

Suitable for high-school teachers, Years 8–9
riaus.org.au/pdplus

Ri Aus PDplus

Current DonateLife Resources

These Teacher Notes are specifically for science teachers of Years 8–9. Additional resources across several subject areas for Year 8–9 students are available at: www.donatelife.gov.au/teachers



Donating for life

The science of organ and tissue donation

This project is sponsored by



Australian Government
Organ and Tissue Authority

donate life 



Have you
had 'the chat that
saves lives' in your
classroom?

We have!
Now we **know**
about the life-changing
benefits of organ and
tissue donation.



A suite of DonateLife school resources is now available for Year 8 and Year 9 students.

Produced by the Australian Curriculum Studies Association for the Organ and Tissue Authority, the resources are aligned to learning descriptions in the Australian curriculum, and support teachers to develop awareness of the issue of organ and tissue donation for transplantation, in Australian classrooms.

Year 8: 'The Gift of Life' – introduces students to a range of issues relating to organ and tissue donation for transplantation

Year 9: 'Have the Conversation' – introduces students to a range of perspectives about the process of organ and tissue donation; and includes analysis of *The Last Race* (pictured), a film by Alagna Films. To download the film for educational purposes please send your request and contact details to enquiries@donatelife.gov.au

Access the resources online now via the DonateLife website, or through the Education Service Australia Scotele national portal.



ABOUT THE GUIDE

RiAus PDplus Teacher Notes are an initiative of RiAus that have been designed to assist Science high school teachers to engage their students. The Teacher Notes supplement a PDplus event hosted by RiAus on the science of cells, tissue and organ systems, and introducing ethical discussions on organ and tissue donation. See the RiAus website for further details and footage.

riaus.org.au

Other RiAus PDplus Teacher Notes

Driven to Distraction, The Science and Myths of Low Level Speeding, Food Security, Synthetic Biology, The Square Kilometre Array and The World Solar Challenge. PDplus Teacher Notes are available on the RiAus website:

riaus.org.au/programs/our-projects/riaus-pdplus

HOW TO USE THE GUIDE

These notes introduce students to a range of issues relating to organ and tissue donation for transplantation. The learning activities are aligned to the Australian Curriculum: Science; they are also relevant to the General Capabilities, including the Personal and Social Competence, the Ethical Understanding and the Critical and Creative Thinking Learning Continuums. Students explore sensitive issues through short films, personal stories and factual texts; engaging and challenging material for the classroom. This set of Teacher Notes complements existing DonateLife Resources for Years 8 and 9 students. You can find more information, teacher resources, and stories on the DonatLife website: www.donatelife.gov.au

INQUIRY BASED LEARNING

The RiAus PDplus Teacher Notes employs a learning and teaching model based on science inquiry skills and understanding in a flexible format, which allows for a combination of task-oriented activities combined with deeper thinking activities. You and your students can choose to use all or any of the four sections – although it is recommended to use them in sequence, along with all or a few of the activities within each section.

The guide is in four sections:

Inquire

Basic information and questions.

Investigate

Practical investigation tasks linked to Science Understanding and Inquiry curriculum links.

Rich task

'Deep thinking', analysis and exploration addressing key capabilities and Science as a Human Endeavour area.

Reflect

Student self-evaluation.

Online resources

1. DonatLife school resources: www.donatelife.gov.au/teachers
2. Australian Organ Donor Register: www.humanservices.gov.au/customer/services/medicare/australian-organ-donor-register
3. The Transplantation Society of Australia and New Zealand: www.tsanz.com.au
4. Australia and New Zealand Organ Donation (ANZOD) Registry: www.anzdata.org.au/anzod/v1/indexanzod.html
5. Eye Bank Association of Australia & New Zealand: www.ebaanz.org
6. Kidney Health Australia: www.kidney.org.au
7. A TED talk by Dr Anthony Atala on growing organs in the lab: www.ted.com/talks/anthony_atala_growing_organ_engineering_tissue
8. Biotherapeutics Association of Australasia www.bioaa.org.au
9. *The Last Race* depicts a family as they struggle to make a decision about donating their son's organs and a parallel story of two patients waiting for a transplant. To download the film for educational purposes, send your request and contact details to enquiries@donatelife.gov.au

The RiAus PDplus Study Guide is produced by RiAus.



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Australian Government
Organ and Tissue Authority



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The content within this guide is linked to the Australian Curriculum: Science

Year	Science Understanding	Science as a Human Endeavour	Science Inquiry Skills
8	<p>Biological sciences</p> <p>ACSSU149 – Cells are the basic units of living things and have specialised structures and functions.</p> <p>ACSSU150 – Multi-cellular organisms contain systems of organs that carry out specialised functions that enable them to survive and reproduce.</p>	<p>Nature and development of science</p> <p>ACSHE134 – Scientific knowledge changes as new evidence becomes available, and some scientific discoveries have significantly changed people’s understanding of the world.</p> <p>Use and influence of science</p> <p>ACSHE135 – Science and technology contribute to finding solutions to a range of contemporary issues; these solutions may impact on other areas of society and involve ethical considerations. Note that organ and tissue donation is included in the elaboration here.</p> <p>ACSHE227 – People use understanding and skills from across the disciplines of science in their occupations.</p>	<p>Communicating</p> <p>ACSIS148 – Communicate ideas, findings and solutions to problems using scientific language and representations using digital technologies as appropriate.</p>
9	<p>Biological sciences</p> <p>ACSSU175 – Multi-cellular organisms rely on coordinated and interdependent internal systems to respond to changes to their environment.</p>	<p>Nature and development of science</p> <p>ACSHE158 – Advances in scientific understanding often rely on developments in technology and technological advances are often linked to scientific discoveries.</p> <p>Use and influence of science</p> <p>ACSHE161 – Advances in science and emerging sciences and technologies can significantly affect people’s lives, including generating new career opportunities.</p> <p>ACSHE228 – The values and needs of contemporary society can influence the focus of scientific research.</p>	<p>Communicating</p> <p>ACSIS174 – Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations.</p>

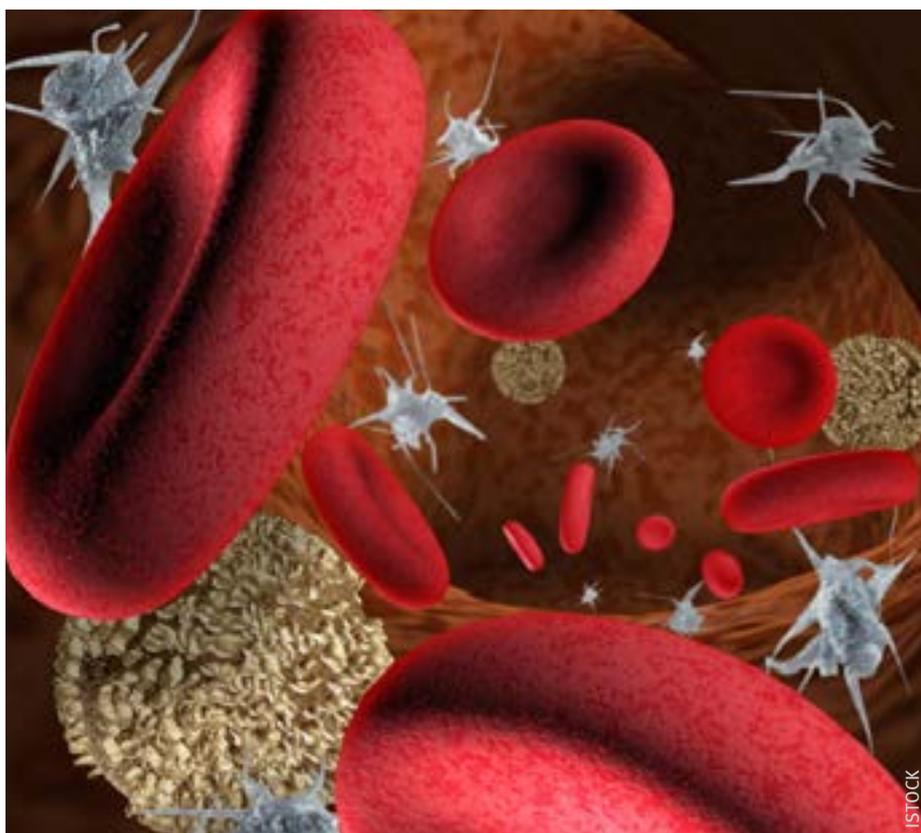
Note: Teachers need to be sensitive to the fact that the activities in this resource raise the issue of death and dying. In particular, the emotions and needs of students in your class who have personal or family experience with organ and tissue donation and/or transplantation need to be considered (and students who may require an organ transplant in the future due to an existing illness). Other students in the class may also feel some caution about discussing issues relating to organ and tissue donation. Before asking your students to engage in these class activities teachers need to establish a ‘safe’ environment by developing students’ ability to listen to a range of ideas and respect ideas that are different to their own.

General Capabilities levels 5 and 6

- ▶ Ethical Understanding
- ▶ Personal and Social Competence
- ▶ Critical and Creative Thinking

ORGAN AND TISSUE DONATION: THE BASICS

Every part of the human body has a special job to do. If something stops working properly and can't be fixed, the only solution may be to replace it. But changing a body part is not quite as simple as changing a light bulb or a tyre.



Organ and tissue donation can transform people's lives.

REPLACING A DAMAGED or diseased body part with a healthy one is called transplantation. Many parts of the body, including cells, tissues and whole organs, can be transplanted.

The most common type of cell transplant is blood transfusion. The Australian Red Cross receives about 1.4 million blood donations each year. Most of the blood is used to treat patients with diseases such as haemophilia, where the body's poor ability to clot blood can lead to a large blood loss from very minor cuts. Bone marrow stem cells are also routinely transplanted to treat people with leukaemia and other cancers. In this case, the patients have lost their own bone marrow cells due to damage by chemotherapy or radiation therapy.

The most common tissue transplants include corneas and bone. A transplanted

cornea (the transparent layer in front of the eye) can clear a person's vision by removing scarring after infection or injury. Less commonly transplanted is skin. Transplanted skin benefits burn victims by promoting healing and providing a temporary protection from infection.

Some patients have lived an extra 40 years after receiving a new kidney.

Organs that can be transplanted include the heart, lungs, liver, pancreas and kidney. It is a popular belief that the reason people need new organs is due to their life choices — such as smoking or drinking too much alcohol. This is not true! Many of the people on the transplant waiting list are there through no fault of their own. Both young and old people need transplants. Patients may be born

with a genetic defect — for example, people with cystic fibrosis may need a lung transplant. Other people may also be unlucky enough to develop a disease that leads to organ failure — for example, in some people a cold or flu can cause cardiomyopathy, a disease that weakens heart muscle.

People may wait up to three years for an organ transplant. However, once the operation takes place, the result is often a life-saving miracle. Some patients have lived an extra 40 years after receiving a new kidney.

Dealing with rejection

Every cell in your body is tagged with a protein pattern, like a barcode, stamped onto its surface. The barcode identifies your cells as belonging to you and nobody else. Your body is constantly patrolled by white blood cells that behave like suspicious police officers. White blood cells scan the barcode of every cell they come across — if the barcode is incorrect, they attack.

Organ transplantation involves the insertion of foreign cells and the recipient's white blood cells can quickly notice the incorrect barcode. This is called 'organ rejection'.

Early organ transplant surgeons used a clever trick to get around this issue. They realised that identical twins have the same protein barcode stamped on their cells. This means that transplantation between identical twins does not result in rejection.

The first successful kidney transplant was performed in 1954 when Ronald Herrick donated a kidney to his identical twin brother, Richard.

Transplantation between people who aren't identical twins was made possible by the development of immune suppressant drugs. These drugs dull the white blood cells' ability to identify the transplanted organ as foreign, which

means the organ is accepted by the body and can function as normal. The drugs have the side effect of lowering the body's natural immune response, making transplant recipients more susceptible to other diseases. They usually have to take the drugs for the rest of their lives.

MOST TRANSPLANTED ORGANS come from deceased donors. To optimise every potential organ and tissue donor, every Australian family needs to ask and know their loved ones' donation decisions. In Australia the family of every potential donor is always asked to confirm the donation decision of their loved one before organ and/or tissue donation for transplantation can proceed. When multiple organs and tissues are transplanted, one donor can transform the lives of 10 or more people.

Organ and tissue donation involves removing organs and tissue from someone who has died (a donor) and transplanting them into someone who, in many cases, is very ill or dying (a recipient). Less than 1% of people die in hospital in the specific circumstances where organ donation is possible.

In 2013 the rate of organ donation in Australia was 16.9 donors per million people. The number of deceased donors in Australia is on the increase, meaning more people receive organs every year. At any one time, more than 1500 people are on the Australian organ transplant waiting list (the number was 1532 in February 2014). When compared to the historical annual average of 200 deceased organ donors this represents a 91% increase in the number of organ donors in 2013. In 2013, 1122 people

Donated organs must be stored correctly and transported quickly.



One day you could transform the lives of 10 or more people by becoming an organ and tissue donor.

received transplants from 391 donors. (source: www.donatelife.gov.au/national-performance-data).

Scientists are driven to look for new ways of supplying organs without requiring human donors. Some researchers are looking outside our own species for sources of organs in a procedure known as xenotransplantation ('xenos' comes from the ancient Greek, meaning 'foreigner'). Chimpanzee, baboon and pig organs have been transplanted in humans,

though few human recipients have survived more than a few months so far. Transplanting heart valves from pigs and cows has been successful.

Another possible solution is growing artificial organs in a lab. This may sound like science fiction, but artificial organ transplantation has already been performed. In 1999, artificial bladders were implanted in seven volunteer patients in the US. These bladders were created using the new science of tissue engineering – bladder cells were grown onto a bladder-shaped scaffold. By using cells from each patient's body, rejection was avoided and drugs weren't needed. The recipients are still alive and healthy today. Research continues on the creation of other artificial organs such as kidneys and livers through 3D printing.

– Cathal O'Connell

Cells, tissues, organs

- ▶ Cells are the basic structures making up your body. Your body has about 200 different cell types, each one with its own unique structure and job to perform. For example, the heart contains special muscle cells that never tire, and the eye contains retina cells that respond to light. Cells are so tiny they can only be seen with a microscope and there are about 30–40 trillion cells in your body. This number is so large it's hard to imagine – it means there are about 5000 cells in your body for every person on Earth!
- ▶ Tissues are groups of similar cells working together on the same job. For example, muscle tissue is made of bundles of muscle cells all pulling together like a team of rowers.
- ▶ Organs are the machines of the body and are made of groups of tissues. For example, the heart is the body's pump. It's made from cardiac muscle tissue and heart valve tissue.

The medical perspective – Q&A with nephrologist Toby Coates

Kidney specialist, expert in transplantation surgery and research at Royal Adelaide Hospital, and Professor of Medicine at the University of Adelaide, Toby Coates talks about organ and tissue transplantations at the frontiers of medicine.

Organ and tissue donation in hospital

People who are critically ill in the hospital are under constant observation by the specialist medical and nursing teams caring for them and are closely monitored for changes in their condition.

There are a number of physical changes that take place when the brain dies. These include loss of pupillary reaction to light, inability to breathe without the ventilator, and reduced heart rate, blood pressure and body temperature. When the medical team observes these changes they will perform clinical brain death testing to confirm whether the brain has stopped functioning or not.

Two senior doctors will independently conduct the same set of clinical tests at the bedside. The doctors performing the brain death testing will be looking to see if the person has any responses to a range of stimuli. If a person shows no response to all of these tests, it means that their brain has stopped functioning and the person has died.

The allocation of organs and tissues is determined by transplant teams in accordance with national protocols. These are based on a number of criteria, including waiting lists and who will be the best match, to ensure the best possible outcome of the donation.

How is transportation of organs and tissue from the donor to the recipient organised?

It depends on how many organs are being retrieved. Some organs are offered nationally. It's often required that a team of surgeons will have to fly in from Sydney or Melbourne or Perth, to collect the heart, or the lungs, for example. There is a lot of coordination done through an organisation called DonatLife.

Different organs have different times they can be out of the body. As an approximate example, the kidney, once removed, can last 24 hours, but the heart needs to be transplanted in 6 hours. Often the organ donor will go to theatre at a very early time in the morning to enable us to get the organs out and to get them into recipients in a reasonable time. That has to fit with commercial flights and everything. The logistics are very, very major.

What is tissue rejection and how do we avoid that?

Tissue rejection typically happens within the first week to two weeks. We can usually diagnose that by a biopsy and we can prevent it by using immune suppression, so different types of drugs. For the kidney, the average rejection rate, even with the best drugs, is about 14%. If we get rejection we change the drugs or we increase the dose of the drugs in order to overcome that rejection. It's true today that forms of rejection are treatable and we really don't lose organs anymore from early acute rejection.

Rejection is the body doing something to fight off an invader. It's a natural process. We have to overcome what is there to protect us, so it's not surprising that occasionally we have to use stronger drugs or different drugs.

What are the side effects of this suppression of the immune response?

The major side effects in the long term are an increased risk of infection, an increased risk of malignancy, and an increased risk of cardiovascular disease. They are the three main things that immunosuppression causes. But that has to be balanced with the fact that these are life-saving treatments that improve the quality and length of life for the individuals. The benefits outweigh the side effects.

How do you expect organ or tissue transplantation will be different in 10 or 20 years?

I hope that in 10 years time that we will be using cells to suppress the immune system, rather than drugs. I hope that we will be also using protocols where we can modify the transplanted organs to resist rejection, through using genes. Importantly, I hope we will have further technology based around something called 'tolerance'. Tolerance is where we 'trick' the immune systems into seeing the organ as 'self' and so we don't get rejection. That's been the long-term goal of transplant scientists for many years. There are places in the world that can achieve that now, but with very toxic treatments.

The truth is, in the future we will have everything. At the moment, the best organ for a human is a human organ. But for some conditions, such as diabetes, animal organs, such as cells from the pancreas of pigs, could be used for transplant. Finally, there will be artificial organs. What we'll end up seeing is a hybrid, a mixture of everything.

There are about 8700 people on dialysis in Australia, of whom only about 1400 are listed for transplantation. If they're aged 71 or 72 we don't transplant them at the moment, but if we had enough organs we would. Those people will have a better future in the future. It's a good time to be alive!



PROFILE:
ASSOCIATE PROFESSOR
BERNADETTE RICHARDS

Deputy Director, Research Unit for the Study of Society, Law & Religion (RUSSLR), Adelaide Law School, The University of Adelaide

Associate Professor Bernadette Richards started her professional life as a high school drama and English teacher, but made a career change by heading back to university to study law. “Law was always something I was interested in, but I wasn’t ready to get into that field when I was young,” she says.

Today, her new career sees her untangling some of the thorniest ethical issues in medical practice, especially in relation to consent and surgical innovation. One of the most controversial questions in medical consent concerns organ and tissue donation, specifically: Who should get the final say on whether a deceased person donates organs or tissues?

A person can register their decision on the Australian Organ Donor Register, which is the only national register for organ and tissue donation for transplantation. You can specify the organ and tissues you agree to donate when you register your decision.

It is important that you discuss your donation decision with your next of kin, and to ask and know their donation decision. This is because in Australia the family will always be asked to confirm the donation decision of the deceased before donation for transplantation can proceed. However, it is important to

note that families can agree to donation even if the deceased’s donation wishes are unknown.

Sometimes families can have trouble letting go however we do know that families that have discussed and know each other’s donation decisions are much more likely to uphold those decisions.

“When a person is on an assisted ventilation device in a hospital, they are medically brain dead but still retain a lot of the other signs of life,” says Richards. “For example, they are warm to the touch, their blood is flowing, they’re breathing. If the family see the chest is rising and falling, it’s difficult to accept that it’s a machine doing that, and that the person really is deceased.”

The potential solutions to the organ and tissue donor shortage are no less controversial. One of the topics Richards has recently examined is xenotransplantation – the transplantation of animal organs into humans. Besides the fact that many people find it difficult to imagine having a part of an animal in them, there is the issue of the treatment of the animal.

“Pigs are inherently social beasts but to have a pig that is appropriate, they have to be kept separate and in sterile conditions. People say this is cruel to the pigs, using the pigs as a means to an end for humanity,” she says.

The creation of artificial organs in the lab may sidestep some of these ethical issues. People might be more willing to have an artificially created organ transplanted than an animal organ. Like any new medical technology, however, there are hurdles to overcome. “Someone’s always got to be first,” says Richards. “That’s a huge risk.”

None of these are straightforward questions, she says. In the classes she teaches, she discusses the issue of a mother donating her uterus to her daughter. Some of the students find it ethically troubling but are hard pressed to explain their standpoint.

“There are so many intangibles involved,” she says. “Students say ‘No, that’s just wrong’ but they can’t articulate why.”
 – *Cathal O’Connell*

In Australia the family will always be asked to confirm the donation decision of the deceased before donation for transplantation can proceed



WHAT'S IT ALL ABOUT?

Task 1

What do you know about organs, tissue, and organ and tissue donation?

Brainstorm your ideas around organ and tissue donation.

Activity 1 – Give one, Get one

Play ‘Give one Get one’ for organ and tissue donation. Write down all the facts about organ and tissue donation that you have seen, read, or heard. Write each fact in a separate square in the table provided. You can’t list the same fact twice.

Then, trade your ideas with others in the class, until all the squares in your table are filled (you give them a fact, and they give you one of their own in exchange).

Note: Facts that are common knowledge do not have high currency for swapping. Try to think of some things that might be less commonly known.

‘Give one, get one’ table

Activity 2 – Brainstorming organs

1. Split into small groups
2. In each group, find a volunteer who is happy to lie down on a large piece of paper, and trace the outside of their body with a thick texta.
3. Brainstorm in your group what you know about the organs that allow your body to function properly, where they are located, and what they do.
4. Using the outline of the human body you have just created, use different coloured textas to draw in the organs you remember, in the position you think they go. Label each organ with its name, and its main task (e.g. heart – pumps blood).
5. Come together as a class to compare and discuss each group’s work.

Task 2

What is organ and tissue donation?

Watch the online *DonatLife SA 2013 Scinamation* clip (riaus.org.au/all-programs/scinamations) and answer the following questions.

Part A – During the clip

While you are watching the clip, think about these questions:

- ▶ Has your family ever discussed organ and tissue donation? What do you think about it?

Part B – After the clip

After watching the clip, write your answers to these questions:

1. Can anyone who wants to donate their organs and tissue actually be a donor? Why/why not?

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2. Why do you think only a small proportion of people who die can become organ and tissue donors?

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3. An organ donor must be declared ‘brain dead’ before their organs and tissue can be taken. Why do you think the testing for brain death is so rigorous and thorough?

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4. How many people can one organ and tissue donor potentially donate to?

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6. Why is it important to talk to your family if you decide to become an organ and tissue donor when you die?

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7. How do you think you might feel if:

a) You needed a donated organ or tissue to stay alive, and a dying person was able to donate it to you?

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b) Someone close to you told you they had decided to be an organ and tissue donor?

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c) Someone in your family died and was able to transform the lives of 10 or more people by becoming an organ and tissue donor upon death?

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Part C – Your own thoughts

Write down at least three questions of your own about organ and tissue donation.

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Task 3

What is brain death?

Watch the clip on brain death below and answer the following questions.

www.youtube.com/watch?v=_khtPqAorU4



1. a) Write a sentence to explain your understanding of 'brain death'.

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- b) Draw and label a simple diagram to illustrate the parts of the brain involved.

2. How is the state of being brain dead different to being in a coma?

3. State at least two ways we can we find out if the brain has died.

4. a) Why might brain death be difficult to understand for a family member?

b) How does brain death relate to organ and tissue donation?

Task 4

Imagine that a 50-year-old man who is a potential heart donor in Australia has just been declared brain dead. A decision must now be made quickly about who will receive his heart. There are five candidates being considered for transplantation, whose blood type matches that of the donor.

Heart transplant candidates

- ▶ **Candidate 1:** A 40-year-old heart surgeon, who is well-known in the community. He has been on the waiting list for six months and is still in relatively good health.
- ▶ **Candidate 2:** A 63-year-old African who immigrated to Australia when she was a child, and who works as a cleaner in a neighbouring town. She has been on the waiting list for three years and is critically ill.
- ▶ **Candidate 3:** A five-year-old child who lives in the same state as the donor, and is likely to die if he does not get a heart in the next month or two.
- ▶ **Candidate 4:** A 50-year-old retired celebrity judge, who has offered to fund a new local hospital if she gets the heart. She has been on the waiting list for 2 years and is quite sick.
- ▶ **Candidate 5:** A 45-year-old nurse, who has been waiting for a heart for three years and is currently overseas doing things on his 'things to do before I die' list.

What to do:

1. In the table provided, fill in Part A only (you will do Part B later). Assess each of these candidates and rank them, to show the order in which you think they should be offered the heart that will give them a second chance at life.

	A. What are your initial thoughts on how donation would work?		B. Now that you have done some research and understand how the allocation process works, what do you think?	
Candidate number	Priority (rank)	Justification for rank	Priority (rank)	Justification for rank
1				
2				
3				
4				
5				

2. Which of the criteria below did you think were important and helped you decide on your rankings, and which were not important?

	Possible criteria for choosing organ recipient	Important (v)	Not important (x)
1	Where the recipient lives		
2	Gender		
3	Age		
4	How well the organs match (including size)		
5	Income		
6	Religion		
7	Whether the organ could be made available to the patient in time		
8	Race		
9	Status		
10	Time spent on the waiting list		
11	How urgent the transplant is		
12	Other (please specify)		

3. Now go online to research how organs are allocated to recipients in Australia. You can start here: www.donatelife.gov.au/discover/about-transplantation and www.donatelife.gov.au/discover/about-donation

4. Which criteria are used in considering potential organ and tissue transplant recipients:

a) In general?

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b) For the heart, lungs, liver and pancreas?

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5. With the new information you have after doing some research, re-consider your rankings of the five candidates for heart transplant. Go back and fill in Part B of the table on page 14. Did your rankings change? Consider why it is important to be informed about a subject when forming ideas and opinions, and when making decisions.

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6. Suggest why it might sometimes be a difficult decision for a team of doctors to choose a recipient for a newly available organ.

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Science activities

Activities designed for a hands-on experience of organ and tissue donation science.

Subject	Year 8	Year 9
ITC 	<p>Activity 1 – Use an interactive website to explore the organs that can be transplanted.</p> <p>Activity 2 – Review an award-winning short film about organ transplantation.</p> <p>Activity 3 – Take an online quiz to find out how much you know about organ and tissue donation.</p>	
Biology 	<p>Activity 4 – Examine blood cells using a microscope.</p> <p>Activity 5 – Do a bone dissection.</p>	<p>Activity 6 – Do an eye dissection.</p>
Psychology 	<p>Activity 7 – Try your hand at tissue typing, and matching donors to recipients.</p> <p>Activity 8 – Do a kidney dissection.</p> <p>Activity 9 – Do a heart dissection.</p> <p>Activity 10 – Watch a ‘pluck’ demonstration.</p> <p>Activity 11 – Find out some attitudes to organ and tissue donation.</p> <p>Activity 12 – Investigate myths around organ and tissue donation.</p>	

Science activities

Activity 1 – Organs that can be transplanted

Go to the interactive website below and explore the kinds of organs that are used for organ transplant. Create a table to record information such as the name of the organ, a description of the organ, the disease or condition the organ transplant will treat, any difficulties with donation or transplant of this organ, any other interesting facts.

www.giveandletlive.co.uk/en/donation/donor_body/index.html

Name of organ	Description	Disease/condition	Possible difficulties	Other facts

Activity 2 – Film review

- You will be reviewing the short film that won 'Best Film' in the FilmLife Project 2013. Before you review the film, decide on three to five criteria you will judge it on (e.g. How engaging is the film? How much information does it convey?), and what you will score it out of (e.g. out of five or 10)?
- Draw up a table that shows:
 - ▶ your chosen criteria
 - ▶ the score you give for each of the criteria
 - ▶ a total score for the film
 (If you like, you can also include a short comment about the film)

List of criteria	Score	Comment
Total score		

- Go to www.donatelife.gov.au/videos and watch the film: *Somebody That I'll Never Know* (3:14).
- Review the video using your criteria.
- If you have time, you might like to also watch the winner of 'Best Use of Theme', *My Wish* (2:24), and any of the other film entries. Using your criteria, how do they compare to the winning film?

Activity 3 – Online organ and tissue donation quiz

1. Go to the following website and have a go at answering the 10 questions.
www.giveandletlive.co.uk/en/quizzesandgames/organsandtissuequiz/organquiz.html

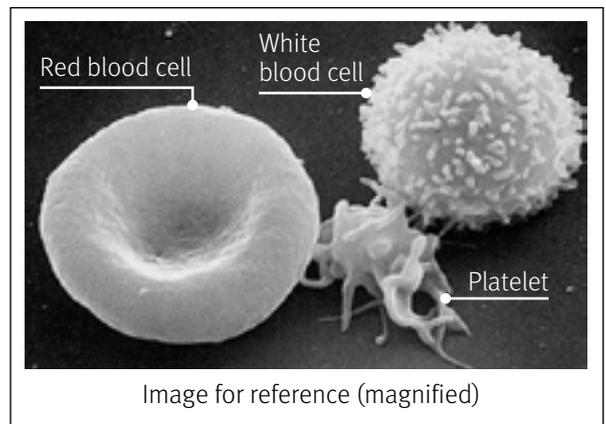
Activity 4 – Human blood cells

What you need:

- ▶ Human blood microscope slides
- ▶ Microscope with 10x and 40x objectives

What to do:

1. Familiarise yourself with how a microscope works.
2. Place a human blood slide on the stage and identify the different kinds of cells.
3. Make a scaled, pencil drawing of red blood cells, white blood cells and platelets.



Your drawing

4. Under which circumstances would someone require a blood transfusion? Refer to page 5 – The Basics.

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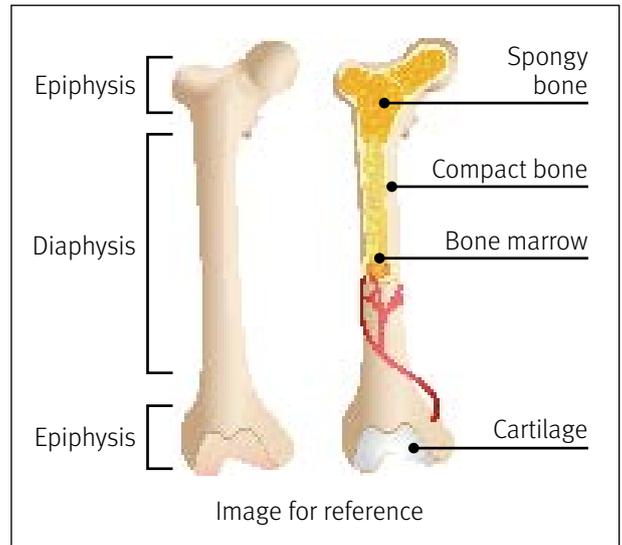
Activity 5 – Bone dissection

You will need for each group:

- ▶ One large, long bone cut in half lengthways, from the local butcher
- ▶ A miniature hammer
- ▶ Newspaper

What to do:

1. Place the bone on the newspaper and examine its internal structure.
2. Use the hammer to gently tap different parts of the bone to feel the hardness.
3. Make a scale drawing of the bone (use pencil).



123RF

Your drawing

4. Label the two epiphysis at either end of the bone, the diaphysis, spongy bone, compact bone, bone marrow and cartilage.
5. Annotate your diagram by describing what each part of the bone looks and feels like.
6. Which part(s) of the bone can be transplanted? Refer to page 5 – The Basics.

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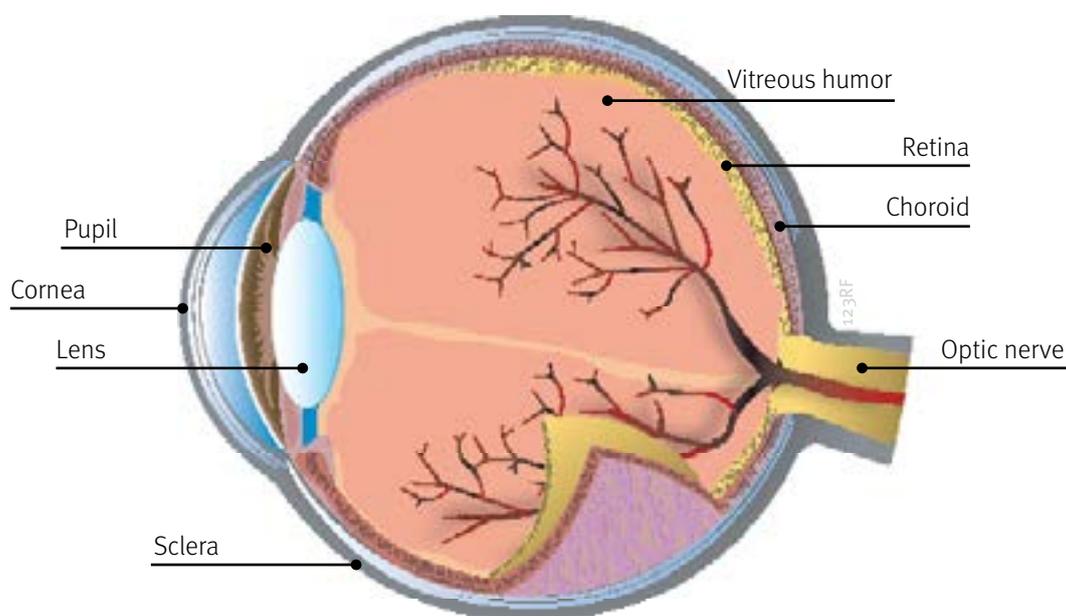
Activity 6 – Eye dissection

What you need:

- ▶ Dissecting board
- ▶ Dissecting scissors
- ▶ Scalpel
- ▶ Tweezers
- ▶ Animal's eye (such as from a cow)
- ▶ Rubber gloves
- ▶ Newspaper

What to do:

1. Place the eye on the newspaper. Observe the outer structure of the eye. Use the labelled diagram below to note the location of the cornea at the front of the eye. You might also be able to see the optic nerve at the back of the eye (this is where light energy is converted to an electrochemical message and sent to the brain).



2. Carefully use the scalpel to make an incision in the sclera (the tough outer layer) halfway between the cornea and the optic nerve.
3. Insert one edge of the scissors into the incision you have made and cut around the eyeball. The fluid that fills the eye is known as the vitreous humour.
4. Dissect out the cornea from the front of the eye. Describe its appearance.

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5. Additional activity:

Watch this online video of a man waiting for a cornea implant: www.giveandletlive.co.uk/en/realstories/video/video_brian.html
Why are corneas transplanted?

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Activity 7 – HLA tissue typing

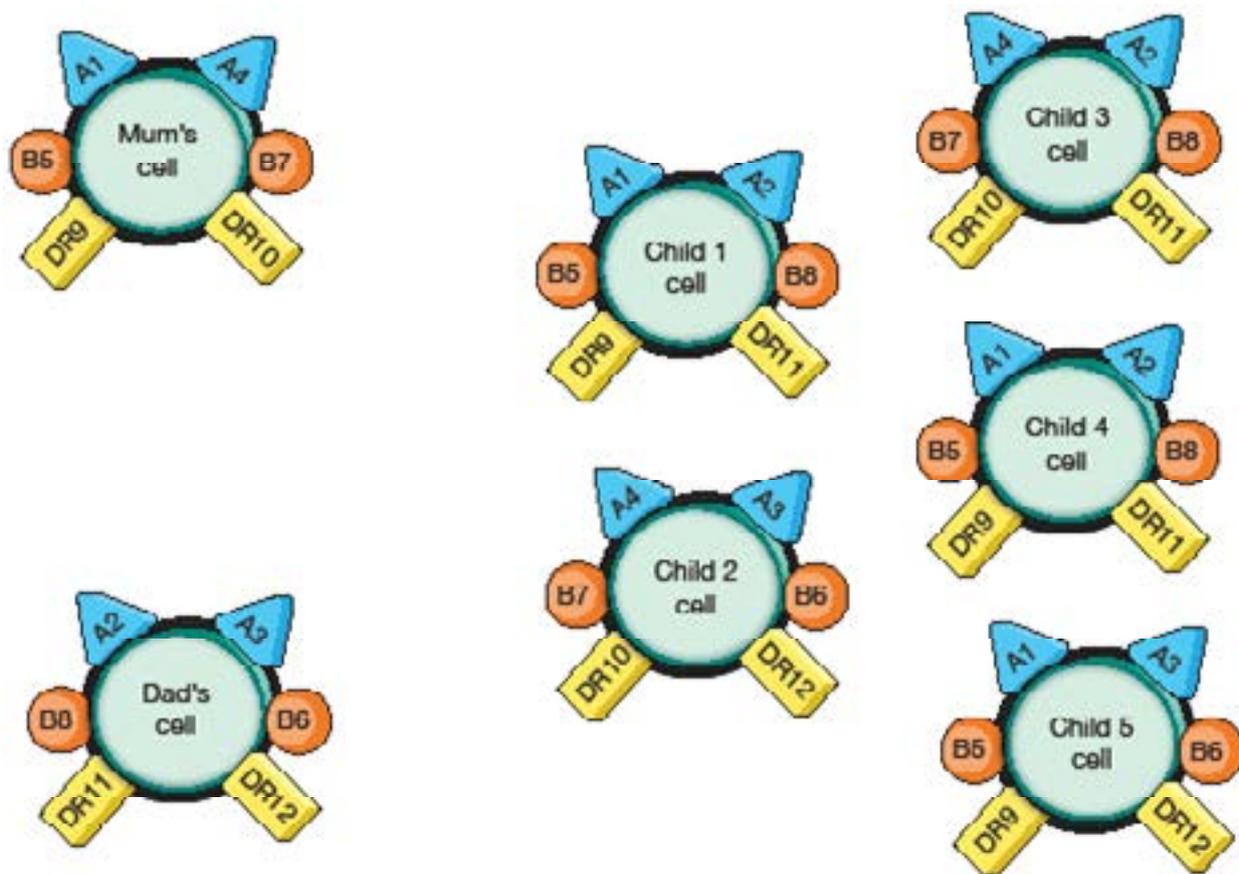
Background information:

When two people share all of the same HLA (Human Leukocyte Antigen) proteins on the surface of their cells, their tissues are compatible and they are said to be a 'tissue match'. Because HLAs are inherited, we can have similar HLAs as family members. However, total strangers, by chance, can also have HLA compatibility.

There are three general groups of HLA that are inherited as a set:

- ▶ HLA-A
- ▶ HLA-B
- ▶ HLA-DR

The following pedigree diagram includes two parents and their five children. The HLA proteins (two for each of the HLA groups) are shown for each family member.



1. Which family member would make the most suitable donor for Child 1? Explain why you chose this family member.

2. Why wouldn't any of the children be compatible donors for either of their parents?

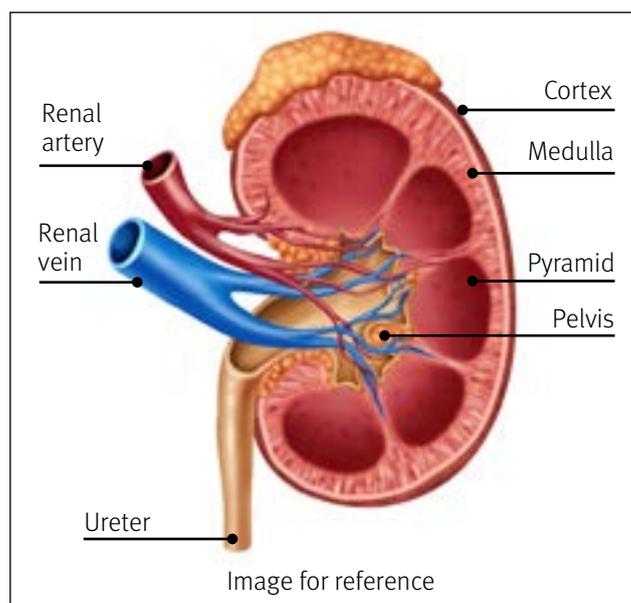
Activity 8 – Kidney dissection

What you need:

- ▶ Sheep or lamb kidney
- ▶ Dissecting needle
- ▶ Scalpel
- ▶ Tweezers
- ▶ Dissecting scissors
- ▶ Newspaper

What to do:

1. Place the kidney on the newspaper. Examine the whole kidney to note whether there are any vessels still attached. The concave part of the kidney should have three vessels attached to it: the ureter that takes the urine to the bladder; the renal artery that brings the blood; and the renal vein that takes the blood away.
2. Use the scalpel to cut the kidney in two equal halves lengthways.
3. You should see three distinct layers inside the kidney: the outer layer (cortex), the middle layer (medulla) and the white part near the middle (pelvis or pyramid).
4. Make a sketch of your cross-section, labelling the three layers, as well as the ureter, renal artery, and renal vein.



123RF

Your drawing

5. Why might people need a kidney transplant?

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6. Do both kidneys need to be transplanted? Why or why not?

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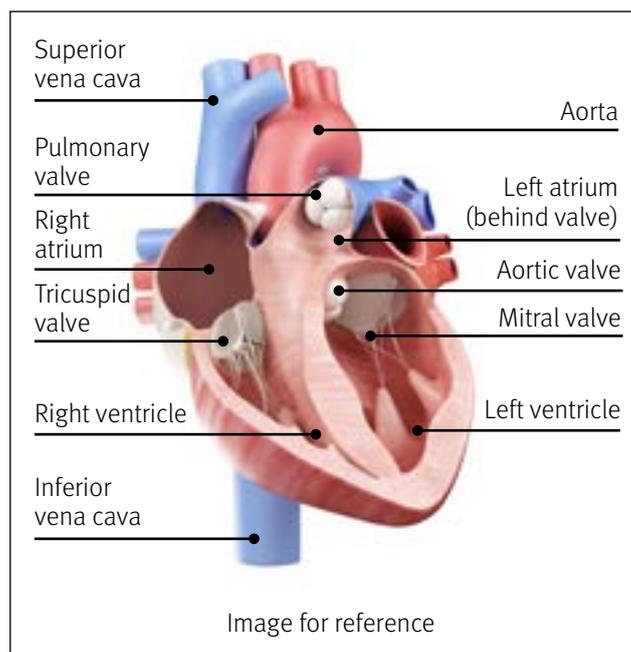
Activity 9 – Heart dissection

What you need:

- ▶ Sheep's heart
- ▶ Scalpel
- ▶ Dissecting scissors
- ▶ Newspaper

What to do:

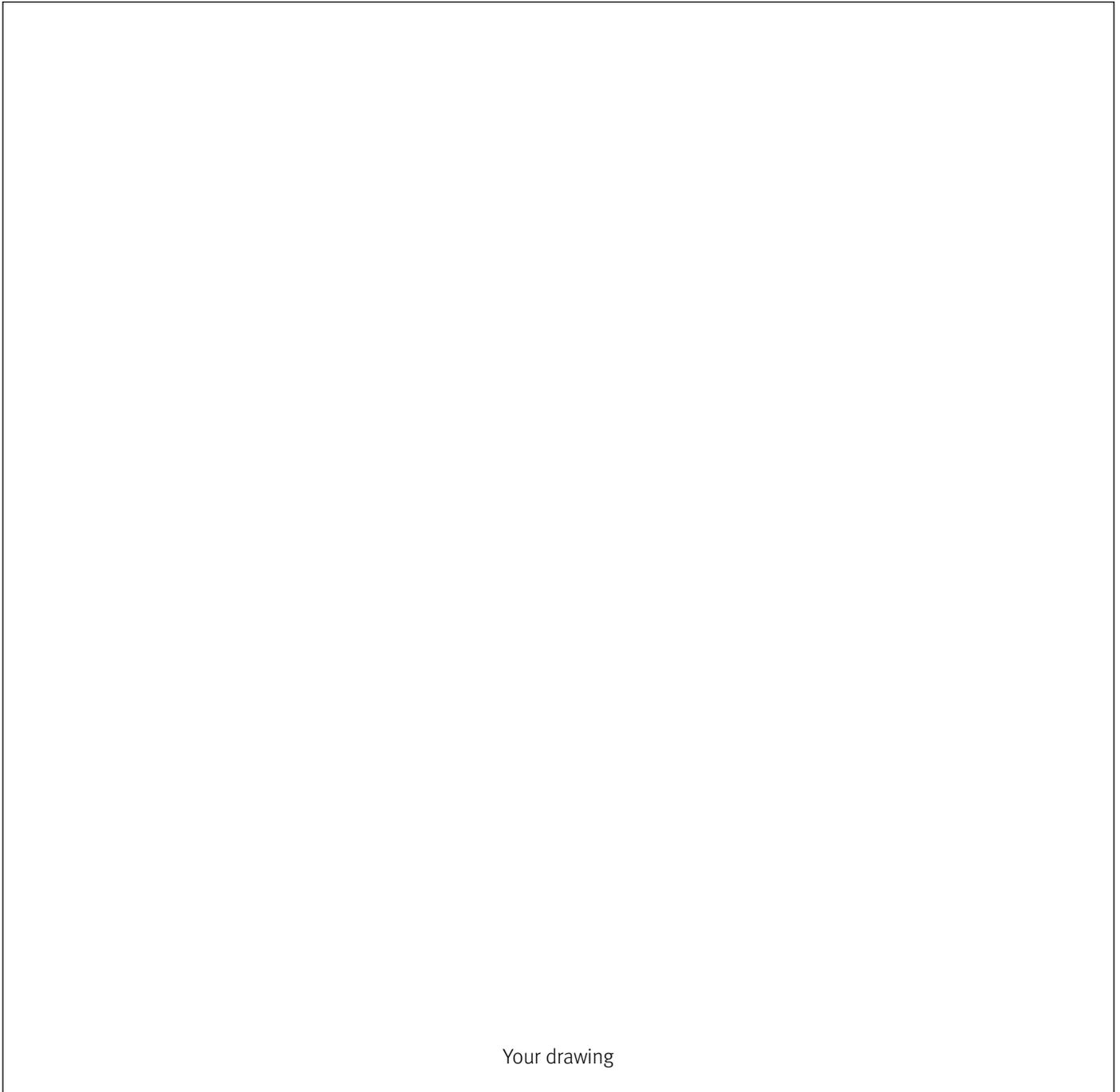
1. Examine the diagram of the heart provided so that you are familiar with the position of the left and right atria and ventricles as well as the aorta and the upper (superior) and lower (inferior) vena cava.
2. Place the newspaper on the bench and examine the whole heart before beginning the dissection.
3. Identify the arteries and veins coming out of the top of the heart.
4. Identify the left and right sides of the heart (the left side will feel firmer due to the thicker walls).
5. Make a drawing of the heart before you start to dissect it, and label as many parts as you can.



SHUTTERSTOCK

Your drawing

6. Cut open the heart and examine the stringy white valves between the atrium and ventricle on both sides of the heart. Use your finger to push in both directions on the valve to show how easy it is to go from the atrium to the ventricle, compared to the opposite direction.
7. Make a drawing of a heart valve.



Your drawing

Activity 10 – Pluck demonstration

What you need:

- ▶ Sheep pluck (heart, liver, lungs, diaphragm)
- ▶ Newspaper to place the pluck on
- ▶ Sterile plastic or rubber tubing
- ▶ Dissecting scissors

What to do:

1. Watch as your teacher demonstrates the pluck, and record your observations in the table below. You can also watch a demonstration of a pluck dissection at www.sciencedemo.org/2014/01/pluck-dissection

	Demonstration	Role in the body	Your observations (size, colour, texture, general appearance)
1	Identify the trachea, showing the rings of cartilage.		
2	Identify the lungs and feel how spongy they are.		
3	Identify the heart and note how firm the muscle tissue is.		
4	Identify the liver and its appearance.		
5	Watch as air is blown into one side of the lungs.		
6	Cut open the heart and locate the valves between the upper chamber (atrium) and lower chamber (ventricle).		

2. Which organs and parts of organs in the pluck can be transplanted?

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Activity 11 – Attitudes to organ and tissue donation

Find out what your family and friends think about organ and tissue donation by interviewing them.

Be sensitive to the fact that this activity raises the issue of death and dying. In particular, the emotions and needs of those who have personal or family experience with organ and tissue donation and/or transplantation need to be considered (and those who may require an organ transplant in the future due to an existing illness). You may encounter a range of ideas, some of which are different to your own, all of which you should respect.

1. Think of some questions (about six, no more than 10) you can ask your interviewees. Try to come up with questions that:
 - ▶ you think will generate interesting answers
 - ▶ will be thought-provoking, but not too confronting or intrusive
 - ▶ will allow people to express what they really think/feel about the topic, without feeling they are being judged in any way for their responses
 - ▶ are specific, rather than general (e.g. 'Would you be willing to donate your organs when you die?' rather than 'What do you think of organ and tissue donation?')
2. Create a template that lists your questions and leaves space to record the interviewees' responses.
3. Find at least three relatives and three friends who are willing to be interviewed, and arrange a time to sit with them and ask your questions.
4. Record the interviewees' answers as accurately as possible on your template.
5. Write a short summary of your experiences and the results you received. Were there any clear trends? Did the results surprise you in any way? Did they make you reconsider your own opinions about organ and tissue donation?

Activity 12 – Myths about organ and tissue donation

1. In the table provided, indicate which statements about organ and tissue donation you think are true and which are false.

Statement about organ and tissue donation	True? (tick)	False? (cross)
Organ and tissue donation is against most religions.		
Only healthy people can donate organs.		
Donation can't go ahead without the permission of the donor's family.		
If you donate organs, they could be used for medical research.		
Doctors are quicker to declare organ and tissue donors dead than non-donors, because the organs need to be transplanted in a very short time frame.		
There are more than 1000 Australians waiting for a donated organ at any given time.		
If you are older than 70, you are too old to donate your organs.		
People only need organs if they haven't looked after their own properly.		
Donating organs won't make a big difference to the way your body looks.		
You can choose which organs you want to donate when you register as a donor.		
If you donate organs, your family won't be able to view your body when you die.		
Organ and tissue donors must die in hospital.		
There is no need for more organ and tissue donors in Australia – we have as many as we need.		
When you register as an organ and tissue donor, any of your organs may be taken and used for transplantation.		

2. Read the fact sheet 'Myths and misconceptions about organ and tissue donation' at: www.donatelife.gov.au/fact-sheets
3. Take another look at the table you filled in above. Put a cross next to any statements you said were true that are actually myths. Put a tick next to any statements you said were myths that are actually true. How many myths were you able to bust by reading the fact sheets on myths and misconceptions?
4. Re-visit the 'Give one, Get one' activity you did at the beginning of this unit. If you included any 'facts' that you now know are incorrect, put a cross next to them.
5. Why do you think people believe myths about organ and tissue donation to be true? Is there anything you can think of that could be done to help dispel these myths?

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Basics of Rich Tasks

A Rich Task is a multifaceted, inquiry-based task that engages students in a variety of activities that are as closely related to real-life experiences as possible. Rich tasks are open ended, problem based, collaborative and experiential.

References and further instruction for Rich Tasks can be found at the following websites:

www.curriculum.edu.au/verve/_resources/Matters_edited.pdf

www.learningschool.wikispaces.com/What+is+a+Rich+Task

The Rich Task Blueprint

Mastery of a topic is sought through completing a series of tasks in sequence. Before the task commences, students discuss the various aspects and stages of their Rich Task and add their ideas to a Rich Task Blueprint. A template, or blueprint, is used to plan and make notes about the process taking place as the Rich Task is undertaken.

A pre-prepared Rich Task Blueprint has been provided for teachers and students new to Rich Tasks, which they can use as a map to guide them through the various aspects of the Rich Task (see page 32). Most sections of this blueprint have been filled out, however, there are some sections, such as ‘What will each group member do?’, that will need to be completed by the students themselves once they are in their working groups.

Alternatively, for teachers and students who would like to plan their own task from scratch, a blank template has been provided (see page 33).

The Rich Task Rubric

A marking rubric is included below for assessment purposes.

Criteria	3 marks	2 marks	1 mark
Organisation of activities around the central task	The whole project is focused around a set of questions that capture the essence of the task.	Most of the project is focused around a set of questions that capture the essence of the task.	The project regularly loses focus due to research questions that do not capture the essence of the task.
Group is engaged in an in-depth inquiry	Students are engaged in a rigorous process of questioning, researching and answering.	Students are engaged in a rigorous process of two of the following: questioning, researching and answering.	Students are engaged in a rigorous process of one of the following: questioning, researching and answering.
Revision and reflection	Students consistently use feedback productively to contribute to a high-quality product.	Students sometimes use feedback productively to contribute to a high-quality product.	Students occasionally use feedback productively to contribute to a high-quality product.
Develop 21st Century skills	Students build skills in critical thinking, problem-solving, collaboration and communication.	Students build skills in three of the following: critical thinking, problem solving, collaboration and communication.	Students build skills in two of the following: critical thinking, problem solving, collaboration and communication.
Voice and choice	Students make their own choices about the way they work and the product they create.	Students occasionally need extra guidance about the way they work and the product they create.	Students struggle to work independently and need continued guidance and motivation about the way they work and the product they create.
Final product	Product(s) of the Rich Task is high-quality, presented to more than one audience (e.g. peers, teachers, parents, experts), and represents the work of all team members.	Product(s) of the rich task demonstrates two of the following: is high-quality, presented to more than one audience (e.g. peers, teacher, parents, experts), and represents the work of all team members.	Product(s) of the rich task demonstrates one of the following: is high quality, presented to more than one audience (e.g. peers, teacher, parents, experts), and represents the work of all team members.
Total: /18			

Task Outline

As part of a team working for the United Nations, draw up a proposal for an international policy on organ and tissue donation. When creating this policy, consider a wide range of attitudes to organ and tissue donation, including cultural, religious, medical and personal perspectives.

What is a policy?

A policy is a statement of beliefs, goals, objectives, and recommendations on a specific subject area. Policies provide a set of guiding principles to help with decision-making.

Writing a policy proposal

A proposal is a plan put forward for consideration by others. A proposal should define a problem and describe a solution that will persuade readers to support it. Use the following headings to shape your policy proposal:

1. A summary of your policy

- You can write this in a few sentences when you have finished your policy proposal.

2. Background

- Why is this policy needed? Make specific reference to the need to create an international policy that can be used by all.
- What is wrong with previous policies? You will need to research policies in different countries and identify why they are not international policies.

3. An outline of the policy itself

- Provide an outline of the organ and tissue donation policies from a variety of perspectives – such as, different religious perspectives, a medical perspective, the perspective of patients on the transplant waiting list, and different cultural attitudes to organ and tissue donation – and suggest a proposal for a policy that can encompass as many different attitudes to organ and tissue donation as possible.
- Identify the benefits and drawbacks of your policy. Who will benefit, who will object?
- Suggest how the policy could be implemented. This includes ideas about how you would advertise or distribute the policy.

You can find out more about writing proposals here:

www.examples.yourdictionary.com/what-is-example-informal-written-proposal.html

Planning

A pre-prepared blueprint has been provided as a guide for you to map out the various aspects of the Rich Task and help you move your research forward (see page 32). Most sections of this blueprint have been filled out. Once you are in your working groups you will need to complete the ‘What will each group member do?’ section.

A questioning toolkit has also been included (page 31) to help you generate questions to help with your research.

GENERATING RESEARCH QUESTIONS

A good way to develop your thinking about your research is to ask questions using a ‘Questioning Toolkit’. This involves converting your task outline into an essential question, and then brainstorming other kinds of questions that you can use as a guide when researching and planning your project.

Type of question	Examples	Your questions to guide your research
<p>Essential These are the most important questions that are central to the area of study. They probe the deepest issues that confront us and can be difficult to answer.</p>	<p>What is organ and tissue donation and why is it needed? Where do donated organs come from? How is it decided who receives donated organs?</p>	
<p>Subsidiary These questions help us build answers to the essential questions. They are smaller questions that help provide insight.</p>	<p>What do people think about organ and tissue donation? What does science add to the debate? What do medical experts think about the ethical issues around consent? What do families think?</p>	
<p>Hypothetical Questions that are designed to explore the possibilities, the ‘what ifs?’ They are useful when we want to test our hunches.</p>	<p>What if a policy could be developed that would guarantee supply of organs for all those in need?</p>	
<p>Planning These are questions that you need to ask in order to work out how you are going to go about your research.</p>	<p>Where can I find the best information on organ and tissue donation policy?</p>	
<p>Organising These are questions that help us to structure what we need to do.</p>	<p>Shall I use a data table or a database to collect the information on organ and tissue donation and organ and tissue donation policy?</p>	
<p>Probing These are questions that get to the heart of the matter. You can explore your hunches with these questions.</p>	<p>Might an all-inclusive organ and tissue donation policy offend some people and organisations? How can we avoid this?</p>	
<p>Difficult These are the ultimate challenge. They serve as boundaries to tell us when we have reached the outer limits. When we wrestle with them we will only shine a light on them rather than answer them.</p>	<p>Why don’t people agree about organ and tissue donation issues?</p>	
<p>Provocative These questions are meant to push and challenge and throw conventional wisdom out the window.</p>	<p>Why don’t governments change the law so that it is compulsory to donate organs unless otherwise stated?</p>	

Inspired by Jamie McKenzie’s Questioning Toolkit – McKenzie, Jamie (2000) *Beyond Technology*, FNO Press, Bellingham, Washington, USA (www.fno.org/nov97/toolkit.html).

Task Outline

As part of a team working for the UN, draw up a proposal for an international policy on organ and tissue donation. When creating this policy, consider a wide range of attitudes to organ and tissue donation, including cultural, religious, medical and personal perspectives.

What types of references will you use?

- ▶ Videos
- ▶ Internet
- ▶ Talking to teacher
- ▶ Books
- ▶ Pamphlets
- ▶ Government documents and protocols

Your approach to the task

- ▶ Generate interesting research questions early on that will guide direction of research (see example, page 31)
- ▶ Collect information on multiple viewpoints
- ▶ Use references provided
- ▶ Identify trends and exceptions in data collected
- ▶ Summarise trends
- ▶ Report writing

As individuals

What will you research?

- ▶ Cultural perspectives
- ▶ Medical perspectives
- ▶ Personal perspectives
- ▶ Various religious perspectives

What will each group member do?

Each group member prepares a draft of the report layout such as listing sections that will be covered

Group selects one draft (can be a combined draft) to continue to work on

Group adds in images, research, data analysis, case studies, evidence

What is the purpose of the final product?

- ▶ To increase organ and tissue donation awareness
- ▶ To increase the number of donors
- ▶ To save lives of people who need donations

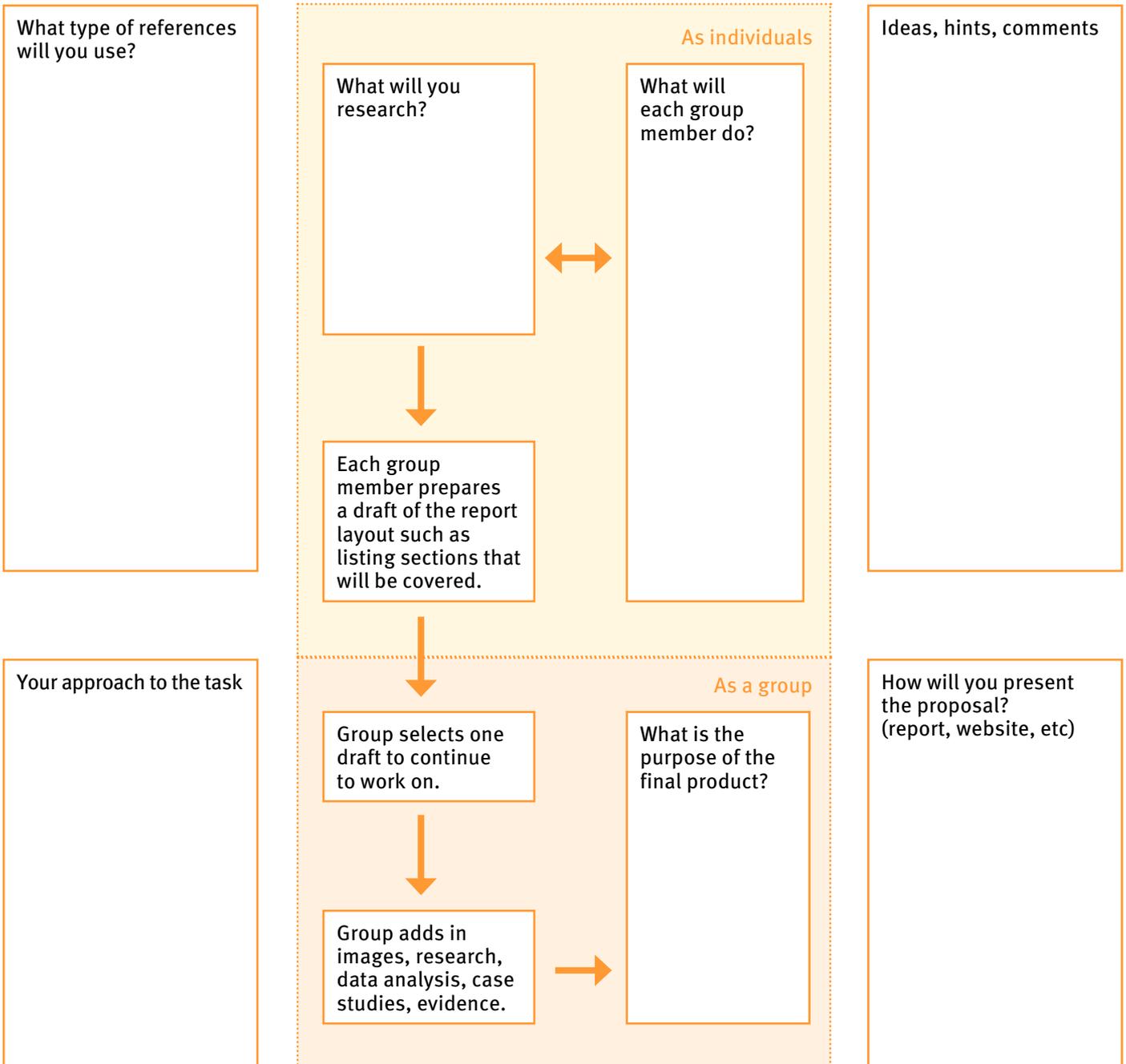
Ideas, hints, comments

- ▶ Complete a questioning toolkit to generate some useful questions to research
- ▶ Remember not to take a biased view of organ and tissue donation according to your own opinions
- ▶ You might find it easier to work on the big picture ideas related to organ and tissue donation policy before examining the details
- ▶ Use all the suggested material provided as a starting point
- ▶ Make sure each group member always has something to do

How will you present the proposal? (report, website, etc)

A report with a general proposal for all humanity that benefits the greatest number of people, with clauses to meet the needs of particular ethnic and religious groups

Task Outline



Student resources

Useful websites

DonateLife
www.donatelife.gov.au

The *Four Corners* story, 'A gracious gift', follows families through their decision to consent to organ and tissue donation
www.abc.net.au/4corners/stories/2013/04/08/3729893.htm

Videos

When are you dead? Brain death and organ donation – Medical perspective
www.youtube.com/watch?v=YaxBEUzJB7k

When are you dead? Brain death and organ donation – Legal issues
www.youtube.com/watch?v=pqQ1OkQwu9U

When are you dead? Brain death and organ donation – A recipient's experience
www.youtube.com/watch?v=dXVP3R5ULQc

When are you dead? Brain death and organ donation – Myth busting
www.youtube.com/watch?v=s8oHGtHFWAU

When are you dead? Brain death and organ donation – Audience Q&A
www.youtube.com/watch?v=Cx18GbaAj34

No one is immune: the reality of organ and tissue donation (part 1)
www.youtube.com/watch?v=crAraV8NYN4

No one is immune: the reality of organ and tissue donation (part 2)
www.youtube.com/watch?v=G1liXpGU2IU

No one is immune: the reality of organ and tissue donation (part 3)
www.youtube.com/watch?v=uOlBQ4Bp4PM

No one is immune: the reality of organ and tissue donation (part 4)
www.youtube.com/watch?v=zPXyKGp_8AQ

Review donor stories

Search for the stories 'Neville would have given his last cent' and 'Tinni's Story' at www.donatelife.gov.au/read-book-life

Recent reports and articles

Read the interview with Associate Professor Toby Coates, renal transplant nephrologist at the Central Northern Adelaide Renal and Transplantation Service, and consultant to the National Transplantation Service for Tissue Typing (page 7)

Other resources

PDplus on Regenerative Medicine
riaus.org.au/events/riaus-pdplus-regenerative-medicine

Complete these reflection tasks to summarise your thinking and learning related to organ and tissue donation

- 1. How has this unit of work helped you better understand the subject of organ and tissue donation? What do you know now that you didn't know in the beginning? Think about the knowledge you gained and the skills you developed. Write the things you learnt on each step.



2. What is your attitude to organ and tissue donation, now that you have completed this unit of work? What are your values and beliefs about organ and tissue donation, and how do you think these will be reflected in your attitude and behaviour from now on?



Additional DonateLife Resources

Further resources for teachers on organ and tissue donation for years 8-9 students, including *The Last Race* (30 minute Australian film), are available from the DonateLife website. Fact sheets, videos and the DonateLife Book of Life are also available here: www.donatelife.gov.au/get-involved