



New Zealand Blood Service Teaching Units

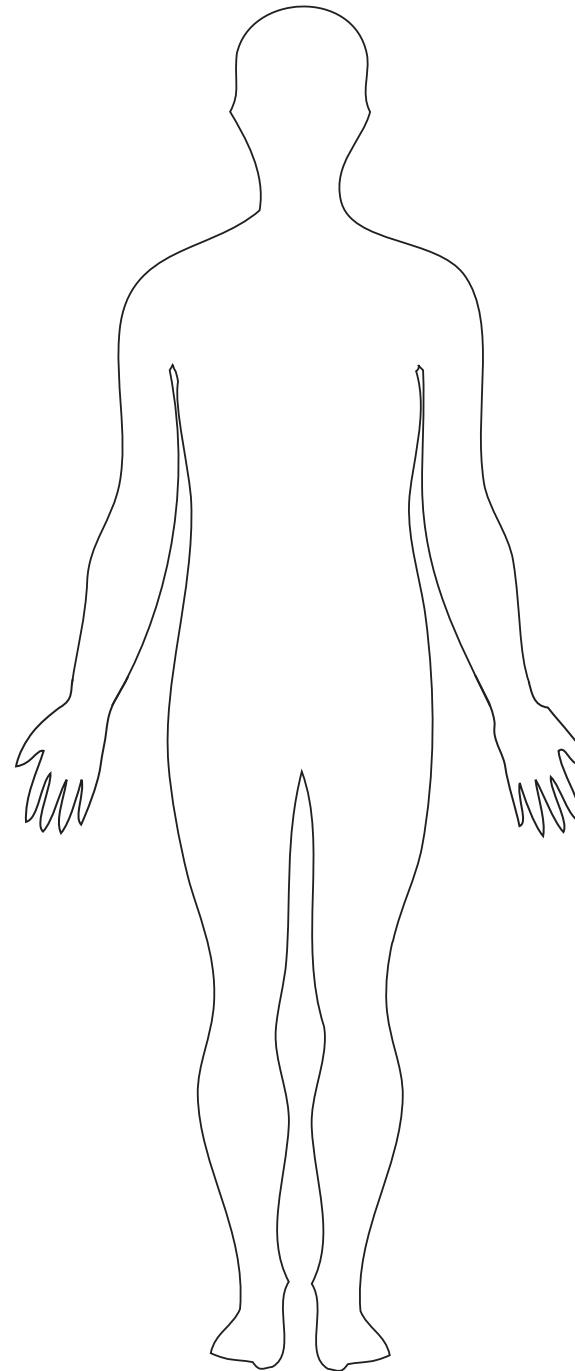
Level 5:
Graphic organisers

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NZBLOOD
Te Ratonga Toto O Aotearoa

A: Body outline



B: First and second definitions

Unit 1

Term	First definition	Second definition
arteries		
capillaries		
veins		
oxygenation		
plasma		
red blood cells		
white blood cells		
platelets		
haemoglobin		
antigen		
antibodies		
cell		
organelle		
cytoplasm		
nucleus		
bone marrow		
stem cells		
blood volume		

B: First and second definitions (continued)

Unit 2

Term	First definition	Second definition
social sustainability		
personally responsible citizen		
participatory citizen		

Your own words for the glossary

C: First and second definitions – mixed answers

special proteins that recognise foreign materials (antigens) and help the body destroy or neutralise them	made up of a jelly-like fluid and other structures that surround the nucleus of a cell
vessels that carry blood to the heart	contain haemoglobin, which carries oxygen and carbon dioxide
very thin vessels in muscles and lungs where the exchange of dissolved gas, nutrients, heat, hormones and wastes takes place	when oxygen molecules enter body tissue
a structure in a cell that has one or more special functions	vessels that carry blood away from the heart
special parent cells that can divide and produce two stem cells, or one stem cell and one cell that will divide rapidly and differentiate the various types of blood cells	an iron-containing protein, carried by red blood cells, that releases oxygen to body tissues and carries carbon dioxide
these clump together to form a soft plug to protect the body by stopping bleeding	serves as the cell's command centre and houses the DNA
the fluid part of blood that carries oxygen, carbon dioxide, nutrients, hormones and waste	where blood cells are produced from stem cells
the basic building blocks of all living things	the total amount of blood in the body
includes some cells that can produce antibodies and others that can destroy harmful foreign substances (organisms and substances that have antigens)	a foreign substance that causes the immune system to produce antibodies against it

D: First and second definitions answers

Unit 1

Term	First definition	Second definition
arteries		vessels that carry blood away from the heart
capillaries		very thin vessels in muscles and lungs where the exchange of gas, nutrients, heat, hormones and wastes takes place
veins		vessels that carry blood to the heart
oxygenation		when oxygen molecules enter body tissue
plasma		the fluid part of blood that carries nutrients, hormones, wastes and small amounts of oxygen and carbon dioxide
red blood cells		contain haemoglobin, which carries oxygen and carbon dioxide
white blood cells		includes some cells that can produce antibodies and others that can destroy harmful foreign substances (organisms and substances that have antigens)
platelets		these clump together to form a soft plug to protect the body by stopping bleeding
haemoglobin		an iron-containing protein, carried by red blood cells, that releases oxygen to body tissues and carries carbon dioxide
antigen		a foreign substance that causes the immune system to produce antibodies against it
antibodies		special proteins that recognise foreign substances (antigens) and help the body destroy or neutralise them
cell		the basic building block of all living things
organelle		a structure in a cell that has one or more special functions

D: First and second definitions answers (continued)

cytoplasm		made up of a jelly-like fluid and other structures that surround the nucleus of a cell
nucleus		serves as the cell's command centre and houses the DNA
bone marrow		where blood cells are produced from stem cells
stem cells		special parent cells that can divide and produce two stem cells, or one stem cell and one cell that will divide rapidly and differentiate the various types of blood cells
blood volume		the total amount of blood in the body

Unit 2

Term	First definition	Second definition
social sustainability		the healthy development of the community and of all different cultures, ages and social groups
personally responsible citizen		someone who accepts the idea that individual members of a society (including themselves) should act in a way that maintains or improves quality of life and that contributes to the “common good”
participatory citizen		someone who aims to solve social problems by involving themselves in the community at local, regional or national levels

E: Learning log

Unit 1

1. An introduction to the circulatory system

- a. What new information have I learnt about the circulatory system?
- b. What are some questions I have about the circulatory system?

2. Blood – A transport medium

- a. Explain the challenges I faced in describing the missing words to my partner in this activity.
- b. How has my understanding of the circulatory system changed since looking through the diagrams?
- c. Why do people use symbols in diagrams?
- d. Which of the following did I find the most useful in getting across the key ideas about blood as a transport medium: the written description, Google images, or both the writing and the images together? Why is this?

3. Observing the effect of exercise on the circulatory system

- a. Explain how effective taking my pulse was in helping me to understand how the circulatory system works.
- b. What new information have I learnt about the circulatory system?

4. Picture dictation of red blood cells

- a. Explain how effective this exercise was in helping me to understand how red blood cells work.
- b. What do red blood cells and the way they work remind me of?
- c. What are some questions I have about red blood cells?

5. Finding out the function of white blood cells

- a. What is something I learnt in this lesson?
- b. Explain how effective this exercise was in helping me understand how white blood cells work.
- c. What is one question about white blood cells that I would like to ask an expert?
- d. Do I think it is important to learn about white blood cells? Why or why not?

6. Platelet paragloss

- a. What is something I learnt in this lesson?
- b. Explain how effective this exercise was in helping me understand how platelets work.
- c. What do platelets and the way they work remind me of?
- d. What am I still unsure of?

7. Cells, plasma and bone marrow business cards

- a. Record three pieces of information that I recall from today's lesson.
- b. What are two ideas I would like to learn more about?

8. Blood groups – A three-level guide

- a. What is the most important thing I learnt this lesson and why was it important?
- b. What did I learn from talking to my group about the statements from the three-level guide?

9. The Blood Typing Game

- a. Explain how effective this exercise was in helping me to understand the importance of blood typing.

E: Learning log

Unit 2

10. Researching the history of blood transfusion

- a. Explain/describe how challenging it was to find information on the internet to answer the questions.
- b. What was the least “reliable” website I visited? What could make this website more reliable?
- c. Explain/describe how effective this exercise was in showing me the impact blood transfusion has had on people’s lives.

11. What is social sustainability?

- a. How does this statement add to my previous understanding of sustainability?
- b. How is this concept relevant to the history of blood transfusion?

12. Bone marrow donation – Taking notes

- a. What was the most difficult thing about this activity and why did I find it challenging?
- b. What did I find most interesting about bone marrow donation and why did I find it interesting?
- c. What questions do I still have about bone marrow donation?

13. Responsible and participatory citizenship

- a. What does learning about these categories of citizenship remind me of?
- b. What other categories of citizenship can I think of?
- c. Do I think one of these categories of citizenship is more important than the other? Why or why not?

14. The role of a blood service

- a. How is the role of the New Zealand Blood Service relevant to social sustainability?
- b. What aspects of citizenship are involved in managing a blood service?

15. Different values on blood donation

- a. Do I know anyone personally who has a strong opinion on blood donation? What does this say about their values?
- b. What questions do I still have about this?

16. Consequence wheel

- a. How are the ideas in my consequence wheel relevant to the concept of social sustainability?
- b. Which of my ideas is related to responsible citizenship?
- c. Which of my ideas is related to participatory citizenship?

F: Blood – A transport medium

A. Blood – A transport medium

Blood is _____ within a closed transport system that is made up of three _____ of vessel: arteries, capillaries and veins.

Arteries _____ blood away from the heart (always oxygenated, apart from the blood in the pulmonary artery, which goes to the _____). They have thick muscular walls and small passageways for blood (called internal lumen). They _____ blood under high pressure.

Capillaries are _____ in the muscles and lungs. They are microscopic – _____ one cell wide. They have low blood pressure. It is where _____ exchange takes place. Oxygen _____ through the capillary wall and into the tissues, and carbon dioxide passes from the tissues into the blood.

Veins carry blood to the heart (always de-oxygenated, apart from the blood in the pulmonary vein, which goes _____ the lungs to the heart). They have _____ walls, and larger internal lumen than arteries. They contain blood under _____ pressure and have valves to prevent blood flowing backwards.

Information adapted from <https://www.bbc.co.uk/bitesize/guides/z9n6sg8/revision/2>

B. Blood – A transport medium

Blood is carried within a _____ transport system that is made up of three types of _____: arteries, capillaries and veins.

Arteries carry blood away from the heart (_____ oxygenated, apart from the blood in the pulmonary artery, which goes to the lungs). They have thick muscular _____ and small passageways for blood (called internal lumen). They contain blood under high _____.

Capillaries are found in the _____ and lungs. They are microscopic – only one _____ wide. They have low blood pressure. It is where gas _____ takes place. Oxygen passes through the capillary _____ and into the tissues, and carbon dioxide passes from the tissues into the blood.

Veins carry blood to the heart (always de-oxygenated, apart from the blood in the pulmonary vein, which goes from the lungs to the _____). They have thin walls, and _____ internal lumen than arteries. They contain blood under very low pressure and have valves to _____ blood flowing backwards.

Information adapted from <https://www.bbc.co.uk/bitesize/guides/z9n6sg8/revision/2>

G: Blood – A transport medium, factsheet

Blood is carried within a closed transport system that is made up of **three types of vessel**: arteries, capillaries and veins.

Arteries carry blood away from the heart. The *aorta* carries oxygenated blood to the body and the *pulmonary artery* carries deoxygenated blood to the lungs. They have thick muscular walls because the blood is under high pressure and small passageways for blood (called *internal lumen*). Arterial blood flow is fast.

Capillaries are found in all tissues, including the muscles, skin and visceral organs, including the lungs. They are microscopic – only one cell wide. They have low blood pressure that is intermediate between arteries and veins. It is where gas exchange takes place: Oxygen passes through the capillary wall and into the tissues, and carbon dioxide passes from the tissues into the blood. The exchange of nutrients, heat, hormones and wastes also takes place in capillaries. Capillaries in the lungs provide the reverse flow of gases with carbon dioxide moving out and oxygen moving in.

Veins carry blood to the heart. The veins from the body tissues (muscles, skin, kidneys, stomach and bowel, liver, brain and bones) carry de-oxygenated blood but the *pulmonary vein* carries oxygenated blood from the lungs to the heart. They have thin walls, because the blood is under very low pressure, and a larger *internal lumen*. Venous blood flow is slow and veins have valves to prevent blood flowing backwards. When limb muscles contract they squeeze veins within the muscles and drive blood back towards the heart.

The **lymphatic system** is a special part of the circulatory system that drains tissue fluid and plasma proteins that leak out of blood vessels and transports them back to the blood. The lymphatics drain the tissue fluid through small organs called lymph nodes which are important filters to detect and remove foreign invaders such as viruses and bacteria. The lymph nodes are important sites where antibodies are produced. In contrast, the spleen is the important organ that filters blood, removes foreign invaders that manage to enter the blood and can produce antibodies against these foreign invaders.

Information adapted from <https://www.bbc.co.uk/bitesize/guides/z9n6sg8/revision/2>

H: Representing the human circulatory system with diagrams

1. What were some of the main messages the illustrators wanted to put across?

2. What commonly understood symbols or colours have been used in your and your partner's diagrams?

3. What do your and your partner's diagrams show about why and how scientists use symbols?

4. Can you think of a circulatory system diagram that would look different from the ones you have chosen? How could it look instead?

5. What are the limitations of using diagrams like these to present a concept such as the circulatory system? What are the advantages?

I: Theorising about the human circulatory system

1. What evidence of the circulatory system can be worked out from observing a living human being?

2. What evidence would have to be looked for in other ways apart from observing a living human being?

3. What other ideas about how the human circulatory system works might scientists in the past have produced as theories?

4. Using books or the Internet, research early theories about the human circulatory system, and summarise two of these below.

5. How do these theories overlap with or differ from your ideas in question 3?

J: Effects of exercise – Word cloze

Choose the correct word or phrase from the table below to fill in the missing spaces.

When exercising, blood does the following things:

- _____ nutrients and waste;
- Delivers _____ to the working muscles, and takes carbon dioxide away from them;
- Removes heat (_____); and
- Dilutes or carries away lactic acid (_____).

Blood pressure _____ when you exercise, but is

_____ when you are fit. It is also affected by age, smoking, stress, diet and weight.

acidic balance	increases	lower at rest
oxygen	temperature regulation	transports

Adapted from <https://www.bbc.co.uk/bitesize/guides/z9n6sg8/revision/4>

K: 5Ws and an H factsheet

The components of blood and the effect of exercise

Blood has four key components: plasma, red blood cells, white blood cells and platelets. **Plasma** is the fluid part of blood. It carries things like carbon dioxide, hormones and waste, and contains many different proteins. **Red blood cells** contain haemoglobin which carries oxygen. Red blood cells are made in the bone marrow. Reduced delivery of oxygen to tissues when living at high altitude will cause increased red blood cell production in the bone marrow so that blood has a higher concentration of haemoglobin. **White blood cells** are an important part of the body's defence system. One group of white blood cells produces antibodies. Other important groups of white blood cells called granulocytes and monocytes (they are phagocytes – “eater cells”) use antibodies to recognise and destroy foreign substances and harmful microorganisms. White blood cells are also made in the bone marrow. **Platelets** clump together at the exposed edges of injured blood vessels to protect the body by stopping bleeding.

When exercising, blood:

- **transports** nutrients and waste;
- delivers **oxygen** to all the tissues, especially the brain and working muscles, and carries carbon dioxide away from them;
- removes heat (**temperature regulation**); and
- dilutes/carries away lactic acid (**acidic balance**) if oxygen delivery is reduced below the amount required.

Blood pressure increases a little when you exercise, but is lower at rest when you are fit. When exercising, the main change that provides sufficient blood flow to muscles is increased heart rate and increased diameter of the arteries to the working muscles, permitting an increased amount of blood to flow through the tissue and resulting in increased delivery of oxygen and removal of carbon dioxide. Blood flow is also affected by age, smoking, stress, diet and weight, all of which may contribute to the development of various disease problems in arteries.

Adapted from: <https://www.bbc.co.uk/bitesize/guides/z9n6sg8/revision/2>

K: 5Ws and an H factsheet (continued)

1. Write as many questions as you can, beginning with the five Ws and an H (who, what, where, when, why and how), about the information above.

Who

What

Where

When

Why

How

2. Write at least two questions that include “if”, “should”, “would” or “might”.

3. Put a star beside the questions above that you think are the four best or most interesting.

Look for answers to these questions in the library or on the Internet. If you have access to an expert, you could ask them.

L: White blood cells factsheet

White blood cells (also called **leukocytes** – *leuco* means white, *cyte* means cell) are a key part of the body's system for defending itself against infection. They can move in and out of the bloodstream to reach affected tissues. New leukocytes are constantly being formed in the bone marrow. Some of the white blood cells that make antibodies are also produced in the lymph nodes and the spleen.

The blood contains far fewer white blood cells than red blood cells, although the body can rapidly release more cells from the bone marrow reserves and increase production of white blood cells to fight infection. Someone with an infection will often have a higher white cell count than when he or she is well, because more white blood cells are being released from the marrow and are entering the bloodstream to battle the infection.

There are several types of white blood cells. White blood cells called **granulocytes** and **lymphocytes** travel in the blood but move out into the tissues if the lining cells of the blood vessels provide signals produced by inflammation. Granulocytes and lymphocytes fight germs such as bacteria and viruses and may also attempt to destroy cells that have become infected by a virus or have become cancer cells. **Monocytes** are another type of white blood cell that are produced in the bone marrow and travel in

the blood to the tissues where they become permanent resident cells called macrophages (meaning: “big eater”). They help to clean up after injuries, remove invading microbes, initiate repair when needed and send signals back to the bone marrow to increase production of other leukocytes.

Certain types of white blood cells that belong to the lymphocyte group produce antibodies. Antibodies are special proteins that recognise foreign substances (antigens) and help the body destroy or neutralise them. Antibodies attach to antigens on invaders such as bacteria and viruses and other foreign substances and provide a marker, like a flag, to help the granulocytes and macrophages recognise, engulf and destroy these foreign invaders. After the body has been challenged by an infection, lymphocytes “remember” how to make the specific antibodies that will quickly attack the same antigens if the bacteria or virus enters the body again. Persisting production of antibodies helps to provide immunity. If you have a virus infection such as chickenpox or measles, persisting immunity prevents you from having the same infection again. Viruses that produce new strains (or varieties) every year, such as influenza (the flu), are able to produce new infections because immunity from previous infections does not protect the body against the new strain.

(Adapted from <https://kidshealth.org/en/teens/blood.html>)

Use the information above to complete this table:

The main functions of white blood cells	How they perform this function	How they differ from red blood cells

M: Platelet paragloss factsheet

- Platelets are very small cells that help the clotting process by sticking to the exposed ends of injured blood vessels.
- Platelets are made in the bone marrow and survive in the circulatory system for an average of 9 to 10 days before being removed from the body by the spleen. The spleen is a blood-filtering organ that removes red cells and platelets at the end of their lifespan and also removes bacteria and other foreign invaders.
- Platelets are vital to life, because they stop leakage from blood vessels after small knocks, cuts or grazes. This process is one of the three essential steps that prevent bleeding from turning into massive blood loss that would cause death.

Adapted from <https://www.nzblood.co.nz/news/2017/top-10-facts-about-platelets/>

Facts about stopping bleeding

- Three processes in the body stop bleeding. These processes must all work together to ensure bleeding is stopped efficiently and remains stopped.
 - The first process is rapid **constriction of blood vessels**. This will temporarily reduce or stop bleeding.
 - The second process involves platelets forming a soft **platelet plug** to seal the injured blood vessel.
 - Finally, **blood clotting** occurs and provides a strong meshwork of protein fibres (made up of a protein called fibrin which is produced from fibrinogen in plasma) that reinforce the soft platelet plug and bind to the cut or torn ends of the injured blood vessels so that bleeding does not easily start again. Blood clotting is the slowest of the three processes.
- After bleeding has stopped, the repair process starts. The platelet plug releases large amounts of growth factors that stimulate the tissue cells and stem cells around capillaries and other small blood vessels to grow and produce new connective tissue and blood vessels. White blood cells (granulocytes and monocytes) also enter the injured tissue. They help by breaking down injured cells and tissue components so that the repair process can occur.

N: Cells, bone marrow and plasma factsheet

What is a cell?

Cells are the basic building blocks of all living things. The human body is composed of trillions of cells. They provide structure for the body, take in nutrients from food, convert those nutrients into energy and carry out specialised functions. Cells also contain the body's hereditary material and can make copies of themselves.

Each cell has two main parts: the nucleus and the cytoplasm. The cytoplasm surrounds the nucleus and is made up of a jelly-like fluid (called the cytosol) and many organelles. Organelles are specialised structures that perform particular tasks within the cell. Each cell is surrounded by a cell membrane that has specialised transport channels to take up or export many different substances. It also has many receptors to receive signals from other cells.

The nucleus is a specialised organelle that serves as the cell's command centre, sending directions to the cell to grow, mature, divide or even die. It also houses DNA (deoxyribonucleic acid), the cell's hereditary material. The nucleus is surrounded by a membrane called the nuclear envelope, which protects the DNA and separates the nucleus from the cytoplasm.

(Adapted from <https://www.nzblood.co.nz/give-plasma/>)

What is bone marrow?

Blood cells only live for a short time so our bodies have to keep making new ones. All of the blood cells in the human body are produced in the bone marrow, inside the bones. Bone marrow looks like a network of tiny connected caves, similar to a honeycomb. Inside are very special parent cells called stem cells. A stem cell can divide itself and produce a

twin. The process of cell division is called mitosis. Through mitosis, the stem cell can keep creating more stem cells exactly like itself.

The stem cell is the source of all of the different blood cells – it can actually “differentiate” (develop) into red cells, white cells or megakaryocytes (bone marrow cells which bud off the tiny platelets). Stem cells make up only a tiny fraction of all bone marrow cells as they are constantly changing into differentiating cells that grow and divide rapidly by mitosis before they become mature blood cells.

(For more information see: <https://www.bonemarrow.org.nz/> and <https://www.nzblood.co.nz/become-a-donor/ways-to-donate/donating-bone-marrow/>)

What is plasma?

Plasma is the main transport fluid in the body. All of the blood cells in your body are carried in a pale yellow liquid called plasma. Plasma is mostly made up of water, but also contains proteins, sugars and salts. In addition to carrying blood cells throughout the body, plasma also carries hormones (chemicals that carry messages to the cells); nutrients such as sugars, fats, amino acids to make proteins, and vitamins; and special transport proteins that carry tiny amounts of metals such as iron, calcium, zinc and copper.

Plasma transports antibodies and other proteins needed for dealing with infections and inflammation in tissues. It also carries waste products from the tissues so that they can be removed from the body. Plasma carries out a variety of functions in the body, including clotting blood, fighting diseases and other important functions.

(Adapted from <https://www.donatingplasma.org/donation/what-is-plasma> and <https://www.stanfordchildrens.org/en/topic/default?id=what-is-plasma-160-37>)

O: Blood types factsheet

In 1901, medical doctor and scientist Karl Landsteiner reported that blood could be classified into blood “groups” (also known as blood types). By selecting blood donors with identical blood groups, a successful blood transfusion could occur using donated blood from a healthy donor and a patient in need of blood replacement due to an injury, disease or surgery. A blood transfusion can consist of whole blood or a blood component, such as red blood cells or platelets or plasma.

Blood groups are small areas on the surface of specific proteins or sugars; they are one type of antigen. They are found on the surface of red blood cells. For each blood group system, several different blood groups, or antigens, occur in different people. If a person receives a transfusion of blood that has an antigen that is not present in their blood, white blood cells may be stimulated to make an antibody that will react with the antigen. The chance that production of an antibody will occur varies greatly between different blood groups. Blood groups A and B of the ABO blood group system and Rh(D) of the Rh system blood group must always be carefully matched to avoid producing an antibody.

Antibodies are found in plasma and are made by specialised white blood cells of the immune system. Antibodies can recognise antigens on foreign cells and substances (those that are not the body's own cells and substances). When the blood of two people mixes during a transfusion, if the donor's red cells are not compatible with the recipient's antibodies, the antibodies will attach to the antigens and cause rapid destruction of the cells bearing the wrong antigen.

There are four basic blood groups in the ABO blood group system discovered by Landsteiner:

1. **Group A** with A antigen on the red cells. These individuals make anti-B antibodies which circulate in the plasma: If you are a Group A person, you do not carry antibodies against A antigens, but you do have antibodies against Group B red cells.
2. **Group B** with B antigen on the red cells and anti-A antibodies in the plasma: If you are a Group B person, you have antibodies against Group A red cells.
3. **Group AB** with both A and B antigens on the red cells and neither anti-A nor anti-B antibodies in the plasma.
4. **Group O** with no A or B antigens on the red cells and both anti-A and anti-B antibodies in the plasma. If you are a Group O, you have antibodies against both Group A and B.

O: Blood types factsheet (continued)

		Donor								
		Type	O-	O+	B-	B+	A-	A+	AB-	AB+
Recipient	AB+									
	AB-									
	A+									
	A-									
	B+									
	B-									
	O+									
	O-									

In summary, if you lack A, or B, antigens you will make anti-B, or anti-A, respectively. We start making these antibodies early in life after we are exposed to bacteria that have similar antigens to the A and B antigens. The ABO system is the only blood group system where bacterial antigens stimulate production of antibodies that react with human blood cells.

The antibody reaction that occurs when blood from two different ABO blood groups are mixed in a laboratory test causes the foreign red cells to clump together. This can lead to blood clots, which can obstruct blood vessels. If they break, hemoglobin can leak out, and this can be toxic.

Other possible adverse effects include allergic reactions and anaphylaxis. In some cases, the body can cope, but others can be life-threatening. That is why it is so important to match blood groups between a donor and a patient before a transfusion is given.

(Adapted from <https://www.medicalnewstoday.com/articles/218285#risks>)

After the ABO system, the Rh blood group system is the second most important. The most important blood group in the Rh system is the Rh(D) type. Within the ABO system, people can be one of four groups – O, A, B or AB. In the Rh system they can be either Rh(D) positive or Rh(D) negative.

Each blood group system is inherited independently of the other systems. As a result, there are eight main blood groups.

The Donor/Recipient chart shows the compatibility of different blood groups by the presence of a red blood drop. For example, an A negative patient (written as A-) may receive blood from an O negative or an A negative donor.

Antibodies against the D antigen are not made unless a D negative person is exposed to D positive red cells. This means that anti-D antibodies are not normally present in people who are D negative.

Rh(D) negative patients should not normally receive Rh(D) positive red cells as this will start their body producing anti-D antibodies. This process cannot be reversed once it has started.

Type O is the most common blood type with around 50% of New Zealanders having this blood group. Type O negative donors are referred to as “the universal donors” because, in an emergency, their red cells can be transfused to people who have any ABO and Rh(D) blood type. Because any patient can receive type O negative red cells, there is a particular need for O negative people to become volunteer blood donors and to give donations regularly.

(Adapted from <https://www.nzblood.co.nz/about-blood/>)

P: Blood types – A three-level guide

Tick if you AGREE or cross if you DISAGREE with each of these statements.

Jot down the ideas from the factsheet that support your point.

Join a group of 3 or 4 students to talk about your responses, explaining to the group why you AGREE or DISAGREE.

✓ or X	Why?
Level 1 – Reading along the lines	
Certain proteins are found on the surface of red blood cells.	
Around half of New Zealand has Type O blood.	
Group A people do not carry antibodies against A antigens.	
There are nine main blood groups.	
Level 2 – Reading between the lines	
There are two types of blood that can be transfused.	
All foreign blood cells are destroyed if incompatible blood groups are mixed.	
Each person can be classified under both the ABO system and the Rh(D) system.	
Mixing the wrong blood types can lead to illness and death.	
Type O positive donors are very valuable because their red cells are compatible enough to give to any recipient in an emergency.	
Level 3 – Reading beyond the lines	
The antibodies in a person's plasma do not react with the antigens on their cells.	
There is a set formula to work out which blood type is compatible with which other blood types.	
Many people would have died before Karl Landsteiner worked out that there were different blood groups.	

Q: The history of blood transfusion

1. Who first developed the blood collection and transfusion process?

2. Why did they do this?

3. What information can you find about who supported and who opposed their ideas and why?

4. What information can you find about why their ideas were accepted and developed?

5. What were the initial or immediate impacts of their work?

6. What were the long-term impacts of their work?

R: Bone marrow donation – Taking notes

Why is donated bone marrow needed?	How does bone marrow donation work?	What are some examples of the difference bone marrow donation makes?

S: Responsible and participatory citizens

Who do you personally know who you consider to be a **responsible citizen** and why do you think of them in this way?

What particular activities do people do that are **participatory** (taking part to make the community better)?

What are some current events stories about people in the community that illustrate responsibility and participation?

T: Website reliability checklist

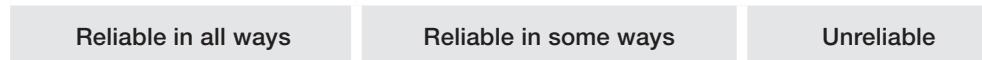
URL (website address):

Date accessed:

Validity:	
Is the personal author of the site identified? What are their credentials/ qualifications?	
Is contact information provided? (The author should be accountable for her/ his work.)	
Does the site allow messages and feedback to be posted?	
When was the site first created and last updated? (A site's longevity is a clue to its stability; a reliable site is frequently revised and improved.)	
Content:	
What is the depth and breadth of the information offered?	
Are there links to other useful and reliable sites?	
Does the advertising overpower the content?	
Has the author referenced the sources used?	
Purpose:	
What is the major domain of the URL? What could that imply? (.com = commercial/ .edu = education/ .org = non-profit organisation/ .gov(t) = government). Is this site trying to persuade you? Educate you? Market a product?	
Are there any biases (only one side of the argument) that might be being promoted, such as racial, gender, religious or other types?	

(Adapted from https://www.ercsd.org/cms/lib/NY02205564/Centricity/Domain/990/Website_Evaluation_Checklist.pdf)

Overall rating of this website's reliability [circle]:

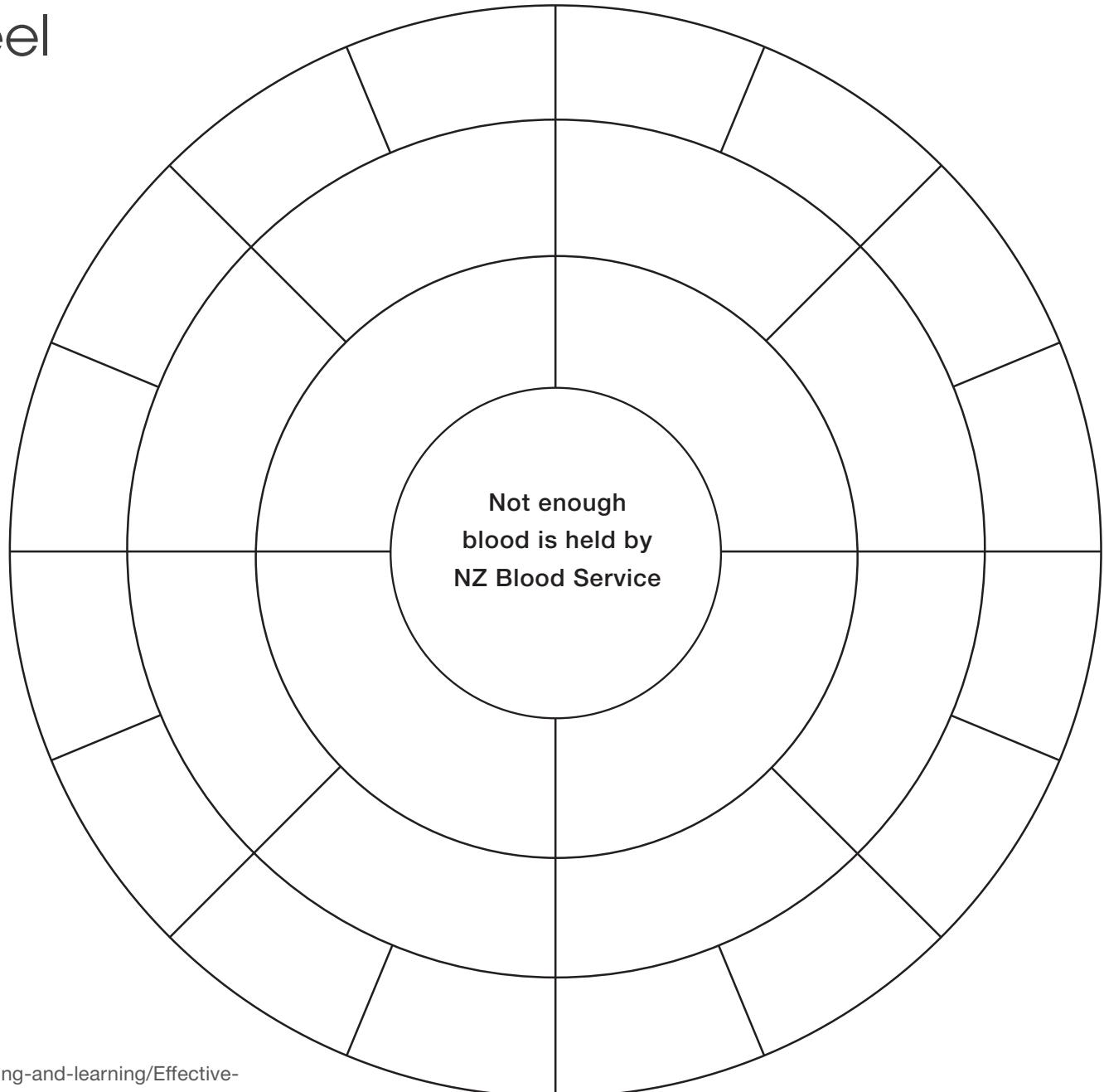


U: Providing a blood service

	What is involved?	What resources are needed?	What potential issues might arise?
Collecting			
Processing			
Storing			
Distributing			

V: Consequence wheel

In each outward radiating section of the wheel, place ONE consequence (either positive or negative) of NZBS not having enough blood. It may help to think of the impact for different individuals or groups in society. Add new consequences of each initial consequence as the wheel works outwards.



Adapted from https://ssol.tki.org.nz/Social-studies-1-10/Teaching-and-learning/Effective-teaching-in-social-studies/Teaching-strategies/graphic_organisers/Consequences-wheel

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W: Careers in the health sector

	What qualifications/skills are needed to get this job?	What are the chances of getting this job?	How might the job be relevant to blood service work?
Job 1:			
Job 2:			
Job 3:			
Job 4:			
Job 5:			