مراجعة نهائية وفق الهيكل الوزاري المسار M-101 منهج انسباير

BIOLOGY

END of TERM 1 Revision

STUDY NOTES — BLOOD VESSELS & THE CIRCULATORY SYSTEM

(Based on McGraw Hill / Glencoe Curriculum)

I. The Circulatory Network

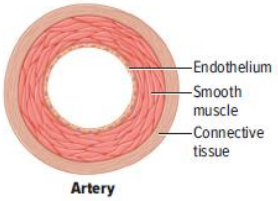
Just like highways carry traffic, **blood vessels** carry blood throughout the body.
This network keeps **oxygen**, **nutrients**, and **wastes** moving between the **heart**, **lungs**, and **body tissues**.

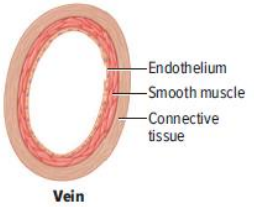
The Three Major Types of Blood Vessels

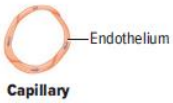
1. **Arteries** – Carry blood *away from the heart*.
2. **Capillaries** – Tiny vessels where *exchange of materials* occurs.
3. **Veins** – Carry blood *back to the heart*.

II. Arteries

- **Function:** Carry **oxygen-rich (oxygenated)** blood away from the heart.
- **Structure:**
  - **Thick, elastic walls** that can handle high pressure from blood being pumped.
  - **Three layers:**
    - Outer **connective tissue**,
    - Middle **smooth muscle**,
    - Inner **endothelial tissue** (thicker than in veins).
- **Why thick walls?** Blood leaving the heart is under **high pressure**, so arteries must be durable and flexible.







III. Capillaries

- **Structure:** Microscopic vessels, only **one cell thick**.
- **Function:** Site of **gas and nutrient exchange** between the **blood** and **body cells**.
- **Process:** Exchange occurs through **diffusion** (movement from high to low concentration).
- **Adaptation:** Red blood cells move **single-file** to allow efficient gas exchange.
- **Example:** During exercise, capillaries **dilate** to increase blood flow and oxygen delivery to muscles.

> *Get It?*
> By what process do materials cross the walls of capillaries?
> **Answer:** Diffusion.

IV. Veins

- **Function:** Carry **oxygen-poor (deoxygenated)** blood back to the heart.
- **Structure:**
  - **Thinner walls** than arteries (less pressure).
  - Contain **valves** to prevent blood from flowing backward.
- **How blood moves:**
  - **Skeletal muscle contractions** squeeze veins.
  - **Breathing movements** push blood toward the heart.

> *Get It?*
> Describe the differences among arteries, capillaries, and veins.
> **Answer:** Arteries—thick and strong; Capillaries—microscopic and thin; Veins—thin with valves.

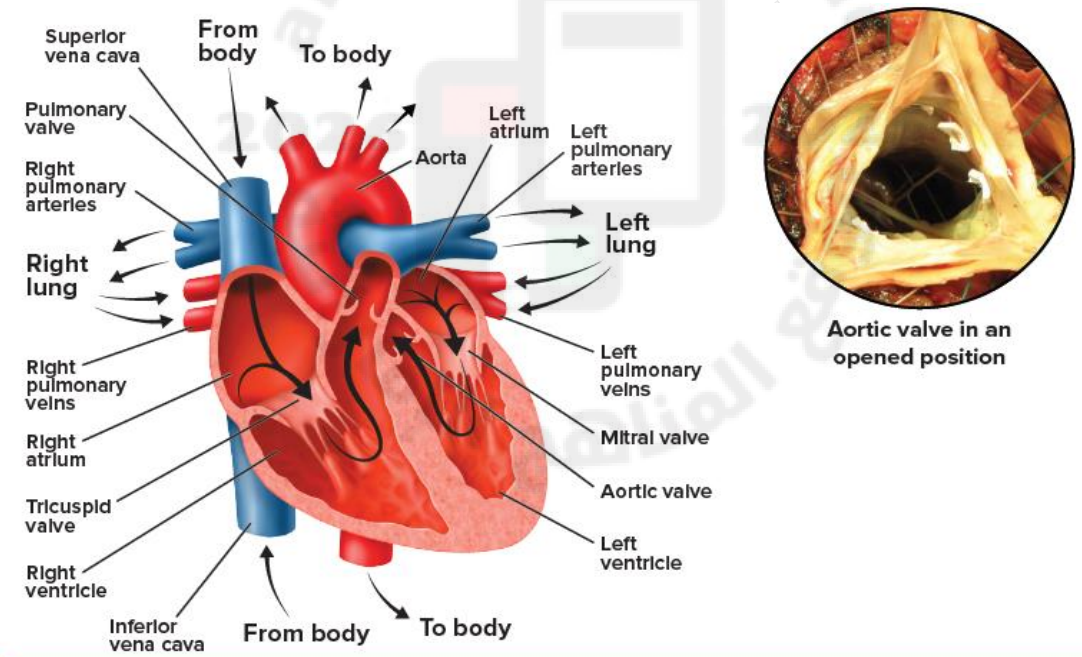
V. The Heart

- **Location & Size:** A **muscular organ** about the size of your fist, located in the **center of the chest**.
- **Function:** Pumps **oxygenated blood** to the body and **deoxygenated blood** to the lungs.

Structure of the Heart

- **Four chambers:**
  - **Right atrium** – Receives deoxygenated blood from the body.
  - **Right ventricle** – Pumps blood to the lungs.
  - **Left atrium** – Receives oxygenated blood from lungs.
  - **Left ventricle** – Pumps oxygenated blood to the body.
- **Valves** between chambers ensure **one-way flow** of blood.
- **Strong wall (septum)** separates the left and right sides.

💡 *Get It?*
Diagram the path of blood through the heart:
Body → Right atrium → Right ventricle → Lungs → Left atrium → Left ventricle → Body



Aortic valve in an opened position

Figure 4 The arrows map the path of blood as it circulates through the heart.
Diagram *the path of blood through the heart.*

VI. How the Heart Beats

- The **pacemaker (SA node)** in the **right atrium** sends signals causing the atria to contract.
- The **AV node** receives the signal and triggers **ventricular contraction**.
- One complete heartbeat = **two-step contraction** (atria, then ventricles).
- **Normal pulse:** ~70 beats per minute (average adult).

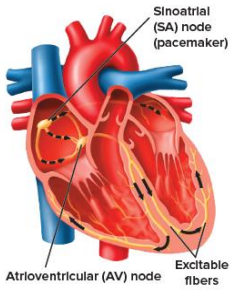


Figure 5 The SA node initiates the contraction of the heart, which spreads through both atria to the AV node. The AV node transmits the signal through excitable fibers that stimulate both ventricles.

Get It?
Compare SA node and AV node:
SA node starts the heartbeat; **AV node** transmits it to ventricles.

VII. Pulse and Blood Pressure

- **Pulse:** Expansion and relaxation of artery walls with each heartbeat.
- **Blood Pressure:** The force of blood against artery walls.

Systolic pressure: Heart contraction (top number). **Diastolic pressure:** Heart relaxation (bottom number).

  - **Normal blood pressure:** 120/80 mm Hg.
- **High blood pressure (hypertension):** Can damage arteries and lead to **heart attack or stroke**.
  - Treated with **exercise, healthy diet, weight control, and medication**.

VIII. Blood Flow in the Body

The circulatory system has **two loops**:

1. **Pulmonary Circulation**
   - **Right side of heart → lungs → back to heart**
   - Blood **gains oxygen** and **releases carbon dioxide** in the lungs.
2. **Systemic Circulation**
   - **Left side of heart → body → back to heart**
   - Blood **delivers oxygen** and **collects wastes** from cells.

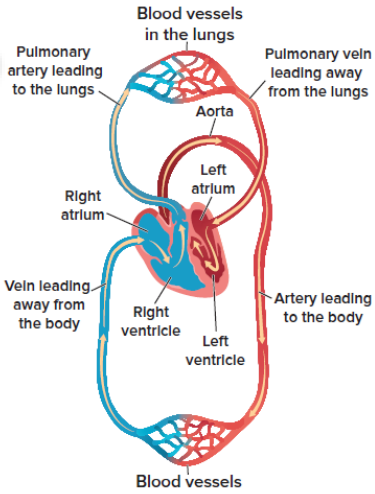


Figure 7 Blood flow through the body consists of two different circulatory loops.

Get It?
What happens in the lungs during circulation?
Answer: Oxygen diffuses into the blood; carbon dioxide diffuses out.

IX. Functions of the Circulatory System

1. **Transports** oxygen, nutrients, and hormones.
2. **Removes** carbon dioxide and other wastes.
3. **Protects** the body with immune cells.
4. **Clots** to prevent blood loss.
5. **Maintains homeostasis** and regulates body temperature.

X. Components of Blood

1. Plasma

- **Definition:** Liquid portion of blood (~55% of total).
- **Composition:** 90% water, 10% dissolved materials (nutrients, hormones, waste).
- **Functions:**
  - Carries nutrients (glucose, fats).
  - Transports hormones and waste.
  - Contains **plasma proteins**: Control water balance, Help fight disease, Form blood clots.

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2. Red Blood Cells (RBCs)

- **Function:** Carry oxygen using **hemoglobin**.
- **Structure:** Disc-shaped, no nucleus, live ~120 days.
- **Hemoglobin:** Iron-rich protein that binds oxygen and gives blood its red color.
- **Iron-rich foods:** Spinach, beans, red meat, fortified cereals.

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3. Platelets

- **Function:** Help form **blood clots**.
- **Process:**
  - Platelets stick to wounds.
  - Release chemicals that produce **fibrin**, which forms a mesh to trap cells → **scab forms**.

💡 *Get It?*
Explain how a blood clot forms.
Answer: Platelets release fibrin → fibers trap cells → clot forms → scab.

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4. White Blood Cells (WBCs)

- **Function:** Defend the body against infection.
- **Types of actions:** Recognize pathogens, Produce disease-fighting chemicals, Surround and destroy invaders.
- **Differences from RBCs:** Have a **nucleus**, **Fewer in number**, **Longer lifespan** (months or years).

Figure 8 Plasma is the clear, yellowish portion of the blood, made up mostly water.

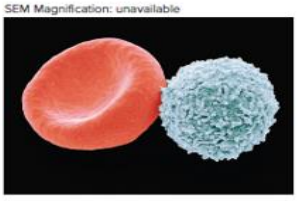

Figure 9 Blood is composed of liquid plasma, red blood cells (dimpled disc on the left), white blood cells (irregularly shaped cell on the right), and platelets (flat fragments, not shown).

Infer *What might be occurring if there are too many white blood cells?*

XI. Blood Groups

ABO Blood Types

Blood Type	Markers on RBCs	Antibodies in Plasma	Can Donate To	Can Receive From
A	A	Anti-B	A, AB	A, O
B	B	Anti-A	B, AB	B, O
AB	A and B	None	AB	A, B, AB, O
O	None	Anti-A, Anti-B	A, B, AB, O	O

*If incompatible blood types mix, clumping (agglutination) can **block blood flow**.*

Rh Factor: Another marker on red blood cells (+ or –). **Rh incompatibility:** If an **Rh– mother** carries an **Rh+ baby**, antibodies may form and attack the baby's RBCs during future pregnancies.

XII. Circulatory System Disorders

Disorder	Description
Atherosclerosis	Fat deposits clog arteries; reduces blood flow.
Heart Attack	Blood flow to heart muscle is blocked; tissue damage occurs.
Stroke	Blockage or rupture of brain blood vessels; oxygen supply cut off.

💡 *Get It?*
How can lifestyle affect circulatory health?
Answer: Regular exercise, balanced diet, and avoiding smoking help prevent atherosclerosis and hypertension.

XIII. Vocabulary Summary

Term	Definition
Artery	Blood vessel carrying blood away from heart
Capillary	Tiny vessel where gas and nutrient exchange occurs
Vein	Vessel that carries blood back to the heart
Valve	Tissue flap preventing backflow of blood
Hemoglobin	Iron-containing protein in RBCs that binds oxygen
Platelet	Cell fragment involved in clotting
Plasma	Liquid portion of blood
Pacemaker (SA Node)	Heart tissue that sets the rhythm of heartbeat
Blood Pressure	Force of blood against artery walls
Atherosclerosis	Hardening/narrowing of arteries due to fat buildup

🧠 **STUDY NOTES**

The Importance of Respiration

1. Purpose of Respiration

- Cells need **oxygen (O_2)** and **glucose** to produce **ATP (adenosine triphosphate)**, the energy molecule used for all cellular activities.
- The process that produces ATP is called **cellular respiration**.
- **Cellular respiration** releases **carbon dioxide (CO_2)** and **water (H_2O)** as waste products.

Breathing vs. Respiration

- **Breathing**: The *mechanical* movement of air into and out of the lungs.
- **Respiration**: The *chemical* process in cells that produces energy.

There are **two types of respiration**:

- **External respiration** – exchange of gases between the **lungs** and the **blood**.
- **Internal respiration** – exchange of gases between the **blood** and **body cells**.

Compare & Contrast

Type	Location	Function
External respiration	Lungs (alveoli ↔ blood)	Oxygen moves into blood; CO_2 moves out
Internal respiration	Tissues (blood ↔ cells)	Oxygen moves into cells; CO_2 moves into blood

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The Path of Air

1. **Nose/Mouth** – Air enters; nose hairs filter large particles.
2. **Nasal passages** – Air is warmed, moistened, and filtered by **cilia** and **mucous membranes**.
3. **Pharynx** – Upper throat; shared by respiratory and digestive systems.
4. **Epiglottis** – Flap that prevents food from entering the respiratory tract.
5. **Larynx** – Voice box.
6. **Trachea (windpipe)** – Tube that connects larynx to bronchi.
7. **Bronchi** – Two main branches leading to the lungs.
8. **Bronchioles** – Smaller air passages branching within lungs.
9. **Alveoli** – Tiny air sacs surrounded by **capillaries** where gas exchange occurs.
10. **Diaphragm** – Muscle that controls breathing movement.

Gas Exchange in the Lungs

- **Oxygen** diffuses from alveoli → capillaries → red blood cells.
- **Carbon dioxide** diffuses from blood → alveoli → exhaled air.

- CO_2 is transported in blood as: **Carbonic acid**, **Dissolved in plasma**, or **Bound to hemoglobin**.

Breathing Mechanics

- Controlled by the **brain** responding to CO_2 levels in blood.
- When **CO_2 is high**, breathing rate **increases**.
- **Inhalation**: Diaphragm **contracts and moves down**, chest cavity expands, air moves in.
- **Exhalation**: Diaphragm **relaxes and moves up**, chest cavity shrinks, air moves out.

Respiratory and Circulatory Systems

- The **respiratory system** brings in oxygen and removes carbon dioxide.
- The **circulatory system** transports these gases between lungs and cells.

Common Respiratory Disorders

Disorder	Description
Asthma	Bronchioles constrict; airways narrow.
Bronchitis	Infected airways; coughing and mucus.
Emphysema	Alveoli break down; less surface area for gas exchange.
Pneumonia	Infection causes alveoli to fill with mucus.
Lung Cancer	Uncontrolled cell growth; persistent cough and breathing problems.

Note: Smoking and pollutants damage respiratory tissues and reduce gas exchange efficiency.

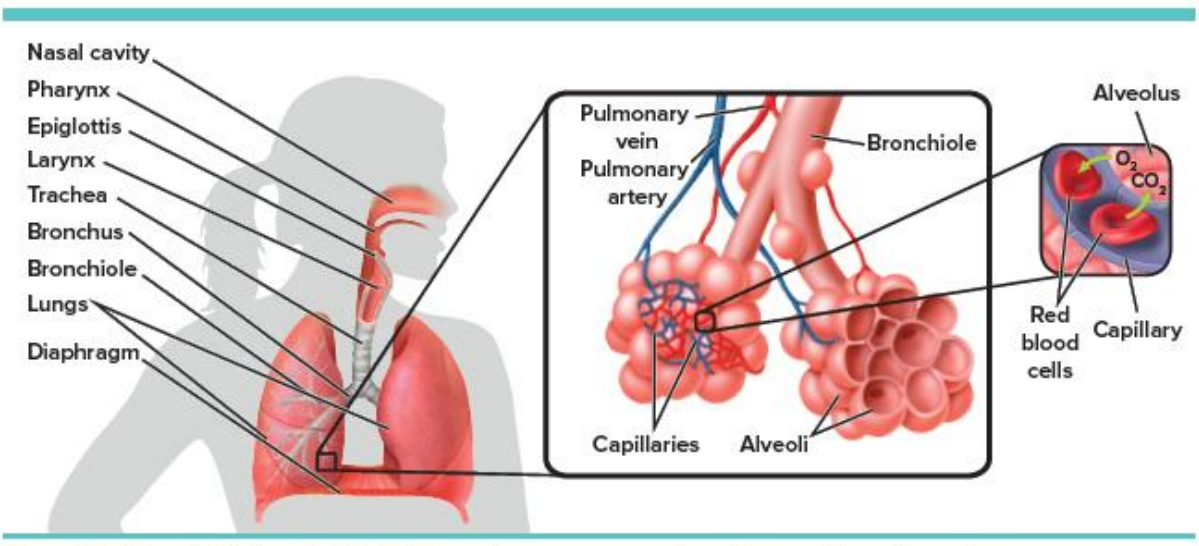


Figure 13 Air travels into the alveoli of the lungs, where gases are exchanged across thin capillary walls.
Diagram *Trace the path of oxygen from the atmosphere to the alveoli in the lungs.*

Blood Vessels

1. What are the three major blood vessels in the human body?
   A. Arteries, veins, and capillaries
   B. Arterioles, venules, and capillaries
   C. Arteries, veins, and valves
   D. Arterioles, venules, and valves

2. Which type of blood vessel carries oxygen-rich blood away from the heart?
   A. Veins
   B. Capillaries
   C. Arteries
   D. Venules

3. Which layer is found in both arteries and veins but NOT in capillaries?
   A. Endothelium
   B. Smooth muscle
   C. Connective tissue
   D. Valves

4. What is the primary function of capillaries in the circulatory system?
   A. To pump blood throughout the body
   B. To prevent blood from flowing backward
   C. To exchange materials between blood and body cells
   D. To store excess blood during rest

5. How thick are capillary walls?
   A. Three cells thick
   B. Two cells thick
   C. One cell thick
   D. Four cells thick

6. What process allows for the exchange of materials through capillary walls?
   A. Osmosis
   B. Active transport
   C. Diffusion
   D. Facilitated diffusion

7. Which blood vessels have the thickest endothelial layer?
   A. Arteries
   B. Veins
   C. Capillaries
   D. Venules

8. Why do arteries need thicker walls than veins?
   A. To prevent blood from flowing backward
   B. To withstand higher blood pressure
   C. To help move blood back to the heart
   D. To allow for more efficient gas exchange

9. How do red blood cells move through capillaries?
   A. In clusters of five or more
   B. Two at a time
   C. In a random pattern
   D. Single-file

10. What happens to muscle capillaries during exercise?
    A. They constrict to reduce blood flow
    B. They dilate to increase blood flow
    C. They close completely to direct blood elsewhere
    D. They remain unchanged regardless of activity level

11. Which structures in veins prevent blood from flowing backward?
    A. Smooth muscle
    B. Valves
    C. Endothelium
    D. Connective tissue

12. What type of blood do veins carry?
    A. Oxygen-rich blood
    B. Oxygen-poor blood
    C. Both oxygen-rich and oxygen-poor blood
    D. Neither oxygen-rich nor oxygen-poor blood

13. Which of the following helps move blood through veins back to the heart?
    A. Contraction of skeletal muscles
    B. Increased pressure from the heart
    C. Dilation of the veins
    D. Constriction of arteries

14. What are the smaller branches of arteries called?
    A. Venules
    B. Capillaries
    C. Arterioles
    D. Valves

15. How does body temperature regulation relate to blood vessels?
    A. Body temperature is unaffected by blood vessel diameter
    B. Constricting blood vessels increases heat loss
    C. Dilating blood vessels near the skin increases heat loss
    D. Blood vessels have no role in temperature regulation

16. What is the main difference between the structure of arteries and veins?
    A. Veins have valves while arteries do not
    B. Arteries have endothelium while veins do not
    C. Veins have smooth muscle while arteries do not
    D. Arteries have connective tissue while veins do not

17. What happens when blood flows from arteries to capillaries?
    A. Blood pressure increases
    B. Blood pressure decreases
    C. Blood velocity increases
    D. Oxygen content increases

18. Which factor does NOT contribute to blood movement in veins?
    A. Contraction of skeletal muscles
    B. Breathing movements
    C. Valves preventing backflow
    D. High pressure from the heart

19. What would happen if capillary walls were thicker?
    A. More efficient exchange of materials
    B. Less efficient exchange of materials
    C. Increased blood pressure
    D. Decreased blood volume

20. Which statement about blood vessels is TRUE?
    A. Arteries always carry oxygen-rich blood
    B. Veins always carry oxygen-poor blood
    C. Capillaries have the thickest walls of all blood vessels
    D. Blood pressure is highest in the veins

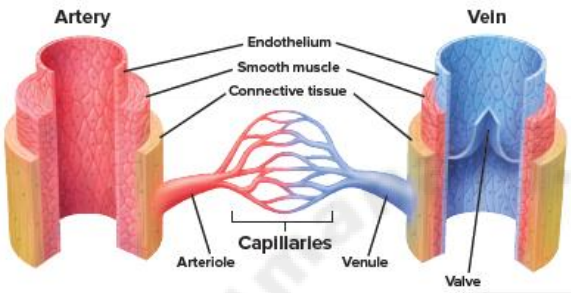
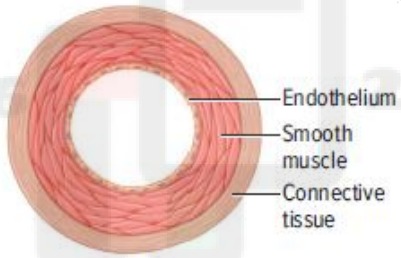
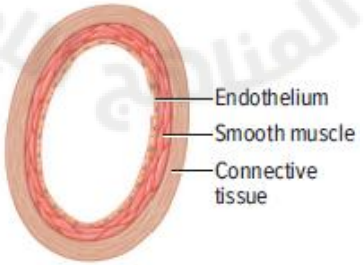


Figure 3 Blood circulates throughout the body inside blood vessels.

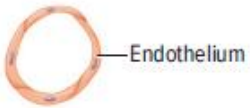
Hypothesize *how body temperature can be regulated by the diameter of blood vessels.*



Artery



Vein



Capillary

Figure 1 The three major blood vessels in the body are arteries, veins, and capillaries.

Predict *By what process do you think materials cross the walls of capillaries?*

The Heart

1. What is the main function of the atria in the heart?
   A. Pump blood away from the heart
   B. Receive blood returning to the heart
   C. Separate the left side from the right side
   D. Generate electrical impulses for contractions

2. The strong muscular wall that separates the left side of the heart from the right side helps to:
   A. Generate electrical impulses
   B. Prevent blood from flowing backward
   C. Keep oxygenated and deoxygenated blood separate
   D. Regulate blood pressure

3. What is the primary function of the ventricles?
   A. Receive blood returning to the heart
   B. Pump blood away from the heart
   C. Generate electrical signals
   D. Store blood between heartbeats

4. The sinoatrial (SA) node is responsible for:
   A. Separating the chambers of the heart
   B. Preventing blood from flowing backward
   C. Initiating the heartbeat
   D. Measuring blood pressure

5. Which of the following correctly describes the path of blood through the heart?
   A. Right ventricle → right atrium → left atrium → left ventricle
   B. Right atrium → right ventricle → left ventricle → left atrium
   C. Right atrium → right ventricle → left atrium → left ventricle
   D. Right atrium → left atrium → right ventricle → left ventricle

6. What is the function of the atrioventricular (AV) node?
   A. It initiates the contraction of the heart
   B. It receives the signal from the SA node and transmits it to the ventricles
   C. It separates the atria from the ventricles
   D. It measures the blood pressure in the heart

7. What is the average number of times the heart pulses per minute in a normal adult?
   A. 50 times
   B. 60 times
   C. 70 times
   D. 80 times

8. What does a blood pressure reading of 120/80 indicate?
   A. The heart is beating 120 times per minute with 80% efficiency
   B. The systolic pressure is 120 and the diastolic pressure is 80
   C. The heart is pumping 120 milliliters of blood with 80% oxygen content
   D. The systolic pressure is 80 and the diastolic pressure is 120

9. Which phase of the cardiac cycle corresponds to the highest blood pressure?
   A. Diastole
   B. Systole
   C. Pulse
   D. Relaxation

10. What instrument is used to measure blood pressure?
    A. Electrocardiograph
    B. Stethoscope
    C. Sphygmomanometer
    D. Pulse oximeter

11. Which of the following is a potential consequence of untreated high blood pressure?
    A. Decreased heart rate
    B. Increased lung capacity
    C. Increased risk of heart attack and stroke
    D. Decreased blood volume

12. What type of muscle makes up the heart?
    A. Smooth muscle
    B. Skeletal muscle
    C. Cardiac muscle
    D. Striated muscle

13. What is the function of heart valves?
    A. Generate electrical impulses
    B. Keep blood flowing in one direction
    C. Regulate heart rate
    D. Filter blood

14. Which of the following best describes the two main phases of the heart's action?
    A. Contraction and expansion
    B. Systole and diastole
    C. Atrial filling/contraction followed by ventricular contraction
    D. Left side pumping followed by right side pumping

15. Which structure receives blood from the lungs?
    A. Right atrium
    B. Right ventricle
    C. Left atrium
    D. Left ventricle

16. What is a pulse?
    A. The electrical signal that causes the heart to contract
    B. The alternating expansion and relaxation of an artery wall caused by heart contraction
    C. The sound made by the heart valves closing
    D. The flow of blood through the capillaries

17. Blood returning from the body (except the lungs) first enters which chamber of the heart?
    A. Left atrium
    B. Left ventricle
    C. Right atrium
    D. Right ventricle

18. Which valve is located between the left atrium and left ventricle?
    A. Tricuspid valve
    B. Aortic valve
    C. Pulmonary valve
    D. Mitral valve

19. What does the SA node respond to when adjusting heart rate?
    A. Blood pressure
    B. Body temperature
    C. The body's oxygen needs
    D. Blood glucose levels

20. Which of the following blood vessels carries oxygenated blood away from the heart to the body?
    A. Pulmonary artery
    B. Pulmonary vein
    C. Vena cava
    D. Aorta

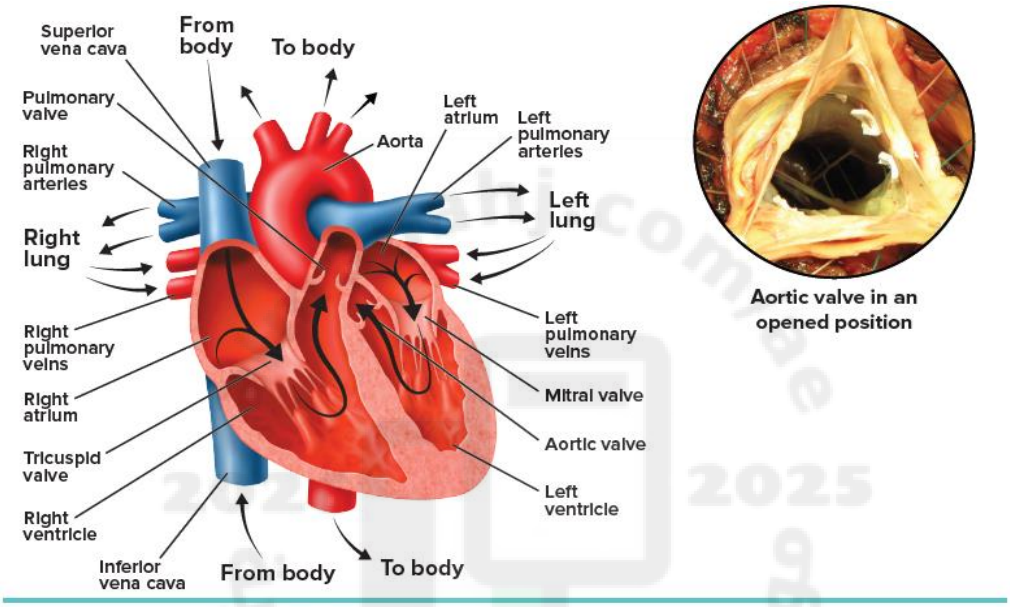


Figure 4 The arrows map the path of blood as it circulates through the heart.
Diagram *the path of blood through the heart.*

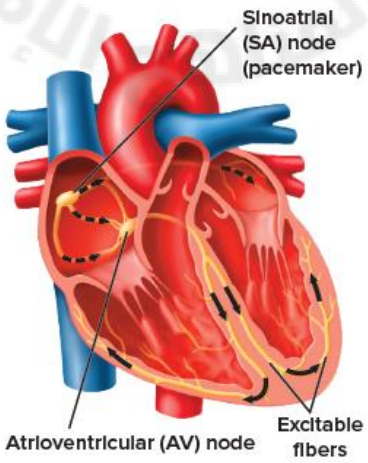


Figure 5 The SA node initiates the contraction of the heart, which spreads through both atria to the AV node. The AV node transmits the signal through excitable fibers that stimulate both ventricles.

Blood Flow

1. What are the two main loops in blood circulation?
   A. Right atrium to left atrium; left ventricle to right ventricle
   B. Heart to lungs and back; heart to body and back
   C. Heart to brain and back; heart to extremities and back
   D. Pulmonary circulation to systemic circulation; systemic circulation to lymphatic circulation

2. Which side of the heart pumps deoxygenated blood to the lungs?
   A. Left side
   B. Right side
   C. Both sides equally
   D. Neither side

3. Blood entering the right atrium is characterized by:
   A. High oxygen, low carbon dioxide
   B. Low oxygen, low carbon dioxide
   C. High oxygen, high carbon dioxide
   D. Low oxygen, high carbon dioxide

4. Where does oxygen diffuse into the blood?
   A. In the heart
   B. In the lungs
   C. In body tissues
   D. In the aorta

5. What is the largest artery in the body?
   A. Pulmonary artery
   B. Aorta
   C. Vena cava
   D. Carotid artery

6. The second loop of circulation begins when blood moves from:
   A. Left atrium to left ventricle
   B. Right atrium to right ventricle
   C. Left ventricle to right atrium
   D. Right ventricle to left atrium

7. In which structures does gas exchange occur in the lungs?
   A. Alveoli
   B. Bronchi
   C. Capillaries
   D. Arterioles

8. What causes oxygen to move from the lungs into the blood?
   A. Active transport
   B. Facilitated diffusion
   C. Concentration gradient
   D. Osmotic pressure

9. After leaving the lungs, oxygenated blood returns to:
   A. Right atrium
   B. Right ventricle
   C. Left atrium
   D. Left ventricle

10. Which vessels carry blood away from the heart?
    A. Veins
    B. Arteries
    C. Capillaries
    D. Venules

11. What is the primary function of the circulatory system?
    A. Gas exchange
    B. Hormone production
    C. Transport of substances
    D. Temperature regulation only

12. Besides oxygen, what else does blood transport to body cells?
    A. Carbon dioxide only
    B. Nutrients
    C. Waste products only
    D. None of the above

13. Which system is considered part of both the circulatory and immune systems?
    A. Respiratory system
    B. Endocrine system
    C. Lymphatic system
    D. Digestive system

14. What happens to carbon dioxide during gas exchange in the lungs?
    A. It is converted to oxygen
    B. It diffuses from the blood into the lungs
    C. It is transported to the heart
    D. It binds to hemoglobin

15. The pulmonary arteries carry:
    A. Oxygenated blood to the body
    B. Deoxygenated blood to the lungs
    C. Oxygenated blood to the heart
    D. Deoxygenated blood to the body

16. What is the correct pathway of blood flow through the heart?
    A. Right atrium → right ventricle → lungs → left atrium → left ventricle → body
    B. Left atrium → left ventricle → lungs → right atrium → right ventricle → body
    C. Right atrium → left atrium → right ventricle → left ventricle → lungs → body
    D. Left ventricle → right ventricle → left atrium → right atrium → lungs → body

17. Which component of blood is responsible for clotting?
    A. Red blood cells
    B. White blood cells
    C. Platelets and proteins
    D. Plasma only

18. How does the circulatory system contribute to homeostasis?
    A. By breaking down nutrients
    B. By filtering blood
    C. By transporting substances and regulating temperature
    D. By producing hormones

19. What drives the movement of blood through the circulatory system?
    A. Respiratory movements
    B. Pumping action of the heart
    C. Skeletal muscle contractions only
    D. Osmotic pressure

20. Which of the following is NOT a function of the circulatory system mentioned in the text?
    A. Carrying oxygen to body cells
    B. Distributing heat throughout the body
    C. Transporting disease-fighting materials
    D. Producing digestive enzymes

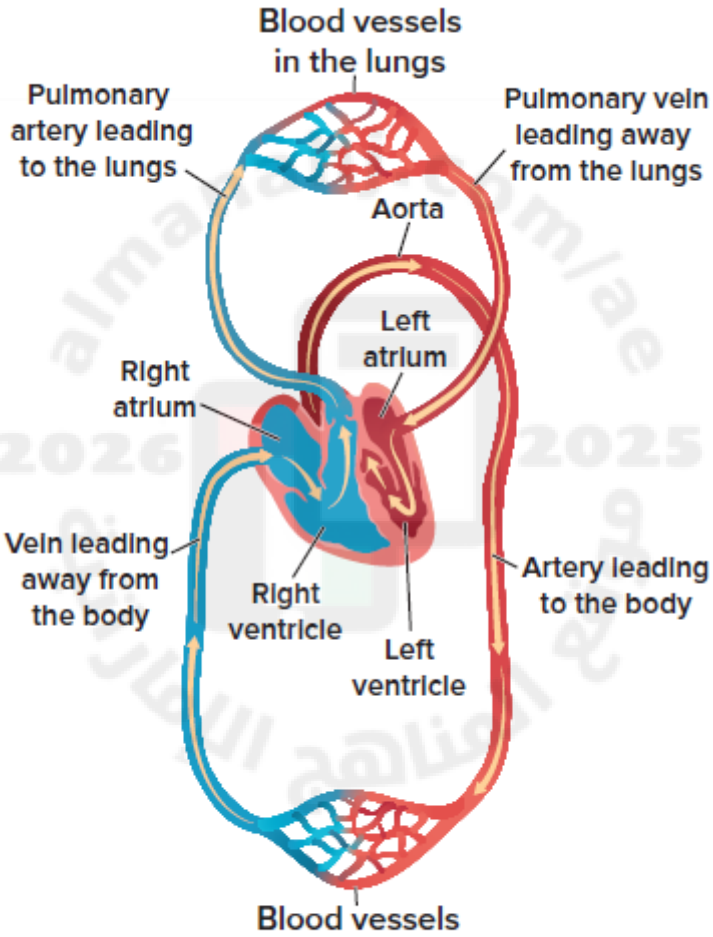


Figure 7 Blood flow through the body consists of two different circulatory loops.

Blood Components

1. What is the primary function of blood in the human body?
   A. To store excess nutrients
   B. To transport important substances throughout the body
   C. To produce antibodies only
   D. To regulate body temperature only

2. What percentage of blood is composed of plasma?
   A. Less than 25 percent
   B. Approximately 30 percent
   C. More than 50 percent
   D. Exactly 90 percent

3. Which component gives plasma its yellow color?
   A. White blood cells
   B. Plasma proteins
   C. Dissolved glucose
   D. Hemoglobin

4. What is the primary function of red blood cells?
   A. To fight disease-causing organisms
   B. To carry oxygen to all of the body's cells
   C. To form blood clots
   D. To transport waste products

5. What is the approximate lifespan of a red blood cell?
   A. 30 days
   B. 60 days
   C. 90 days
   D. 120 days

6. Which protein in red blood cells binds with oxygen molecules?
   A. Fibrin
   B. Hemoglobin
   C. Albumin
   D. Globulin

7. Which nutrient is essential for healthy red blood cells?
   A. Calcium
   B. Potassium
   C. Iron
   D. Sodium

8. What are platelets?
   A. Complete cells with nuclei
   B. Cell fragments important in forming blood clots
   C. A type of white blood cell
   D. The liquid portion of blood

9. What protein is produced during the blood clotting process that creates a fiber network?
   A. Hemoglobin
   B. Albumin
   C. Fibrin
   D. Collagen

10. What is the ratio of white blood cells to red blood cells in human blood?
    A. 1:10
    B. 1:50
    C. 1:100
    D. 1:500-1000

11. Which of the following is NOT a function of white blood cells?
    A. Recognizing disease-causing organisms
    B. Producing chemicals to fight invaders
    C. Transporting oxygen to cells
    D. Surrounding and killing invaders

12. What is the primary composition of plasma?
    A. 90% water, 10% dissolved materials
    B. 50% water, 50% proteins
    C. 75% water, 25% blood cells
    D. 60% water, 40% hormones

13. Which of the following is NOT transported by plasma?
    A. Glucose
    B. Fats
    C. Vitamins
    D. Oxygen

14. What happens when platelets collect at the site of a wound?
    A. They immediately stop all blood flow
    B. They release chemicals that produce fibrin
    C. They transform into red blood cells
    D. They dissolve the damaged tissue

15. Which of the following is a key difference between white blood cells and red blood cells?
    A. Only white blood cells are produced in bone marrow
    B. White blood cells have nuclei while red blood cells do not
    C. White blood cells live for only a few days
    D. White blood cells cannot move through the bloodstream

16. What is a scab primarily composed of?
    A. White blood cells only
    B. Plasma proteins
    C. Trapped blood cells and platelets in fibrin threads
    D. Hemoglobin and iron

17. Which group of plasma proteins helps to regulate the amount of water in blood?
    A. The first group
    B. The second group
    C. The third group
    D. None of the plasma proteins

18. In addition to carrying oxygen, what other gas do red blood cells transport?
    A. Nitrogen
    B. Carbon dioxide
    C. Hydrogen
    D. Methane

19. What is the shape of red blood cells?
    A. Spherical
    B. Cubic
    C. Discs with pinched-in centers
    D. Irregular with multiple extensions

20. What is the typical lifespan of most white blood cells?
    A. A few days
    B. About 120 days
    C. Several weeks
    D. Months or years

Figure 8 Plasma is the clear, yellowish portion of the blood, made up mostly water.

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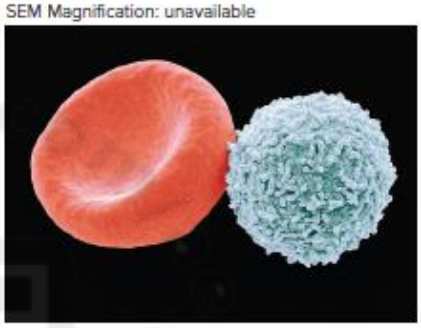


Figure 9 Blood is composed of liquid plasma, red blood cells (dimpled disc on the left), white blood cells (irregularly shaped cell on the right), and platelets (flat fragments, not shown).

Infer *What might be occurring if there are too many white blood cells?*

Color-Enhanced SEM Magnification: 5000×

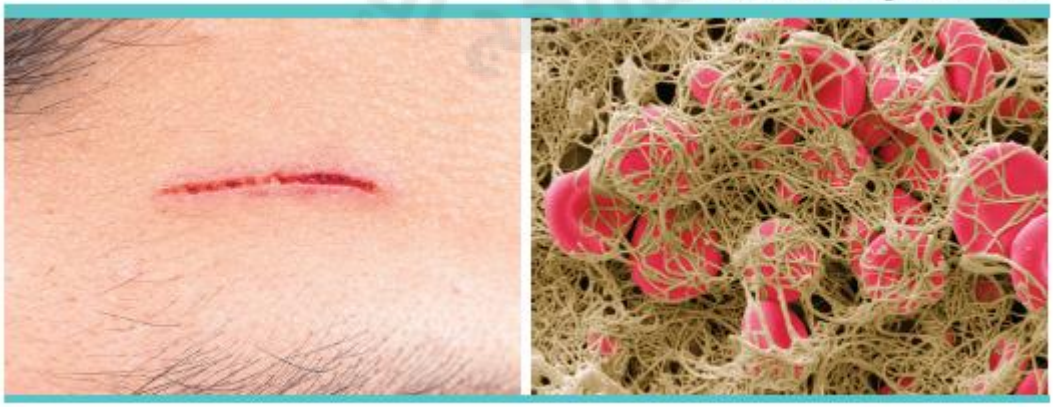


Figure 10 A scab forms as fibrin threads trap blood cells and platelets.

Blood Groups and Circulatory Disorders

1. What are the marker molecules attached to red blood cells that determine blood type?
   A. Blood groups
   B. Plasma proteins
   C. Antibodies
   D. Clotting factors

2. How many types of blood are there in the ABO blood group system?
   A. 2
   B. 3
   C. 4
   D. 6

3. If your blood type is AB, which marker molecules are present on your red blood cells?
   A. Only A markers
   B. Only B markers
   C. Both A and B markers
   D. Neither A nor B markers

4. Which blood type has no A or B markers on the red blood cells?
   A. Type A
   B. Type B
   C. Type AB
   D. Type O

5. Why is it important to know your blood type before a blood transfusion?
   A. To determine how much blood you need
   B. To prevent clumping of blood cells that could block blood flow
   C. To know how fast the transfusion should occur
   D. To determine the color of your blood

6. What are the antibodies in plasma that recognize foreign markers on red blood cells?
   A. Antigens
   B. Platelets
   C. Antibodies
   D. Leukocytes

7. If a person has type B blood, which antibody is present in their plasma?
   A. Anti-A
   B. Anti-B
   C. Both anti-A and anti-B
   D. None

8. Which blood type is considered the universal donor?
   A. Type A
   B. Type B
   C. Type AB
   D. Type O

9. Which blood type is considered the universal recipient?
   A. Type A
   B. Type B
   C. Type AB
   D. Type O

10. If a person has type A blood, which blood types can they donate to?
    A. Only type A
    B. Types A and AB
    C. Types A, B, and AB
    D. All blood types

11. What complication can arise during pregnancy related to the Rh blood group?
    A. The mother can develop antibodies against the fetus's Rh-positive blood
    B. The fetus can develop antibodies against the mother's Rh-positive blood
    C. The mother's Rh-positive blood can mix with the fetus's Rh-negative blood
    D. The mother and fetus will always have compatible Rh factors

12. What condition refers to blocked arteries in the circulatory system?
    A. Hypertension
    B. Atherosclerosis
    C. Stroke
    D. Heart attack

13. What can reduce the flow of oxygen-rich blood through arteries?
    A. Increased heart rate
    B. Decreased blood pressure
    C. Blood clots and fat deposits
    D. Increased red blood cell production

14. What happens when blood does not reach the heart muscle?
    A. Stroke
    B. Heart attack
    C. Anemia
    D. Hypertension

15. What occurs during a stroke?
    A. Blood does not reach the heart muscle
    B. Clots form in blood vessels supplying oxygen to the brain
    C. Blood pressure increases dramatically
    D. The heart beats irregularly

16. Why can a stroke lead to brain cell death?
    A. Because brain cells are deprived of glucose
    B. Because brain cells are deprived of oxygen
    C. Because brain cells are exposed to too much blood
    D. Because brain cells are damaged by antibodies

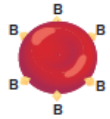
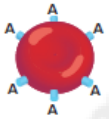
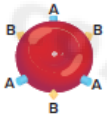
17. If a person with type AB blood needs a transfusion, which blood types can they receive?
    A. Only type AB
    B. Types A and B only
    C. Types A, B, and AB only
    D. Types A, B, AB, and O

18. What happens when a person with type A blood receives type B blood?
    A. Nothing, the blood types are compatible
    B. The recipient's anti-B antibodies will cause the donor's red blood cells to clump
    C. The donor's anti-A antibodies will cause the recipient's red blood cells to clump
    D. Both blood types will change to type AB

19. What additional blood factor can cause complications during pregnancy besides the ABO blood group?
    A. The Kell factor
    B. The Lewis factor
    C. The Rh factor
    D. The Duffy factor

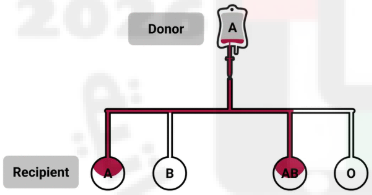
20. What must the heart do when blood flow is reduced or blocked in arteries?
    A. Beat slower to conserve energy
    B. Work harder to pump blood
    C. Stop pumping temporarily
    D. Redirect blood to different vessels

Table 1 Blood Types

Blood Type	A	B	AB	O
Marker molecule and antibody	Marker molecule: A Antibody: anti-B	Marker molecules: B Antibody: anti-A	Marker molecules: AB Antibody: none	Marker molecules: none Antibodies: anti-A, anti-B
Example				
Can donate blood to:	A or AB	B or AB	AB	A, B, AB, or O
Can receive blood from:	A or O	B or O	A, B, AB, or O	O

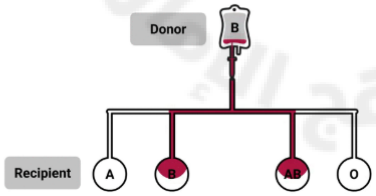
Blood Type A

- can **donate** blood to types A or AB
- can **receive** blood from types A or O



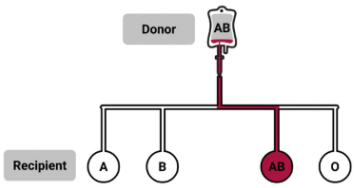
Blood Type B

- can **donate** blood to types B or AB
- can **receive** blood from types B or O



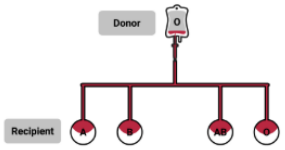
Blood Type AB

- can **donate** blood only to type AB
- can **receive** blood from types A, B, AB, or O



Blood Type O

- can **donate** blood to types A, B, AB, or O
- can **receive** blood from type O



People who are Rh-positive:

- can **donate** blood to only Rhesus-positive
- can **receive** from Rhesus-positive and Rhesus-negative

People who are Rh-negative:

- can **donate** blood to Rhesus-positive and Rhesus-negative
- can **receive** from only Rhesus-negative

Breathing and Respiration

1. What is the primary function of the respiratory system?
   A. To produce energy in the form of ATP
   B. To facilitate the exchange of gases between the atmosphere and the body
   C. To remove waste products from the bloodstream
   D. To regulate body temperature

2. Which of the following is NOT a component of the respiratory system?
   A. Bronchioles
   B. Alveoli
   C. Nephrons
   D. Trachea

3. What is the difference between breathing and respiration?
   A. Breathing is involuntary while respiration is voluntary
   B. Breathing occurs in plants while respiration occurs in animals
   C. Breathing is the mechanical movement of air while respiration involves gas exchange
   D. Breathing requires oxygen while respiration can occur without oxygen

4. During cellular respiration, which molecules are used to produce ATP?
   A. Carbon dioxide and water
   B. Oxygen and carbon dioxide
   C. Oxygen and glucose
   D. Glucose and nitrogen

5. Which structure prevents food from entering the respiratory tubes?
   A. Larynx
   B. Pharynx
   C. Epiglottis
   D. Trachea

6. What is the primary function of the cilia in the respiratory system?
   A. To produce mucus that moistens the air
   B. To trap foreign particles and sweep them toward the throat
   C. To facilitate the exchange of gases in the alveoli
   D. To regulate the temperature of inhaled air

7. External respiration refers to:
   A. The exchange of gases between the atmosphere and the blood in the lungs
   B. The exchange of gases between the blood and body cells
   C. The mechanical process of breathing air into and out of the lungs
   D. The production of ATP in the mitochondria

8. In which structure does gas exchange primarily occur in the lungs?
   A. Bronchi
   B. Trachea
   C. Bronchioles
   D. Alveoli

9. What happens to oxygen after it diffuses across the alveolar walls?
   A. It is converted to carbon dioxide
   B. It enters capillaries and binds to red blood cells
   C. It is exhaled back into the atmosphere
   D. It combines with glucose to form ATP in the alveoli

10. Which of the following is a byproduct of cellular respiration?
    A. Glucose
    B. Oxygen
    C. Carbon dioxide
    D. Nitrogen

11. How is carbon dioxide primarily transported in the blood?
    A. Bound to plasma proteins
    B. As carbonic acid in red blood cells
    C. In all of the forms listed: as carbonic acid, dissolved in plasma, and bound to hemoglobin
    D. Only as dissolved gas in plasma

12. Internal respiration refers to:
    A. The exchange of gases between the atmosphere and blood in the lungs
    B. The exchange of gases between the blood and body cells
    C. The mechanical movement of the diaphragm during breathing
    D. The production of ATP in the mitochondria

13. What is the correct pathway of air through the respiratory system?
    A. Nose → pharynx → larynx → bronchi → trachea → bronchioles → alveoli
    B. Nose → pharynx → larynx → trachea → bronchi → bronchioles → alveoli
    C. Nose → larynx → pharynx → trachea → bronchioles → bronchi → alveoli
    D. Nose → trachea → pharynx → larynx → bronchi → bronchioles → alveoli

14. What characteristic of alveoli makes them efficient for gas exchange?
    A. They have thick walls to prevent damage
    B. They have a small surface area to concentrate gases
    C. They have walls that are only one cell thick
    D. They contain specialized cells that actively transport gases

15. Which statement about the relationship between cellular respiration and breathing is correct?
    A. Cellular respiration produces oxygen that is used in breathing
    B. Breathing supplies oxygen needed for cellular respiration
    C. Breathing and cellular respiration are unrelated processes
    D. Cellular respiration occurs only in the lungs during breathing

16. What is the main purpose of mucous membranes in the nasal passages?
    A. To produce antibodies that fight infection
    B. To warm, moisten, and trap foreign particles in the air
    C. To produce red blood cells for oxygen transport
    D. To regulate the amount of air entering the lungs

17. What is the primary function of hemoglobin in respiration?
    A. To transport carbon dioxide from tissues to the lungs
    B. To transport oxygen from the lungs to body tissues
    C. To produce ATP during cellular respiration
    D. To remove waste products from the respiratory system

18. Which of the following occurs during exhalation?
    A. The diaphragm contracts and moves downward
    B. Air pressure in the lungs decreases below atmospheric pressure
    C. Carbon dioxide-rich air is expelled from the lungs
    D. Oxygen diffuses from the alveoli into the bloodstream

19. What is the relationship between cellular respiration and ATP?
    A. ATP is used as a reactant in cellular respiration
    B. ATP inhibits the process of cellular respiration
    C. ATP is produced as a result of cellular respiration
    D. ATP and cellular respiration are unrelated processes

20. Which of the following best describes the function of the respiratory system in maintaining cellular metabolism?
    A. It directly produces ATP for cellular functions
    B. It supplies the oxygen needed for ATP production and removes carbon dioxide waste
    C. It breaks down glucose into simpler compounds for cell use
    D. It regulates body temperature to maintain optimal conditions for metabolism

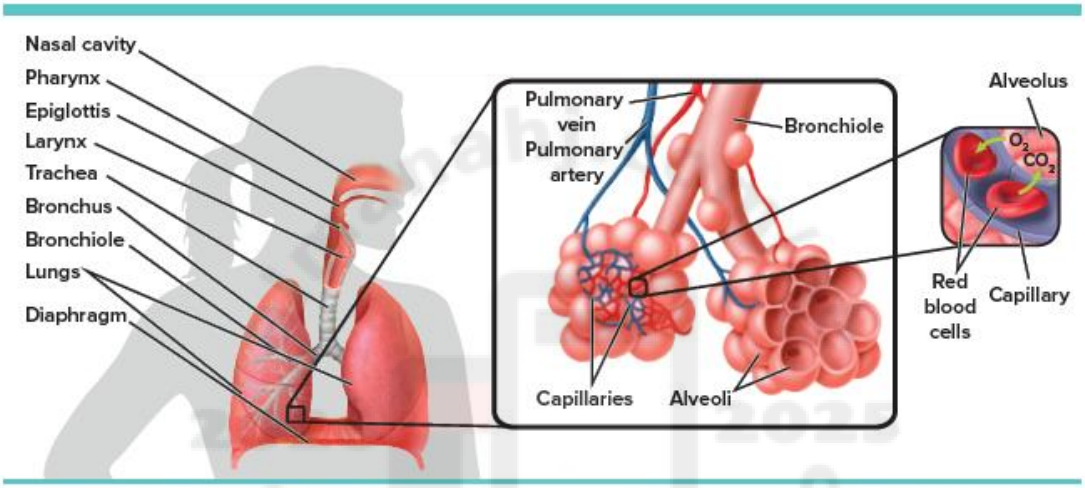


Figure 13 Air travels into the alveoli of the lungs, where gases are exchanged across thin capillary walls.
Diagram *Trace the path of oxygen from the atmosphere to the alveoli in the lungs.*

Color-Enhanced SEM Magnification: unknown

Figure 14 Hairlike cilia line the mucous membranes of the nasal cavity.

Breathing and Respiratory Disorders

1. What causes the breathing rate to increase according to the passage?
   A. Decreased oxygen levels in the blood
   B. High concentration of carbon dioxide in the blood
   C. Relaxation of the diaphragm
   D. Contraction of the rib muscles

2. During inhalation, what happens to the diaphragm?
   A. It relaxes
   B. It moves upward
   C. It contracts
   D. It remains stationary

3. Which of the following correctly describes exhalation?
   A. The diaphragm contracts and moves downward
   B. The chest cavity expands to allow air in
   C. Air flows from lower pressure to higher pressure
   D. The diaphragm relaxes and moves upward

4. How does the chest cavity change during inhalation?
   A. It expands
   B. It contracts
   C. It remains the same size
   D. It collapses partially

5. What respiratory disorder is characterized by the breakdown of alveoli?
   A. Asthma
   B. Bronchitis
   C. Emphysema
   D. Pneumonia

6. Which respiratory condition results in the constriction of bronchioles?
   A. Pneumonia
   B. Asthma
   C. Emphysema
   D. Lung cancer

7. What is the primary function of alveoli in the respiratory system?
   A. To filter incoming air
   B. To produce mucus
   C. To provide surface area for gas exchange
   D. To regulate breathing rate

8. In which respiratory disorder do the alveoli collect mucous material?
   A. Bronchitis
   B. Emphysema
   C. Asthma
   D. Pneumonia

9. What role does air pressure play in the breathing process?
   A. It has no role in breathing
   B. Air moves from areas of lower pressure to higher pressure
   C. Air moves from areas of higher pressure to lower pressure
   D. Air pressure remains constant throughout breathing

10. Which factor does the brain respond to when directing the rate of breathing?
    A. Body temperature
    B. Blood pressure
    C. Internal stimuli indicating oxygen needs
    D. External environmental conditions

11. What respiratory condition is characterized by uncontrolled cell growth in lung tissue?
    A. Pneumonia
    B. Emphysema
    C. Lung cancer
    D. Bronchitis

12. What happens to the size of the chest cavity during exhalation?
    A. It expands
    B. It reduces
    C. It remains the same
    D. It fluctuates randomly

13. Which of the following is NOT mentioned as a symptom of lung cancer?
    A. Persistent cough
    B. Shortness of breath
    C. High fever
    D. Pneumonia

14. What substance is mentioned as causing chronic irritation to respiratory tissues?
    A. Pollen
    B. Dust
    C. Carbon dioxide
    D. Smoking

15. Which respiratory disorder is characterized by infected respiratory pathways resulting in coughing and mucus production?
    A. Bronchitis
    B. Asthma
    C. Emphysema
    D. Pneumonia

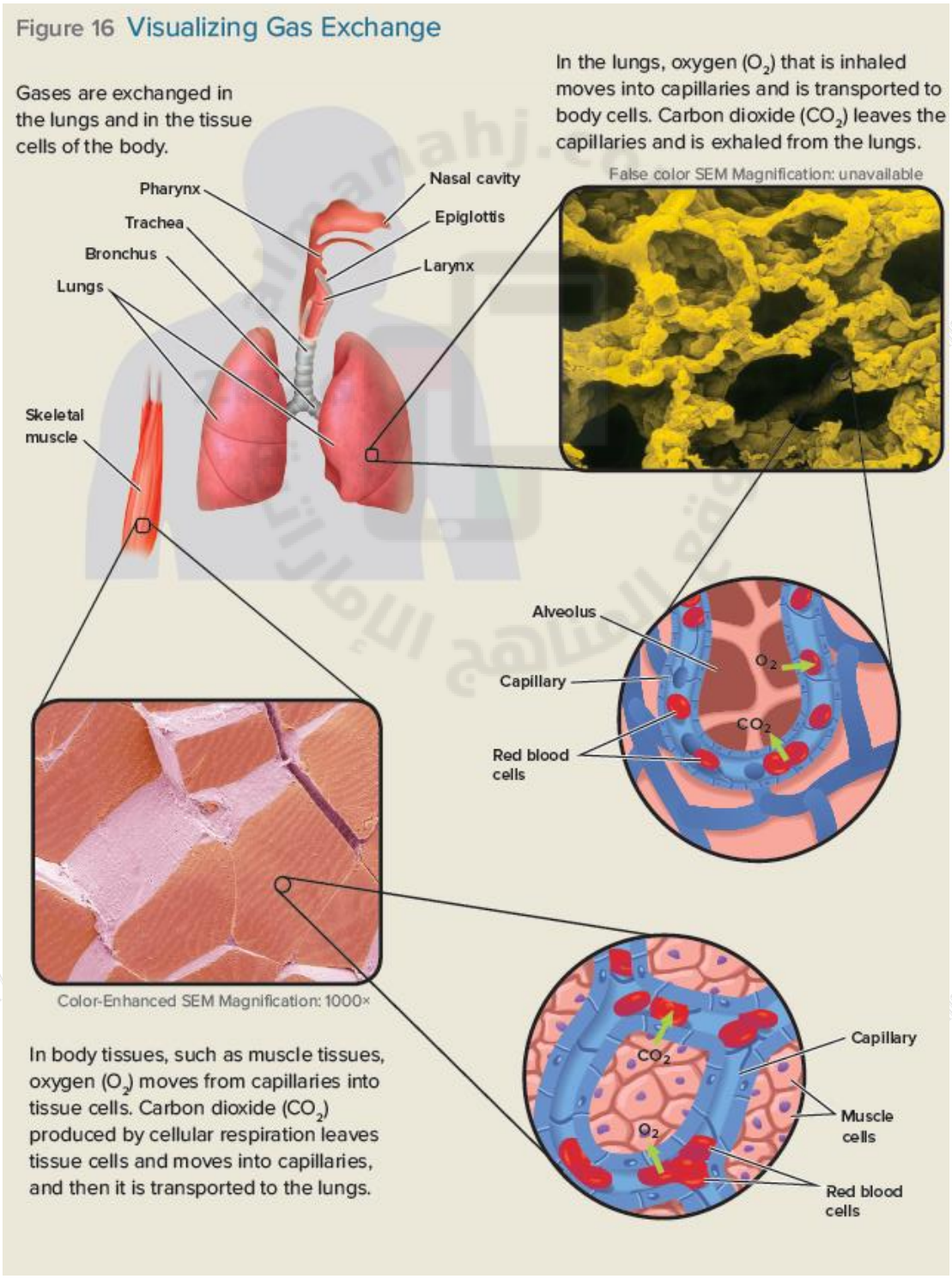
16. What can exposure to airborne materials like pollen produce in some people?
    A. Lung cancer
    B. Emphysema
    C. Allergic respiratory reactions
    D. Bronchitis

17. What systems work together to supply oxygen and remove carbon dioxide according to the passage?
    A. Digestive and respiratory systems
    B. Nervous and respiratory systems
    C. Circulatory and respiratory systems
    D. Muscular and respiratory systems

18. What is the consequence of respiratory disorders on the bronchi and alveoli?
    A. Increased efficiency in gas exchange
    B. Reduced effectiveness due to tissue damage
    C. No significant impact on respiratory function
    D. Temporary enhancement of oxygen absorption

19. During which phase of breathing do the rib muscles contract?
    A. Only during exhalation
    B. During inhalation
    C. Neither inhalation nor exhalation
    D. Both inhalation and exhalation equally

20. What happens when respiratory tissues become damaged?
    A. Breathing becomes easier
    B. Oxygen consumption decreases
    C. Respiration becomes difficult
    D. Carbon dioxide is eliminated more efficiently



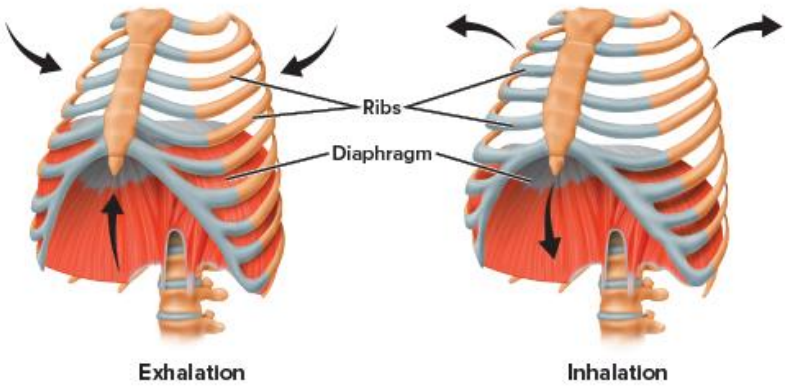


Figure 15 Rib and diaphragm muscles contract and relax during breathing.
Analyze *how air pressure is involved in breathing.*

Table 2 Common Respiratory Disorders

Disorder	Brief Description
Asthma	Respiratory pathways become irritated, and bronchioles constrict.
Bronchitis	Respiratory pathways become infected, resulting in coughing and production of mucus.
Emphysema	Alveoli break down, resulting in reduced surface area needed for gas exchange with the alveoli's blood capillaries.
Pneumonia	Infection of the lungs causes the alveoli to collect mucous material.
Lung cancer	Uncontrolled cell growth in lung tissue can lead to a persistent cough, shortness of breath, bronchitis, or pneumonia, and can lead to death.

1. Which of these is not a function of the circulatory system?

A) removing wastes
B) transporting blood
C) conducting neuron impulses
D) delivering oxygen

Feedback: The circulatory system transports blood and other important substances, including oxygen and nutrients, throughout the body. This system is responsible for removing waste from the body.

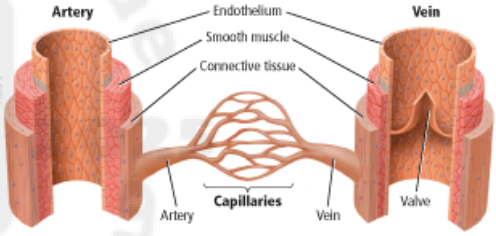
2. What are the three major types of blood vessels?

A) arteries, valves, arterioles
B) arteries, veins, capillaries
C) veins, arterioles, capillaries
D) capillaries, arterioles, valves

Feedback: Arteries carry blood away from the heart, while veins carry blood back to the heart. These, along with microscopic capillaries, are the major types of blood vessels.

3. Which part of the vessels shown here prevents blood from flowing backwards?

A) smooth muscle
B) endothelium
C) connective tissue
D) valve



Feedback: The valve shown in the center of this vein is a flap of tissue that prevents blood from flowing backwards.

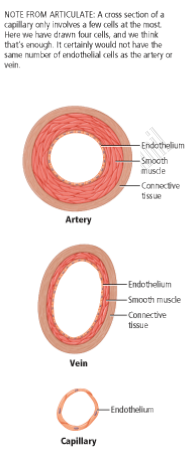
4. The heart pumps ____ blood to the lungs.

A) deoxygenated
B) oxygenated
C) oxygen-rich
D) depressurized

Feedback: The heart pumps deoxygenated blood into the lungs from the pulmonary arteries. Oxygen then diffuses from the air in the lungs into the blood.

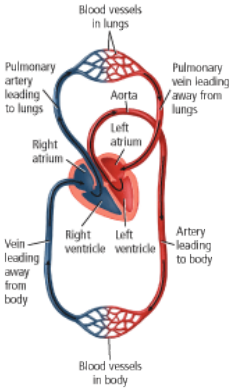
5. Which of these three vessels carries blood back to the heart?

A) artery; largest cross section
B) vein, medium sized cross section
C) capillary; smallest cross section
D) none of these



Feedback: The center cross section in is a vein, which has a thinner structure than arteries. The primary function of veins is to carry blood back to the heart.

6. Where does oxygenated blood flow to first in this circulatory loop?



A) to the pulmonary artery leading to the lungs
B) to the right ventricle from the lungs
C) to the left atrium from the lungs
D) to the vein leading away from the body

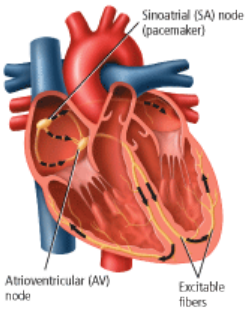
Feedback: After being oxygenated in the lungs, blood flows into the left atrium of the heart. This begins the second loop of the circulatory cycle.

7. How does atherosclerosis cause health problems?

A) clogged arteries decrease blood pressure
B) clogged arteries put stress on heart
C) clogged veins decrease blood pressure
D) clogged veins increase blood volume

Feedback: Atherosclerosis causes a number of problems, including high blood pressure and heart stress. These conditions are caused by clogged arteries.

8. Which structure sends the initial signal for the heart to contract?



A) SA node
B) AV node
C) excitable fibers
D) atrium

Feedback: The sinoatrial (SA) node sends the signal for the heart to contract. This signal reaches the excitable fibers and the AV node.

9. Why is the endothelial layer of arteries thicker than that of other blood vessels?

A) Arteries must be rigid and inflexible.
B) Arteries carry blood back to the heart.
C) Artery blood exerts less pressure than blood in veins.
D) Blood pumped from the heart exerts a high pressure.

Feedback: The endothelial layer of arteries is thick and durable in order to withstand the high pressure exerted by blood pumped from the heart.

10. What crucial cell function is oxygen necessary for?

A) DNA sequencing
B) external respiration
C) osmosis
D) cellular respiration

Feedback: Oxygen provided by the respiratory system is crucial for cells to perform cellular respiration.

11. Individual air sacs in lung bronchioles are called ____.

A) tracheas
B) alveoli
C) capillaries
D) cilia

Feedback: The bronchioles are small tubes in the lungs that branch into air sacs called alveoli. Each of these sacs is surrounded by capillaries, which absorb oxygen.

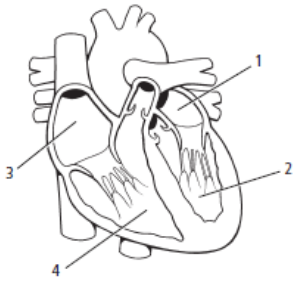
12. Which is true of the human circulatory system?

A) A It transports oxygen and nutrients.
B) B It makes blood cells.
C) C It breaks down food and releases nutrients.
D) D It is the first line of defense against pathogens.

Feedback: The primary function of the circulatory system is to act as a transportation network, delivering oxygen and nutrients to cells and removing waste products like carbon dioxide

Use the diagram below to answer questions 13 and 14.

13. Which is the path that blood follows through the heart as it returns from the head and body?



A) 1→2
B) 2→1
C) 3→4
D) 4→3

Feedback: Deoxygenated blood returning from the head and body enters the right atrium (chamber 3) via the superior and inferior vena cava. From there, it flows into the right ventricle (chamber 4) to be pumped to the lungs.

14. Which chamber does blood flow into once it has picked up a fresh supply of oxygen?

A) 1
B) 2
C) 3
D) 4

Feedback: After picking up oxygen in the lungs, blood becomes oxygenated and returns to the heart, entering the left atrium (chamber 1). From there, it will flow into the left ventricle to be pumped out to the body.

15. Which vessels carry blood away from the heart?

A) arteries
B) veins
C) capillaries
D) lymphatics

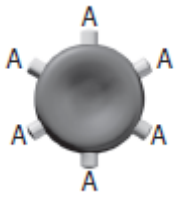
Feedback: Arteries always carry blood *away* from the heart. Veins carry blood *toward* the heart, capillaries are the sites of exchange, and lymphatics are part of the lymphatic system, not the blood circulatory system.

16. Red blood cells transport oxygen attached to which components?

A) nuclei
B) plasma membranes
C) hemoglobin
D) nitrogen

Feedback: Hemoglobin is the iron-containing protein inside red blood cells that binds to oxygen molecules, allowing for efficient transport. Red blood cells lack nuclei, their plasma membranes are for structure, not transport, and nitrogen is not involved in oxygen transport.

17. A person has the blood type represented in the illustration below. What blood type can this person safely receive?



A) A only
B) A or O
C) O only
D) AB

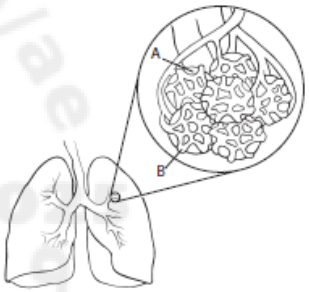
Feedback: A person with blood type A has anti-B antibodies. They can receive blood from type A (matching antigens) or type O (the universal donor, which has no A or B antigens to be attacked by the recipient's antibodies).

18. Which blood component can recognize and kill disease-causing organisms?

A) red blood cells
B) white blood cells
C) platelets
D) fibrin

Feedback: White blood cells (leukocytes) are the key cellular components of the immune system. They specialize in identifying, engulfing, and destroying pathogens. Red blood cells carry oxygen, platelets help with clotting, and fibrin is a protein that forms clots.

Use the diagram below to answer questions 19 and 20.



19. Identify the structure labeled A in the above diagram.

A) bronchi
B) bronchiole
C) alveolus
D) pharynx

Feedback: The alveolus (plural: alveoli) is the tiny air sac where gas exchange occurs. The bronchi are the larger main airways, bronchioles are smaller branches leading to the alveoli, and the pharynx is the throat at the back of the mouth.

20. What happens in the netlike structure labelled B in the above diagram?

A) Carbon dioxide and oxygen diffuse into the blood.
B) Nitrogen and oxygen are exchanged.
C) Carbon dioxide and oxygen are exchanged.
D) Nitrogen and carbon dioxide remain constant.

Feedback: This capillary network is the site of gas exchange. Oxygen diffuses from the alveolus into the blood, and carbon dioxide waste diffuses from the blood into the alveolus to be exhaled. Nitrogen is largely inert in this process.

21. At which point in the respiratory system cycle does cellular respiration take place?

A) during breathing
B) during external respiration
C) during internal respiration
D) when air moves into the bronchioles

Feedback: Cellular respiration is the process where cells use oxygen to produce energy (ATP) and release carbon dioxide as a waste product. This occurs *inside the body's cells*, which is what internal respiration refers to. External respiration is the gas exchange between the air in the lungs and the blood.

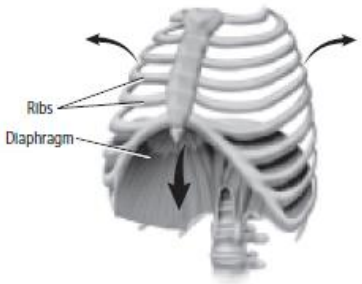
22. Which causes an increase in the breathing rate?

A) high concentration of oxygen in the blood
B) high concentration of blood in the lung capillaries
C) high concentration of carbon dioxide in the blood
D) low concentration of carbon dioxide in the blood

Feedback: The primary trigger for an increased breathing rate is a high concentration of carbon dioxide (not low oxygen) in the blood. Chemoreceptors detect this increase and signal the respiratory center in the brain to increase the rate and depth of breathing to remove the excess CO_2.

23. Which is taking place in this diagram?

A) Inhalation; the diaphragm is contracting.
B) Exhalation; the diaphragm is relaxing.
C) Inhalation; the chest cavity is reduced.
D) Exhalation; the rib cage is expanding.



Feedback: Correct. When the diaphragm relaxes, it moves upwards into a dome shape, reducing the volume of the chest cavity. This increase in pressure forces air out of the lungs, which is exhalation. Inhalation occurs when the diaphragm contracts and flattens.

24.Which of these is not part of the structure of arteries?

a. fibrin
b. connective tissue
c. smooth muscle
d. endothelial tissue

Feedback: Fibrin is a protein that aids blood clotting. The outer, middle, and inner layers of arteries are made of connective tissue, smooth muscle, and endothelial tissue.

25.A group of cells called the ____ causes the heart to contract.

a. vena cava
b. atrium
c. pacemaker
d. platelet

Feedback: The pacemaker, or sinatrial node, is a group of cells in the right atrium that sends a signal causing the heart to contract. This signal causes the atria to contract, and then travels to the atrioventricular node and caues the ventricles to contract.

26.A kidney disorder called ____ is due to inflamation of glomeruli.

a. polycystic kidney disease
b. kidney cancer
c. nephritis
d. kidney stones

Feedback: Nephritis is caused by inflamed and swollen glomeruli. This may result from large particles in the blood becoming lodged in the glomeruli.

27. A nitrogenous waste product resulting from kidney filtration is called ____.

a. glomerulus
b. acid
c. filtrate
d. urea

Feedback: Blood pressure in the kidney causes substances dissolved in water to enter the walls of the Bowman's capsule. Urea is one of these waste substances filtered from water in the kidney.

28. Hairlike structures called ____ line the nasal passages.

a. bronchioles
b. alveoli
c. cilia
d. filters

Feedback: Cilia, which line the nasal passages, trap foreign particles before they can enter the lungs.

29.How do platelets form blood clots?

a. by producing white blood cells
b. by producing fibrin
c. by by releasing carbon dioxide
d. by destroying red blood cells

Feedback: Platelets help to clot blood by producing a protein called fibrin. Fibrin makes a network of fibers that traps platelets and red blood cells, forming a clot.

30.How do the kidneys help maintain blood pH?

a. by excreting dopamine
b. by absorbing white blood cells
c. by excreting hydrogen
d. by absorbing red blood cells

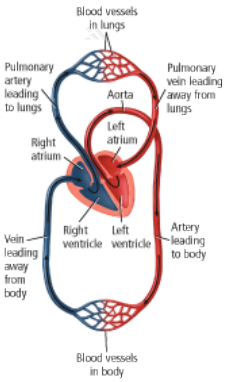
Feedback: A low pH results from an abundance of hydrogen. Kidneys can regulate pH by excreting hydrogen ions and ammonia into the renal tubules, or by reabsorbing bicarbonate and sodium.

31.The exchange of gases between the blood and the body's cells is called ____.

a. external respiration
b. internal respiration
c. bronchial respiration
d. exhalation

Feedback: Gases are exchanged between blood and the body's cells in a process called internal respiration. Blood is oxygenated in alveoli in the lungs. Oxygen is tranported by blood and released in cell tissues.

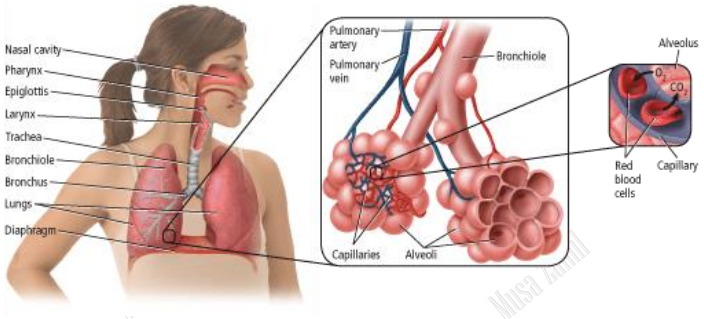
32. This figure shows the two circulatory loops in which blood flows. What occurs when blood from the lungs enters the left atrium?



a. blood flows directly into veins
b. first circulatory loop begins
c. blood is deoxygenated
d. second circulatory loop begins

Feedback: After blood is oxygenated in the lungs, it enters the left atrium, which begins the second circulatory loop. Blood then enters the left ventricle.

33. What are these round lung structures called?



a. platelets
b. capillaries
c. red blood cells
d. alveoli

Feedback: The round, grape-like structures are the alveoli of the lungs. They branch out from the bronchioles. Alveoli are air sacs that provide oxygen for capillaries to absorb.

34. What causes inhalation during breathing?

a. air is released from lungs
b. shrinking of chest cavity
c. relaxation of rib and diaphram muscles
d. contraction of rib and diaphram muscles

Feedback: During inhalation, the rib and diaphram muscles contract, causing the chest to expand, which draws air into the lungs.

35. What causes oxygen to diffuse from the lungs into the capillaries?

a. equal oxygen concentration in lungs and capillaries
b. oxygen concentration is lower in lungs
c. oxygen concentration is lower in capillaries
d. blood from pulmonary arteries is high in oxygen

Feedback: Deoxygenated blood enters the lungs from the pulmonary arteries. Oxygen from the air in the lungs diffuses into the blood through capillaries, moving from high to low concentration.

36. Which of the following is not part of the passagway that air travels through in the respiratory system?

a. atrium
b. trachea
c. bronchi
d. nasal passages

Feedback: The atrium is a heart chamber that fills with oxygenated blood. It is not part of the respiratory passageway that air travels through during inspiration.

Best Wishes….