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