocytes.                 | <u>Polycythemia</u>             |
| 4) Infection of lymphocytes by Epstein-Barr virus.             | <u>Infectious mononucleosis</u> |
| 5) Anemia due to a deficiency of iron.                         | <u>Nutritional anemia</u>       |
| 6) Cancer producing excess of leukocytes.                      | <u>Leukemia</u>                 |
| 7) Anemia due to inability to absorb vitamin B <sub>12</sub> . | <u>Pernicious anemia</u>        |
| 8) Anemia due to excessive bleeding.                           | <u>Hemorrhagic anemia</u>       |
| 9) Anemia due to sickling of erythrocytes.                     | <u>Sickle-cell anemia</u>       |
| 10) Anemia due to premature rupture of RBCs.                   | <u>Hemolytic anemia</u>         |
| 11) Anemia due to loss of red bone marrow.                     | <u>Aplastic anemia</u>          |
| 12) Fetal blood contains erythroblasts.                        | <u>Erythroblastosis fetalis</u> |

## 9. Clinical Applications



- a. A person can receive platelets from anyone, no matter the blood type. How is this possible? Platelets do not have antigens on their surfaces.
- b. Chemotherapy is often used to destroy the rapidly dividing cells of a cancer. What impact would chemotherapy have on the production of blood cells? Blood cell production would decrease.  
Explain. Some dividing cells in red bone marrow would be killed by the chemotherapy.
- c. Mary's blood type is A, Rh<sup>-</sup>. She is at the hospital for delivery of her second child, and her first child is Rh<sup>+</sup>. The attending physician wants blood available in case the baby exhibits erythroblastosis fetalis upon delivery. What blood type should he order? O, Rh<sup>-</sup>  
Explain. O, Rh<sup>-</sup> is acceptable by all blood types. Maternal anti-Rh antibodies in fetal blood will not destroy O, Rh<sup>-</sup> RBCs.