The Circulatory & Respiratory Systems

Virtual Science University
The Circulatory & Respiratory Systems

Texas TEK B.10(A) The student will interpret the function of systems in organisms (humans) including the Circulatory and Respiratory Systems.

Texas TEK B.10(B) The student will compare the interrelationships of Circulatory and Respiratory Systems to each other and to the body as a whole.
Introduction to Systems

• The human body is like a complex organization that has an important job to get done on a tight deadline.

• In order to get everything done perfectly and on time, it has to use a system.

• Actually, the human body uses many systems that work side by side.
Introduction to Systems

- Some of the body's systems are directly connected to the heart, while others are not.
- Of course, the heart is like the president of the organization.
- Even if it is not directly involved in the system, it still plays a part.
Introduction to Systems

The heart actively participates in the circulatory system, while it just keeps an eye on the respiratory system (lungs) & excretory system (liver & kidneys).
Circulatory System

- On average, your body has about **5 liters of blood** continually traveling through it by way of the circulatory system.
- The **heart**, **the lungs**, and the **blood vessels** work together to form the **circle** part of the circulatory system.
- The **pumping** of the heart forces the **blood** on its journey.
Circulatory System

• The body's circulatory system really has three distinct parts:
  – pulmonary circulation
    • the lungs (pulmonary)
  – coronary circulation
    • the heart (coronary)
  – systemic circulation
    • the rest of the system (systemic).

• Each part must be working independently in order for all of them to work together.
Pulmonary Circulation

- Pulmonary circulation is the movement of blood from the heart, to the lungs, and back to the heart again.
- This is just one phase of the overall circulatory system.
Key Points

- The Heart has 4 chambers
  - Left side of the heart has oxygenated blood (red)
    - One Atrium on the left
    - One Ventricle on the left
  - Right side of the heart has deoxygenated blood (blue)
    - One Atrium on the right
    - One Ventricle on the left
Cardio-pulmonary Circulation

- The *veins* bring waste-rich blood, low in oxygen (*deoxygenated*) back to the heart, entering the **right atrium** throughout two large veins called *vena cava*.
  - **Superior vena cava**
    - Drains the head and upper part of body
  - **Inferior vena cava**
    - Drains lower part of body
Cardio-pulmonary Circulation

- The right atrium fills with the waste-rich blood and then contracts, pushing the blood through a one-way tricuspid valve into the right ventricle.
Cardio-pulmonary Circulation

- The **right ventricle** fills and then contracts, pushing the **deoxygenated blood** into the **pulmonary artery** which leads to the lungs.
- In the lung capillaries, the exchange of carbon dioxide and oxygen takes place.
- The **pulmonary vein** carries **oxygenated blood** back to the heart.
Cardio-pulmonary Circulation

- The fresh, **oxygen-rich blood** enters the **pulmonary veins** and then returns to the heart, re-entering through the **left atrium**.

- The **oxygen-rich blood** then passes through a one-way valve (mitral) into the **left ventricle** where it will exit the heart through the main artery, called the **aorta**.

- The **left ventricle's contraction** forces the blood into the **aorta** and the blood begins its journey throughout the body.
Cardio-pulmonary Circulation

- The **one-way valves** are important for **preventing any backward flow of blood**.
- The circulatory system is a **network of one-way streets**.
- **Some Heart Defects**
  - Blood can flow the **wrong way**, the blood gases (oxygen and carbon dioxide) might mix, causing a **serious threat to your body**.
Cardio-pulmonary Circulation

• You can use a stethoscope to hear pulmonary circulation.

• The two sounds you hear, "lub" and "dub" are the ventricles contracting and the valves closing.
Coronary Circulation

- While the circulatory system is busy providing oxygen and nourishment to every cell of the body, let's not forget that the heart, which works hardest of all, needs nourishment, too.
- Coronary circulation refers to the movement of blood through the tissues of the heart.
- Blood from the aorta passes through a right coronary artery and left coronary artery
  - Initially Left Main Coronary then splits into
    - Circumflex
      • Left side of the heart
    - Left Anterior Descending (LAD)
Systemic Circulation

- Systemic circulation supplies oxygen & nourishment to all of the tissue our body, with the exception of the heart and lungs because they have their own systems.
- Systemic circulation is a major part of the overall circulatory system.
- The blood vessels (arteries, veins, and capillaries) are responsible for the delivery of oxygen and nutrients to the tissue.
Systemic Circulation

- **Oxygen-rich blood** enters the blood vessels through the heart's main artery called the **aorta**.
- The forceful **contraction** of the heart's **left ventricle** forces the blood into the **aorta** which then branches into many smaller arteries which run **throughout the body**.
- The inside layer of an artery is very smooth, allowing the blood to flow quickly.
Systemic Circulation

- The outside layer of an artery is very strong muscular wall allowing the blood to flow forcefully.
- The oxygen-rich blood enters the capillaries where the oxygen and nutrients are released.
- The waste products are collected and the waste-rich blood flows into the veins in order to circulate back to the heart where pulmonary circulation will allow the exchange of gases in the lungs.
Systemic Circulation
Renal (Kidney)

- During systemic circulation, blood passes through the kidneys.
- This phase of systemic circulation is known as renal circulation.
- During this phase, the kidneys filter much of the waste from the blood.
Portal (Liver) Systemic Circulation

- Blood also passes through the small intestine during systemic circulation.
- This phase is known as portal circulation.
- During this phase, the blood from the small intestine collects in the portal vein which passes through the liver.
- The liver filters sugars from the blood, storing them for later.
Respiratory System

- The primary function of the respiratory system is to supply the blood with oxygen in order for the blood to deliver oxygen to all parts of the body.
- The respiratory system does this through breathing.
- When we breathe, we inhale oxygen and exhale carbon dioxide.
- This exchange of gases is the respiratory system's means of getting oxygen to the blood.
Respiratory System

- Respiration is achieved through the **mouth, nose, trachea, lungs, and diaphragm**.
- Oxygen enters the respiratory system through the mouth and the nose.
- The oxygen then passes through the **larynx** (where speech sounds are produced) and the **trachea** which is a tube that enters the chest cavity.
- In the chest cavity, the **trachea splits** into two smaller tubes called the **bronchi**.
Respiratory System

- Each bronchus then divides again forming the bronchial tubes.
- The bronchial tubes lead directly into the lungs where they divide into many smaller tubes which connect to tiny air sacs called alveoli.
Respiratory System

- The average adult's lungs contain about **600 million** of these spongy, air-filled sacs (alveoli) that are surrounded by capillaries.

- The inhaled oxygen passes into the alveoli and then **diffuses through the capillaries** into the arterial blood.
Respiratory System

- Meanwhile, the waste-rich blood from the veins releases its carbon dioxide into the alveoli.
- The carbon dioxide follows the same path out of the lungs when you exhale.
Contact Information

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1-877-920-5550