



ONLINE FOOTBALL COACHING ACADEMY

O N L I N E S C H O O L F O R C O A C H E S

LEVEL 1: ANATOMICAL AND PHYSIOLOGICAL FOUNDATIONS OF SPORT
MODULE 1: ANATOMICAL FOUNDATIONS

TOPIC 1

Cardiovascular and Physiological Function of the Circulatory System

CIRCULATORY SYSTEM OVERVIEW

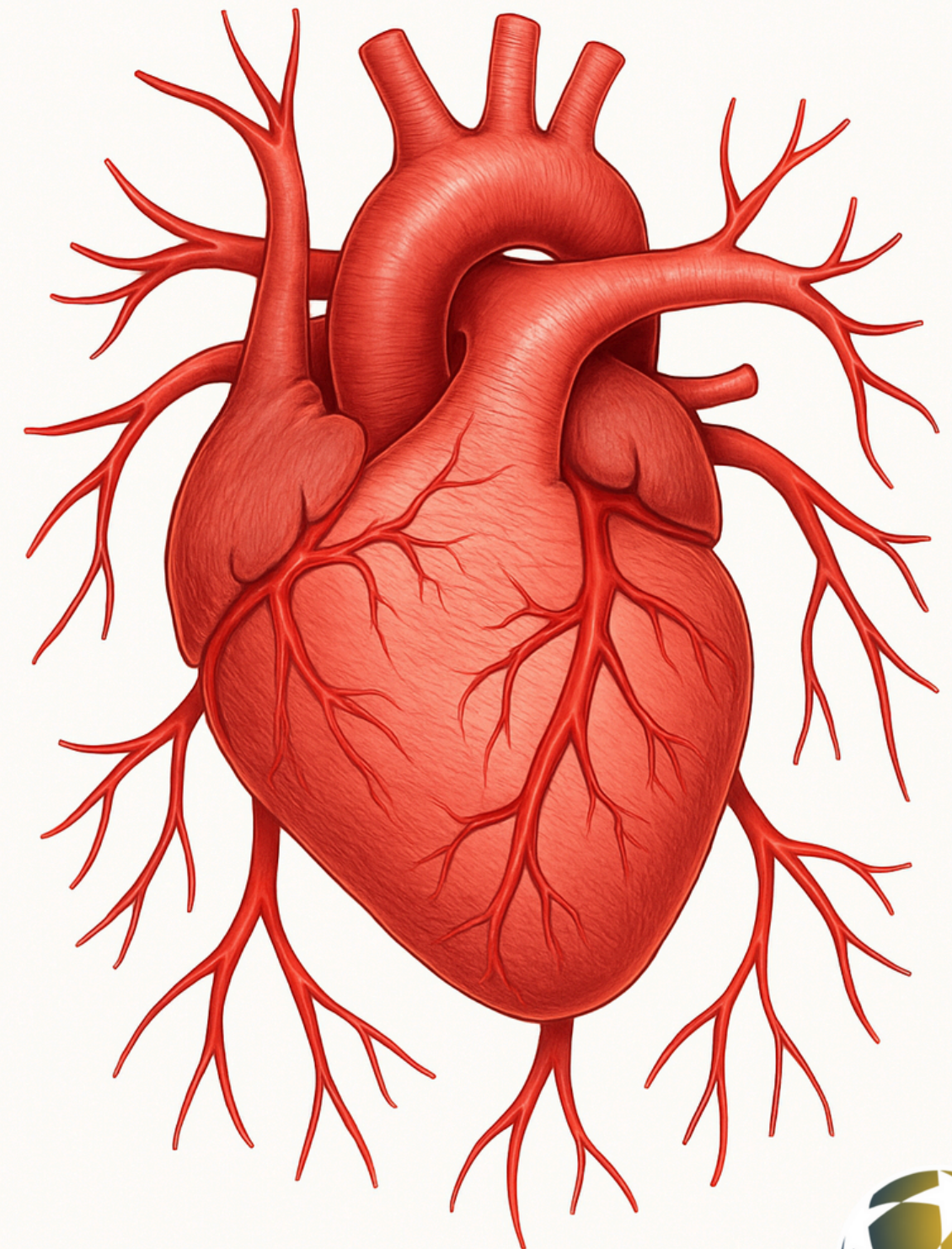
- Distributes oxygen and food throughout the body
- Collects carbon dioxide and excretory products from cells

Components:

- Circulatory fluid: Blood
- Pump: Heart
- Tubes: Blood vessels (arteries, veins, capillaries) and lymphatic vessels

ANATOMY OF THE CARDIOVASCULAR SYSTEM

- Four Linked Parts:
- Heart: Motor part; initiates blood circulation
- Blood Vessels:
- Arteries: Carry blood from heart to body
- Inner Layer: Endothelium + elastic membrane
- Tunica Media: Muscular + elastic fibers (thickest layer)
- Tunica Adventitia: Superficial protective layer
- Capillaries: Connect arterial and venous systems; site of substance and gas exchange
- Veins: Carry blood to the heart; same layers as arteries but thinner and less muscular
- Function:
- Blood travels: Heart → Arteries → Capillaries → Veins → Heart → Lungs → Heart → Tissues



HEART ANATOMY

General Characteristics:

- Hollow muscular organ functioning as a double pump
 - Pulmonary Circulation: To lungs for oxygenation
 - Systemic Circulation: To body for distribution

Location:

- Central thorax, above diaphragm, between lungs
- Behind sternum, from 2nd rib to 5th intercostal space

Four Cavities:

- Atria: Right (receives from venae cavae), Left (receives from lungs)
- Ventricles: Right (sends to lungs), Left (sends to body via aorta)

Valves:

- Right atrium to right ventricle: Tricuspid valve
- Left atrium to left ventricle: Mitral valve

Functional View:

- Right Side: Receives venous blood, sends to lungs
- Left Side: Receives oxygenated blood, sends to tissues

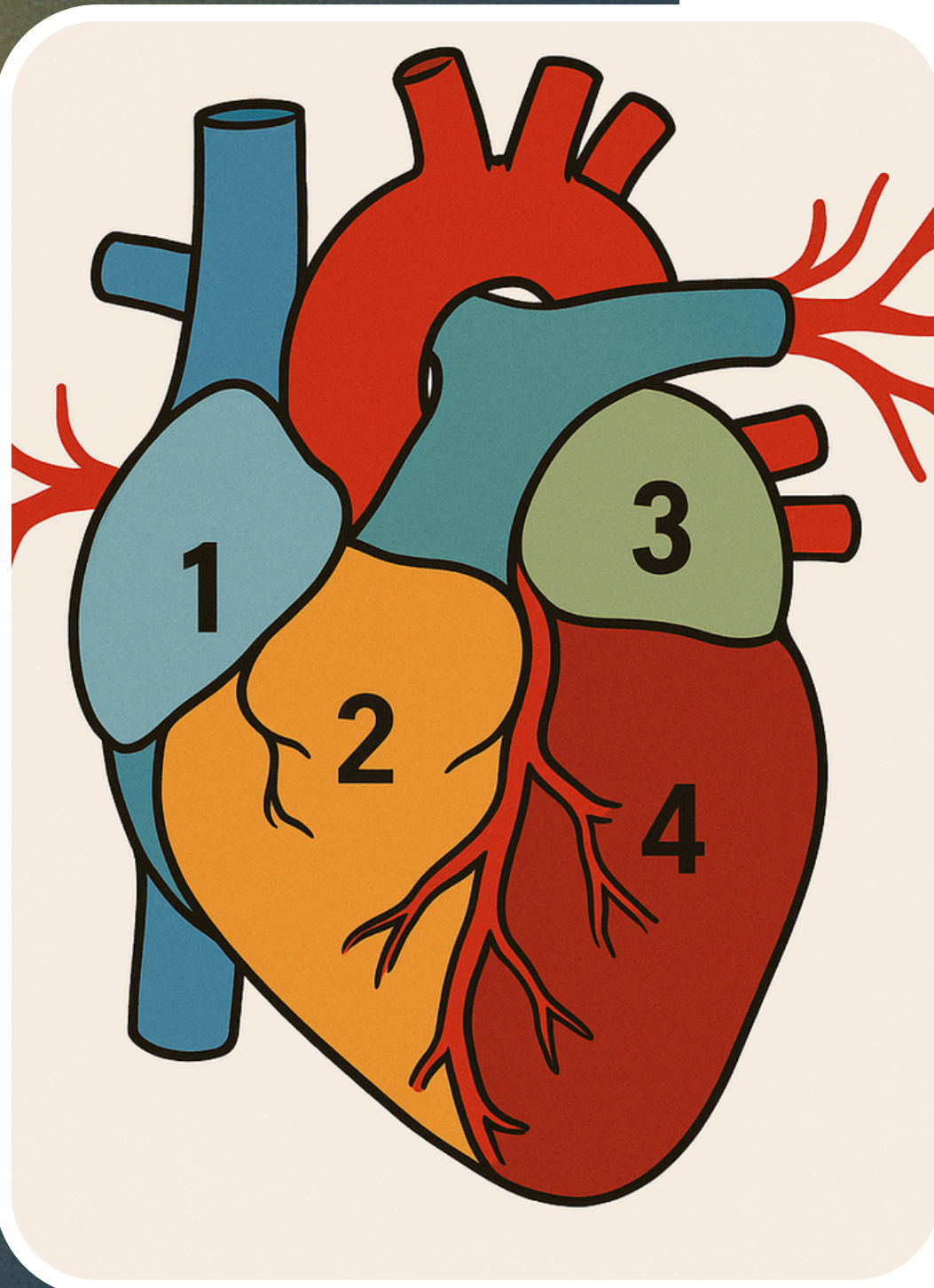
MAIN VEINS AND ARTERIES

Veins:

- Pulmonary Veins: Lungs → Left atrium
- Venae Cavae (Superior and Inferior): Body → Right atrium

Arteries:

- Pulmonary Arteries: Right ventricle → Lungs
- Aorta: Left ventricle → Body
- Carotids: Head
- Subclavian: Arms
- Hepatic: Liver
- Splenic: Spleen
- Mesenteric: Intestine
- Renal: Kidneys
- Iliacs: Legs



HEART RATE

Phases:

- Systole: Contraction, closure of atrioventricular valves, opening of sigmoid valves
- Diastole: Relaxation, heart fills with blood

CARDIAC MUSCLE CHARACTERISTICS

- Automatism: Functions automatically
- Excitability: Self-exciting
- Conductivity: Conducts impulses without CNS

Innervation:

- Pneumogastric Nerves: Slow contraction
- Sympathetic Nerves: Speed contraction

Heart Rate Ranges:

- Normal Adults: 60–100 bpm
- Babies: 100–150 bpm
- Tachycardia: >100 bpm
- Bradycardia: <60 bpm
- Irregular rhythm: Arrhythmia

CIRCULATORY PATHWAYS

Pulmonary (Minor) Circulation:

- Right Ventricle → Pulmonary Arteries → Lungs → Gas Exchange → Pulmonary Veins → Left Atrium

Systemic (Major) Circulation:

- Left Ventricle → Aorta → Body → Venae Cavae → Right Atrium

Coronary Circulation:

- Supplies heart muscle via coronary arteries



THE BLOOD

Function:

- Transport of essential substances and gases
- Takes place primarily in capillaries

Volume:

- Males: 5–6 L
- Females: 4–5 L

Components:

- Plasma: 55%, mainly water, ~10% proteins (albumin, globulins)
- Cellular Elements: 45% (Hematocrit)

Blood Cells:

- Red Blood Cells (Erythrocytes): Carry oxygen via hemoglobin; production via erythropoietin (EPO)
- White Blood Cells (Leukocytes): Defense function
 - Polymorphonuclear: Neutrophils, Eosinophils, Basophils
 - Mononuclear: Lymphocytes, Monocytes
- Platelets (Thrombocytes): Plug vascular wounds; cell fragments from bone marrow

ADAPTATIONS IN THE BLOOD (EXERCISE)

- Haemoconcentration: ↓ Plasma, ↑ Hematocrit, ↑ Viscosity
- Hemoglobin: ↑ During exercise, ↓ Post-exercise
- Red cell destruction: ↑ With strenuous effort
- Leukocyte count: ↑ With exercise
- Moderate regular activity: ↑ Immune capacity
- Intensive training: ↓ Immune response
- Platelets: ↑ Number and size
- Training reduces hypercoagulant tendency

CIRCULATORY ADAPTATIONS TO EXERCISE

- Increased Cardiac Output
- Elevated Blood Pressure
- Blood Flow Redistribution
- Enhanced Venous Return
- Cardiac Adaptations
- Regulation of Cardiovascular Adjustments





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