Honors Biology Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
NDHS Per: \_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_

**Cardiopulmonary System**

Cardio – heart

Pulmonary - lungs

**Gas Exchange in Humans**

1. **Mouth/Nose/Nasal Cavity, Pharynx, Larynx**: air entrance

**Epiglottis** open - allows air into **trachea**

Larynx:

**Voice Box** - air passing over vocal chords causes vibration

2. **Trachea**: Wind Pipe - in front of esophagus

**Cartilage rings** - reinforcement

3. **Bronchi**:

Trachea splits into bronchi

Each bronchus splits further into more **bronchioles**

4. **Alveolus**: air sac

- located at the end of bronchioles

- enveloped by **capillaries** for gas exchange

5. **Diffusion of Gases**

Inhale: lots of oxygen - diffuses across membrane into blood - fixed by hemoglobin - binds to the iron at the center of the **hemoglobin** subunit

- oxygen binds less well in **acid** environments (control mechanism)

Blood has lots of **CO2** - diffuses out of RBC into alveoli

1. **Circulation**: RBC move throughout body and O2 diffuses with concentration gradient to cells via the **interstitial fluid**

- CO2 diffuses opposite direction

**RESPIRATION CONTROL**

1. **Bulk Flow**: moving air in and out of lungs

**Negative Pressure**: mammals, **birds and reptiles**

- generated by **diaphragm** (muscle separating the pulmonary and abdominal cavities) and **intercostal** muscles (muscles between **ribs**)

- diaphragm contracts and **moves downward**

Result: decreases **the pressure** in lungs (more volume)

- **air rushes in**

- diaphragm relaxes and moves up - **air expelled**

2. **Breathing Rate**:

**Balance of pH**

- chemoreceptors in **carotid artery** and **medulla oblongata** monitor pH

- when pH drops (**excess CO2**) a signal is sent to the breathing control center (medulla oblongata) in the brain which signals the **diaphragm to contract more often – CO2 out/O2 in/pH rises**

**Circulatory System**

Function: distribute nutrients and oxygen

transport waste products for removal

immune system

**Structures of Circulatory Systems**

Vessels:

**Arteries** **Veins**

move blood **away from heart** blood **to heart**

**thick** layer of smooth muscle **thin** layer of smooth muscle

Branch into **arterioles** Formed from converging **venules**

**Capillaries**: smallest blood vessels - transfer of nutrients and waste

**Heart**: Pumping mechanism: cardiac muscle tissue

Compartments:

**Atria**: receive blood from veins pump blood to ventricles

**Ventricles**: typically larger chamber with thicker wall - pump blood into arteries

**Human Circulatory Systems**

Parts/Pathway:

1. **Vena Cava**- largest veins: **Superior** (anterior) - head and forelimbs and **Inferior** (posterior) - torso and legs

2. **Right Atrium (RA)-** receives blood from vena cavas

3. **Atrioventricular Valve (AV valve):** **tricuspid** valve

- passes blood to RV - separates the right chambers

- prevents **backflow** of blood from RV so blood only moves forward

4. **Right Ventricle (RV)**- thicker **wall**- pumps blood to Pulmonary Artery

5. **Pulmonary Semi-lunar Valve**: gateway to pulmonary artery - prevents blood from flowing into the **RV**

6. **Pulmonary Artery**: carries blood to lungs for oxygen - **NOTE**: blood is leaving the heart through an artery but is **O2 Poor**

- in lungs the arteries branch into arterioles and then into a capillary net around the alveoli allowing for gas exchange

7. **Pulmonary Veins**: from lungs to LA - carries **O2 rich** blood

8. **Left Atrium (LA):** receives O2 rich blood and pumps it into the LV

9. **Left Atrioventricular Valve** - aka **mitral valve** or **bicuspid valve**

- prevents backflow from LV

10.**Left Ventricle (LV)** : pumps blood into Aorta

11.**Left Semilunar Valve** : prevents blood from flowing back into LV

12. **Aorta**: main artery - branches

- sends blood to body systems

13. **Arteries**:

- branch into **arterioles** and then into capillaries

14. **Capillaries/Capillary Nets**:

- gas and nutrient exchange

15. **Venules and veins**: capillaries merging into larger vessels like streams into rivers

[THE HEART](http://www.youtube.com/watch?v=D3ZDJgFDdk0&feature=related)

In 1 year, the average human heart circulates from 770,000 to 1.6 million gallons of blood through the body. This is enough fluid to fill 200 tank cars, each with a capacity of 8,000 gallons

[Beating Heart/Heart Surgery](http://www.youtube.com/watch?v=Zxqj1BcBpIg&feature=related)

**Blood Pressure**: **120/80**

**Systole**: blood being forced into the **arteries**

- larger pressure because of the **stronger contraction** of the **ventricles**

**Diastole**: relaxing of the **ventricles**

**Sphygmomanometer**

**Increased blood pressure**:

- higher amounts of **water** in the blood due to increased **solute** content

- **sugar or salt**

- decreased **diameter** of blood vessels – **atherosclerosis and arteriosclerosis**

**Capillary Exchange**:

- nutrient rich blood from arteries enters capillaries

- water, food and gases leave blood to cells

- metabolic wastes enter blood and nearly all of the fluid that left the capillary