

The Circulatory System

1. Explain why large, multicellular organisms require circulatory systems.
 - The circulatory system is important in order to transport nutrients, wastes and gases throughout the system to different organs and tissues.
2. No cell is further than two cells away from a blood vessel. This allows nutrients to pass to cells via the process of **Diffusion**.
3. Name six functions of the circulatory system.
 - Respiration
 - Nutrition
 - Waste removal
 - Immunity
 - Cellular Communication
 - Thermoregulation
4. Capillaries connect arteries to **veins**.
5. An artery always carries blood **away from** the heart.
6. An **aneurysm** is due to the weakening of the wall of an **artery**. This leads to a bulge in the wall which easily ruptures.
7. Explain how you blush or pale depending on your situation.
 - Blush = blood rushing to your face vessels
 - Pale = blood rushing away from your face vessels
8. Hardening of the arteries is also known as **atherosclerosis**. This is when **cholesterol** droplets mix with **salt** and other minerals to form **plaque** which is deposited on the artery wall. **Clots** form around this, blocking off blood flow.

9. Capillaries are the site of **nutrient** and **gas** exchange in tissue. (Because they are so thin, **diffusion** occurs easily.)
10. Venules and veins carry blood **away from** the heart.
11. Blood pressure in the veins and venules is much **lower** than arteries.
12. What two factors work together to push blood against gravity back up to the heart?
- **Valves**
 - **Blood pressure due to muscular contractions**
13. If blood pools for a long period of time in a vein, the **valves** in the veins can be damaged, leading to a condition known as **varicose veins**. Name two factors that can lead to this condition. **Pregnancy, high blood pressure, diabetes, standing for long periods of time, obesity, etc.**
14. The average heartbeat is **60-100** beats per minute (BPM).
15. Diastole is the stage of heart contraction when the **relaxes**. During this stage, the **semilunar** valves slam shut, producing the **dub** sound of the heartbeat.
16. Systole is the stage of heart contraction when the **contracts**. During this stage, the **AV** valves slam shut, producing the **lub** sound of the heartbeat.
17. Differentiate between cardiac output, stroke volume and heart rate.
- **Cardiac output = volume of blood pumped per minute (mL/min)**
 - **Stroke volume = amount of blood pumped out of the heart during each contraction (mL/beat)**
 - **Heart rate = # of beats per minute (BPM)**

18. A **sphygmometer** is used to measure blood pressure.

19. Blood pressure readings include two numbers. Indicate what the average numbers are, and what they represent.

- **Systolic pressure / Diastolic pressure**
- **Regular blood pressure = 120/80**
- **High blood pressure = 140/90**
- **Low blood pressure = 90/60**

20. Why is low blood pressure a problem?

- **Not enough oxygen to the body = weak, tired, out of breath**

High blood pressure?

- **Too much pressure = chance of clot**

21. Describe the causes and symptoms of anemia.

- **Anemia = low red blood cell count, caused by low iron**
- **Blood does not hold on to oxygen, people are often tired, out of breath**

22. Describe how blood clotting takes place.

**Injury → platelets → Thromboplastin → Calcium ions → Prothrombin → Thrombin
→ Fibrinogen → Fibrin → Clot!**

23. Antigens are **proteins** on the surface of **pathogen** cells. Antibodies are **proteins** that attach to antigens and cause the blood to **immobilize the pathogen to get rid of it during the immune response!**

24. A person with type AB blood has **A and B** antigens. They are referred to as the universal **acceptor**.

25. Match the following parts of the immune system with the description on the right:

Helper T cells / Macrophages Identify the antigens present on an invading cell

Antibodies Y-shaped proteins that attach to antigens and immobilize invaders

Suppressor T cells Slows down immune reactions after the invader has been destroyed

Antigens Proteins located on the surface of a cell membrane

Memory B and T Cells Retain information about the invader to speed up future reactions

Killer T cells Puncture and rupture the cell membranes of intruders, and digesting infected cells, also destroy mutated cells.

B cells White blood cells that produce antibodies.

Helper T cells Produced in the bone marrow and stored in the thymus gland, seek out intruders and signal the attack

Macrophages White blood cells that engulf and digest invaders

Erythrocytes Red Blood Cells

White blood cells / Leukocytes Cells that do not contain a nucleus

Plasma Mostly water, but also contains proteins, glucose, nutrients, and cellular waste products.

Platelets Initiate blood clotting reactions

Fibrin Useful in blood clotting

Red blood cells Biconcave discs (which gives a better surface area for oxygen exchange)

Leukocytes White Blood Cells

Hemoglobin Iron containing pigment that holds oxygen