

Anatomy & Physiology of Domesticated Animals — Exam 3

Section I – True/False (Explain if False)

- _____ The pulmonary circulation moves blood between the heart and lungs. **T**
- _____ The left ventricle has thinner walls than the right ventricle. **F – The left ventricle has thicker walls because it pumps blood to the entire body.**
- _____ The tricuspid valve is located between the left atrium and left ventricle. **F – It is between the right atrium and right ventricle.**
- _____ The respiratory system's main function is to exchange oxygen and carbon dioxide. **T**
- _____ Veins always carry deoxygenated blood. **F – Pulmonary veins carry oxygenated blood back to the heart.**
- _____ Hemoglobin is found in plasma. **F – It is found inside red blood cells.**
- _____ The diaphragm and intercostal muscles assist in breathing. **T**
- _____ The systemic circulation transports oxygen-rich blood from the heart to the body's tissues. **T**
- _____ Internal respiration occurs between the lungs and blood. **F – It occurs between blood and tissues.**
- _____ The myocardium is the muscular layer responsible for heart contraction. **T**
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Section II – Multiple Choice

1. Which valves prevent backflow from the arteries into the ventricles?
 - a) AV valves
 - b) Pulmonary and aortic valves
 - c) Mitral and tricuspid valves
 - d) Semilunar and mitral valves**Answer: b) Pulmonary and aortic valves**

2. Which blood vessel type carries blood under the highest pressure?
- a) Veins
 - b) Capillaries
 - c) Arteries
 - d) Venules

Answer: c) Arteries

3. Which structure prevents friction and heat buildup around the heart?
- a) Endocardium
 - b) Myocardium
 - c) Serous pericardium
 - d) Epicardium

Answer: c) Serous pericardium

4. What is the main function of hemoglobin?
- a) Transports oxygen and carbon dioxide
 - b) Regulates body temperature
 - c) Stimulates red blood cell formation
 - d) Stores iron in the spleen

Answer: a) Transports oxygen and carbon dioxide

5. Which law states that gas pressure and volume are inversely related?
- a) Bohr Effect
 - b) Boyle's Law
 - c) Henry's Law
 - d) Dalton's Law

Answer: b) Boyle's Law

6. Which type of immune cell is the first line of defense and results in pus?
- a) Basophil
 - b) Neutrophil
 - c) Eosinophil
 - d) Monocyte

Answer: b) Neutrophil

7. Which cell type releases histamine and heparin?
- a) Lymphocyte
 - b) Monocyte
 - c) Basophil

d) Eosinophil

Answer: c) Basophil

8. Which organ is the site of red blood cell formation?

a) Liver

b) Thymus

c) Red bone marrow

d) Spleen

Answer: c) Red bone marrow

9. Which of the following is the correct order of airflow?

a) Trachea → Bronchi → Bronchioles → Alveoli

b) Alveoli → Bronchi → Trachea → Pharynx

c) Bronchi → Alveoli → Trachea → Bronchioles

d) Larynx → Pharynx → Trachea → Lungs

Answer: a) Trachea → Bronchi → Bronchioles → Alveoli

10. Which immune cell type produces antibodies?

a) B cells

b) T cells

c) Monocytes

d) Neutrophils

Answer: a) B cells

Section III – Matching

Match the term with its correct function or description:

A. Veins

B. Arteries

C. Capillaries

D. Neutrophil

E. Basophil

F. Eosinophil

G. Monocyte

H. Lymphocyte

- _____ Carry blood toward the heart – **A**
 - _____ Carry blood away from the heart – **B**
 - _____ Connect arteries and veins; site of gas exchange – **C**
 - _____ First responder; phagocytosis; forms pus – **D**
 - _____ Involved in allergic response; releases histamine and heparin – **E**
 - _____ Active during parasitic infections; less common in humans – **F**
 - _____ Matures into macrophages; largest leukocyte – **G**
 - _____ Regulates immune response; includes B, T, and NK cells – **H**
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Section IV – Short Answer

1. What are the two divisions of the circulatory system and what do they do?
Systemic circulation moves oxygenated blood between the heart and the body's tissues.
Pulmonary circulation moves deoxygenated blood between the heart and the lungs.

2. Define internal and external respiration.
Internal respiration – gas exchange between blood and tissues.
External respiration – gas exchange between air and blood in the lungs.

3. Describe the pathway of blood through the heart, including electrical conduction.
Deoxygenated blood enters the **right atrium** through the vena cavae → passes through the **tricuspid valve** to the **right ventricle** → through the **pulmonary valve** to the lungs → returns to the **left atrium** via pulmonary veins → through the **mitral valve** to the **left ventricle** → exits through the **aortic valve** to the body.
Electrical conduction: **SA node** → **AV node** → **Bundle of His** → **Purkinje fibers**.

4. What are the three ways CO₂ is transported in blood?
Dissolved in plasma, bound to hemoglobin as carbaminohemoglobin, or as bicarbonate ions.
5. List the parts of the upper and lower respiratory tract.
Upper: Nostrils, pharynx, larynx
Lower: Trachea, bronchi, lungs

Section V – Extended Response

1. **Describe the process of erythropoiesis to lysis and removal.**
When oxygen levels drop, the kidneys release **erythropoietin (EPO)**, which stimulates red bone marrow to produce **erythrocytes**. Mature RBCs circulate for about 120 days, carrying oxygen and CO₂. When they age, they are broken down in the **liver and spleen** by macrophages, and hemoglobin components are recycled or excreted.
2. **Discuss the process of blood clotting.**
When a vessel is damaged, smooth muscle contracts to reduce blood loss. **Platelets** stick to the injury site and release chemicals that activate clotting factors. **Thrombin** converts **fibrinogen** into **fibrin**, forming a mesh that traps platelets and red blood cells. After healing, **fibrinolysis** dissolves the clot.
3. **Explain how blood maintains pH.**
Blood maintains pH through the **bicarbonate–carbonic acid buffer system**. If pH drops, bicarbonate binds excess hydrogen ions; if pH rises, carbonic acid releases hydrogen ions. This keeps pH around **7.35–7.45**.

4. Describe gas exchange in alveolar sacs.

Oxygen diffuses from alveolar air into the capillaries (where O_2 partial pressure is lower), while CO_2 diffuses from the blood into the alveoli to be exhaled.

5. List and describe different breathing patterns.

- **Eupnea:** Normal quiet breathing
- **Apnea:** Temporary cessation of breathing
- **Dyspnea:** Labored breathing
- **Tachypnea:** Rapid breathing
- **Costal breathing:** Rib movement only
- **Diaphragmatic breathing:** Abdomen expands due to diaphragm movement

Section VI – Gas Laws

1. Boyle's Law

States that pressure and volume of a gas are inversely related — when one increases, the other decreases.

Answer: As the size of a closed container (like the lungs) decreases, pressure increases.

During inhalation, thoracic volume increases and pressure decreases, drawing air in; during exhalation, volume decreases and pressure increases, pushing air out.

2. Henry's Law

Describes how gases dissolve in liquids depending on their pressure and solubility.

Answer: The amount of gas that dissolves in a liquid (such as oxygen in blood plasma) is directly proportional to the partial pressure of that gas and its solubility. This explains how oxygen and carbon dioxide move between air and blood during respiration.

3. Dalton's Law

States that the total pressure of a gas mixture equals the sum of the pressures of each individual gas.

Answer: Each gas in a mixture (like nitrogen, oxygen, and carbon dioxide in air) exerts its own partial pressure. This determines how gases diffuse — oxygen moves from high to low partial pressure across the alveolar membrane.

4. Bohr Effect

Explains how changes in pH and CO_2 affect hemoglobin's oxygen-binding ability.

Answer: As acidity increases (pH decreases) or CO_2 rises, hemoglobin's affinity for oxygen decreases, releasing oxygen to tissues. This ensures active tissues with more CO_2 get more oxygen delivered.

Section VII – Names all the Blood and Lymphatic Cells with their function