Our Human Body

Classroom Activities

The classroom activities are designed to stimulate students’ curiosity for the visit and assist them in understanding and interpreting the exhibitions they see. They also allow follow-up of students’ experiences in The Human Body exhibition in the Mind and Body Gallery. The activities outlined in the following pages are provided to support integrated units of work, based on certain VELS and VCE recommendations.

The classroom activities contained in this section include:

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Activity 2: Mapping the human body
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Activity 1: Human body parts

Work in teams (Interpersonal relationships) to cooperate with others and increase scientific vocabulary. Identify and describe the major human organs and body parts and identify how these features operate together to form systems which support human survival (Science - knowledge and understanding). Collect information and images from a range of sources to inform your drawings and vocabulary for this activity (Thinking processes - reasoning, processing and inquiry). Apply creative ideas in practical ways and test the possibilities of ideas they generate. Use open-ended questioning and integrate available information to explore ideas (Thinking Processes – Creativity).

What to do:
Refer to Activity 1 Worksheet: Human body parts (p151) and Activity 2 Worksheet: Human body outline (p152).

Answers to crossword:
Across: (2) bone, (3) stomach, (4) spine, (5) kidneys, (7) heart, (9) muscles. Down: (1) intestines, (2) brain, (6) lungs, (8) ribs.

Activity 2: Mapping the human body

Apply the terms models and systems appropriately to anatomical structures of human body organs and systems and identify and explain the connection between systems in the human body and their various functions (Science - Knowledge and understanding). Design and build simple models of the body organs and systems and explain the essential science behind the model (Science at work). Work effectively and cooperatively in teams to allocate and complete tasks and accept responsibility for individual tasks, within set timelines. Develop questions for investigation, collect relevant information from a range of sources and use information collected to develop concepts (Thinking Processes – Reasoning, processing and inquiry). Use books, CD Roms and the internet, with recommended search engines to locate information quickly (ICT for communicating). Ask clarifying questions about ideas and information discussed and found and develop interpretations about the workings of body systems and provide reasons about their importance for human survival (Communication – Listening, viewing and responding). Demonstrate creativity in thinking (Thinking Processes – Creativity). Document changes in ideas and beliefs over time (Thinking Processes – Reflection, evaluation and metacognition).

What you need:
Access to a box of age appropriate books about the human body or access to a library or access to the world wide web and a list of relevant websites, large poster paper, craft materials – tape, coloured paper, card, colouring pencils or textas etc.

What to do:
This activity can be modified for different age groups depending on the age-related focus.

Part 1: Brainstorm with the class the different body parts that make up the human body. Younger groups may focus on discrete body parts (bones, lungs, heart etc) and older groups may focus on the organ and tissue systems. As the body parts are suggested, discuss what function these body parts might have in the body. Record the responses on the board or poster at the front of the class.

Part 2: Divide the class into groups that will each focus on a different body part, or body system. In these groups students will look at a selection of books provided for the class, use the library to do research, or search a number of reference websites to find out information about the body parts that the group is studying. Each member of the group should draw sketches of the body part and record some important information about the role that it performs to keep humans alive. The teacher will need to communicate with students about the amount of time dedicated to this part of the activity.

Part 3: Trace the outline of one person from each group onto a large piece of poster page. Alternatively use an A3 copy of the Activity 2 Worksheet: Human body outline that is provided (p33). Each group should construct a model, from different craft materials, of their body part or system and attach it to the body outline. Older students might be encouraged to make some parts of their model 3-dimensional, or have moving parts to represent how the organ or body part works. However, make sure the model does not become too heavy.
to hang on the poster. After they attach the model to the poster, they should use the information that they have recorded from Part 2 to write labels, and an explanation of how that body part works, around the outside of the body outline. The posters should be hung around the room.

**Part 4:** Using their model-poster as a prop each group should prepare a short presentation about their body part or system, and give this presentation to the rest of the class. Some time should be spent with the class, developing the criteria for the preparation and evaluation of the presentations.

*A criteria could include, each member of the team to:*
1. Research different sources to find accurate information about body parts and record it.
2. Design and make a creative and informative representation of the body parts and relevant system, using various sources of information and resources as inspiration;
3. Clearly communicate factual information using appropriate vocabulary, about the body system and answer questions from other class members, during the presentation
4. Demonstrate preferred learning styles and the strategies used that promoted individual learning

During the presentation each group of students should be encouraged to write down one question for the presenting group about their body part or system, to ask the presenter at the end of the presentation. The teacher should use the question-answer time to guide and clarify, build upon or modify some of the ideas that were suggested during the brainstorm during part 1.

**Activity 3: Getting to the guts of it**

**Level 3:** Develop a step by step understanding of the movement and digestion of food from the beginning to the end of the digestive tract. Identify and describe the major human organs and body parts and identify how these features operate together to form systems which support human survival (*Science - knowledge and understanding*). Plan, design, conduct and report collaboratively on experiments related to their questions. Select and use simple measuring equipment, record observations, and comment on trends (*Science at work*). Use open-ended questioning and integrate available information to explore ideas (*Thinking Processes – Creativity*). Work in teams (*Interpersonal relationships*), use appropriate language to explain thinking, identify and provide reasons for a point of view, and justify changes in thinking (*Thinking Processes - Reflection, evaluation and metacognition*).

**Level 4:** Illustrate the transforming and transferring of energy – using examples of the human digestive system and energy. Apply the terms *models* and *systems* appropriately to anatomical structures and body systems - circulatory, digestive and skeletal. Identify and explain the connection between systems in the human body and their various functions (*Science - knowledge and understanding*). Use diagrams and symbols to explain procedures (*Science at work*). Use information collected to develop concepts, solve problems or inform decision making. Develop reasoned arguments using supporting evidence (*Thinking Processes - Reasoning, processing and inquiry*). Work in teams (*Interpersonal relationships*). Demonstrate creativity in thinking in a range of contexts and test the possibilities of concrete and abstract ideas generated (*Thinking Processes – Creativity*). Articulate thinking processes and document changes in ideas and beliefs over time. (*Thinking Processes - Reflection, evaluation and metacognition*).

**What you need:**
Apple, small piece of red meat, white processed bread, coca cola, flour, oil, loose tea leaves, pancreatic enzymes (from health food store), chopping board, knife, meat tenderiser, plastic cups, funnel, balloons, detergent, sieve, paper towel, long stocking or material tube, smooth plastic ball.

**What to do:**
Refer to *Activity 3 Worksheet: Getting to the guts of it (pp153-155).*
Activity 1 Worksheet
Human body parts

What to do:
Work in a small group for this activity.

Use books and the internet to find some information and pictures about important *Human body parts* and organs, so that you can complete the following crossword.

Use the pictures that you find to help you draw the body parts onto the *Human body outline* that you are given.

Across

2. I am a very hard substance that makes up your skeleton.
3. I mix up and break down your food after you chew and swallow it.
4. I support your body and keep it tall and straight. I also protect your spinal cord.
5. We filter your blood and keep it nice and clean.
7. I pump blood around your body.
9. When we move, you move too.

Down

1. I am a long tube that lets very, very tiny food pieces move across my wall and into the body. The left-over food continues through me and is expelled out of the end as waste.
2. I am needed so that you can think and remember things.
6. We take the air that you breathe into us and put it into the body.
8. We are hard and thin and we protect your important body parts inside your chest.
Activity 2 Worksheet
Human body outline
Activity 3 Worksheet
Getting to the guts of it

The Munching Mouth

Chew your Food:
Chewing flattens out your food and grinds it into lots of small pieces. Chewing also mixes food with spit so that it slides down your throat and into your stomach easily.

Use a knife to cut a small piece of apple into pieces. Do the same thing with a small piece of meat.

Q. Which of your teeth do this when you are eating food?

- Bash the apple pieces with a meat tenderiser on a chopping board (or use a mortar and pestle). See if you can flatten it out or break it into smaller pieces. Do the same thing with the piece of meat

Q. Which of your teeth do this job?

Mixing with Saliva:
Saliva is the scientific name for spit. In saliva there are special chemicals that break down food, such as bread, potatoes and rice, into very tiny pieces. As the pieces get smaller and smaller they taste sweeter and sweeter.

Put a piece of white bread on your tongue.

Q. Record the sweetness that you can taste. (use a scale of 0-4 ticks: 4 being very sweet)
1) Before you chew
2) After 5 chews
3) After 15 chews
4) After 30 chews

Try to swallow some dry bread without chewing.

Q. Is it easy?

Let the bread soak in your mouth for 1 minute and swallow it.

Q. Is it harder, or easier?

The Mixing and Mushing Stomach

Acid attack:
Your stomach mixes the mushed up food with strong acid and breaks down food such as meat, eggs and nuts.

Tie the piece of meat that you bashed with the tenderiser to a piece of string (20cm) and suspend it in half a glass of coke (acid).

Q. Check the meat every over a period of a few days and write down what you see.
Squish and Squeeze:
Muscles in your stomach squeeze and mush up the food with the acid juices until it all looks like smooth porridge. This smooth mashed up food is called chyme and it is ready to pass through a small valve at the bottom of your stomach, into the small intestines.

Use a funnel to fill a balloon with flour. Slowly add small amounts of water and knead the outside of the balloon until the flour and water are mixed well. You can make several of these balloons with different consistencies to represent the stomach contents as they change over time. The smoothest one resembles the consistency of chyme that passes into the small intestines.

Q. What does the stomach look like? Draw it below.

Q. Colour in and label the stomach in the picture above

Long Skinny Guts (Small Intestines)

Getting the goodness out of food:
Different chemicals are squirted into the small intestines and mixed into the mushed up food. They break the food into smaller pieces and extract the nutrients out of it so they can move into the body.

Put ¼ of a cup of warm water into three different glasses with and add 1 or 2 tablets of pancreatic enzymes (from a health food shop). Put some bread into one glass, some mashed meat into the second, and a tablespoon of oil into the third. Observe what happens to these foods over several days. Make sure they are stored in a warm place.

Q. Describe what you see. What do you think the enzymes do?

Fatty Food:
The small intestines squirt another chemical that acts like detergent, into the food mixture. This chemical is called bile and it breaks down the fat into tiny bits.

Put a teaspoon of oil into ½ a cup of warm water. Q. What do you notice?

Gently stir the mixture with an icy pole stick.

Q. Describe what you see

1. immediately.
2. after 1 minute.
3. after 5 minutes

Add ¼ teaspoon of dishwashing detergent to the mixture and stir it in.

Q. Describe what you see

1. immediately.
2. after 1 minute.
3. after 5 minute.

Holey guts:
There are tiny holes in the walls of the small intestine that let tiny food pieces move across the digestive tube into the blood vessels that are very close on the other side. In this way the digestive tube is like a sieve that lets small particles through but not the big ones. The big food particles remain trapped inside the digestive tube.
Make a cup of tea with loose tea leaves and pour it through a tea sieve into another cup.

(Food particles in the small intestine are much smaller than tea leaves and the holes in the gut are also much smaller but the nutrients pass through the small intestine wall in much the same way as tea through a sieve).

Q. Describe what you see.

Q. Colour in and label the small intestine in the picture on the first page of this activity.

Short Fat Guts (Large Intestines)

_Drying out:_
The large intestine is where the juices and water are removed from the waste food and sucked back into the body.

Wrap some wet tea leaves into layers of paper towel (or a sponge). Let the leaves sit on the paper towel for a few minutes.

Q. What happens to the liquid around the tea leaves?

Q. Colour in and label the large intestine in the picture on the first page of this activity.

_Moving Muscles:_
The long tubular intestines are surrounded by muscles. These muscles squeeze the tube in a regular rhythm and force food along the digestive tract.

Two students should hold each end of a long stocking. Put a small smooth ball into one end of it and move the ball along with a hand-over-hand action. You may like to do this in teams and have a race.

_Smelly business:_
Faeces is a scientific name for pooh. Pooh is the left over food with most of the nutrients taken out of it. It is forced out the end of the large intestine, through the anus, and ends up in the toilet.

Find out what happens to pooh when it is flushed down the toilet.

_You could visit the Australia Gallery, at Melbourne Museum, and investigate the interactive Sewer tour; or visit the Scienceworks Pumping Station to find out how sewage is processed and returned to the environment._
Activity 4: Make a lung

**Level 3:** Make a model of a lung to discover the relationship between the action of the diaphragm and the movement of air into and out of the lungs. Identify and describe the major organs of the respiratory system and identify how these features operate together as a system to support human survival (*Science - knowledge and understanding*). Record observations, and comment on trends (*Science at work*). Apply thinking strategies to organise information and concepts in a variety of contexts, including problem solving activities. Provide reasons for conclusions (*Thinking Processes - Reasoning, processing and inquiry*). Use open-ended questioning and integrate available information to explore ideas (*Thinking Processes - Creativity*). Use appropriate language to explain thinking, identify and provide reasons for a point of view, and justify changes in thinking (*Thinking Processes - Reflection, evaluation and metacognition*).

**Level 4:** Make a model of a lung to discover the relationship between the action of the diaphragm and the movement of air into and out of the lungs. Apply the terms *models* and *systems* appropriately to anatomical structures of the respiratory system. Identify and explain the connection between the respiratory system and other systems of the human body and their various functions (*Science - knowledge and understanding*). Use diagrams and symbols to explain procedures (*Science at work*). Ask clarifying questions about ideas and information listened to and viewed. Develop interpretations about observations and provide reasons for them (*Communication - Listening, viewing and responding*).

**What you need:**
Plastic bottles with a narrow opening at the top (large soft drink bottle), supermarket shopping bags, masking tape, scissors, saucers with bubble mixture – water and strong detergent (Supervision will be required to cut out the bottom of the plastic bottles).

**What to do:**
Cut the bottom out of a plastic bottle and tape a large plastic bag around this hole. Make sure that there are no leaks from this end of the bottle. Blow into the top of the bottle until the bag at the end is fully blown up. This is your model lung. Hold the top of the bottle very close to your cheek so that the flow of air may be felt moving in or out of the model lung.

Imagine that your hand is the muscular diaphragm below the lung and gentle push on the blown up bag.

Q. What happens to the air in the model lung?

Keep the opening near your face and pull the bag outwards slowly.

Q. What happens to the air in the model lung?

Blow the bag up again. This time, dip the top of the bottle into a thin bowl of water with detergent so that a flat bubble forms over the opening. Slowly push the bag towards the bottle and then away from it.

Q. What happens to the bubble?

Activity 5: Lung volume

**Level 3:** Use simple experiments to discover that lungs can hold a certain volume of air (lung capacity). Identify and describe the major organs of the respiratory system and identify how these features operate together as a system to support human survival (*Science - knowledge and understanding*). Record observations, and comment on trends (*Science at work*). Apply thinking strategies to organise information and concepts in a variety of contexts, including problem solving activities. Provide reasons for conclusions (*Thinking Processes - Reasoning, processing and inquiry*).

**Level 4:** Use simple experiments to discover that lungs can hold a certain volume of air (lung capacity). Apply the terms *models* and *systems* appropriately to anatomical structures of the respiratory system. Identify and explain how the respiratory system works with other systems of the human body (*Science - knowledge and understanding*). Use diagrams and symbols to explain procedures (*Science at work*). Ask clarifying questions about ideas and information listened to and viewed. Develop interpretations about observations and provide reasons for them (*Communication - Listening, viewing and responding*).
What you need:
Two large buckets or troughs (approximately 10 litres and preferably with volume measurements on the inside), a black waterproof marker pen, access to water and enough balloons so that each student in the class has one.

What to do:
If at least one of the buckets does not have volume measurements indicated on the inside, use the permanent marker pen to accurately mark the inside of the bucket at 0.5 litre increments. You may even choose to make the increments smaller as you move closer to the top of the bucket. Each student is given one balloon to exhale into. They should practice blowing the balloon up a few times before they do the final test exhale. This should loosen the balloon and make it easier to blow into it when they do the lung volume test.

To test the lung capacity each student should take a deep breath and exhale one long and complete breath into the balloon, then pinch off the balloon so that no air escapes. Tie the balloon. This is the maximum amount of air that fits in each student’s lungs at rest. Each student can measure their lung volume by holding their balloon at the bottom of the bucket that has the measurements on the inside. Another student should gently pour water over the balloon until it has just covered the top of it. Have the students’ record as accurately as they can the volume that the water comes up to in the bucket. Then let them take the balloon out and record the volume once again.

The lung capacity is the first volume minus the second volume.

You may choose to extend this activity and have the students do some strenuous exercise for a few minutes – perhaps run around a small oval or do a minute of high impact star jumps. Have the students repeat the activity above quickly. Students will discover that lung capacity increases slightly after exercise as the small airways deep inside the lungs open up to ensure that the body receives the additional oxygen that it needs to make energy during exercise.

Activity 6: Breathing in, breathing out

**Level 3:** Discover how oxygen flows into our lungs during inhalation, how it moves across the tiny lung cells that make up the air sacs to oxygenate the blood. Identify and describe the major organs of the respiratory system and identify how these features operate together as a system to support human survival (Science - knowledge and understanding).

**Level 4:** Discover how oxygen flows into our lungs during inhalation, how it moves across the tiny lung cells that make up the air sacs to oxygenate the blood. Apply the terms *models* and *systems* appropriately to anatomical structures of the respiratory system. Identify and explain how the respiratory system works with other systems of the human body (Science - knowledge and understanding). Use diagrams and symbols to explain procedures (Science at work). Ask clarifying questions about ideas and information listened to and viewed. Develop interpretations about observations and provide reasons for them (Communication - Listening, viewing and responding).

What to do:
Refer to Activity 6 Worksheet: Breathing in, breathing out (p158).
Activity 6 Worksheet
Breathing in, breathing out

When we breathe in, our muscular diaphragm contracts and pulls downward toward our stomach. This causes our lung space to get bigger and air is sucked down into our lungs. When our diaphragm relaxes again it expands and curves upward toward our lungs. This forces our lung space to shrink and air is forced out of our lungs.

Draw the large muscle, called the diaphragm, onto the two diagrams below. Draw a dotted line over the lungs to show what happens to them when the diaphragm moves down during inhalation and up during exhalation.

Oxygen moves across the wall of the air sacs (alveoli) into the blood. It moves into red blood cells and is carried to cells throughout the body. At the same time, carbon dioxide gas moves out of the blood vessels around the lungs, into the air sacs is breathed out.

The following diagrams are of an air tube (bronchiole) and the air sacs (alveoli) at the end of them that make up our lungs.

Label the following parts onto the diagram - arteries, veins and capillaries, bronchioles and alveoli.

Describe how blood gets into our blood from our lungs.
Activity 7: Our circulation: the round trip

Apply the terms models and systems appropriately to anatomical structures of the circulatory system. Identify and explain the function of the circulatory system and the connection between the other systems in the human body (Science - knowledge and understanding). Ask clarifying questions about ideas and information listened to and viewed. Develop interpretations about observations and provide reasons for them (Communication - Listening, viewing and responding).

What to do:
Refer to Activity 7 Worksheet: Our circulation: the round trip (pp160-161).

Answers to word find.

Our cells demand nutrients and oxygen constantly.

The watery part of blood is called plasma and it carries dissolved nutrients and cell wastes.

Suspended in the plasma are billions of blood cells.

Most of the cells are red blood cells. Oxygen attaches to a chemical called haemoglobin that is inside red blood cells. It is delivered to the different cells and tissues of the body. Some cells are white blood cells, which attack intruders (such as bacteria), or sick cells (such as cancer).

Two and a half litres of blood is pumped through our heart every minute. Blood travels away from the heart in arteries, which carry the blood to the different tissues of the body. Blood travels back to the heart in veins. Capillaries are the smallest of all blood vessels. They have extremely thin walls and are only one cell wide. Capillaries off-load nutrients and oxygen into cells and pick up wastes such as carbon-dioxide. Most of these wastes are removed from our blood by our kidneys which make urine by filtering the wastes out of our blood. In one day, our kidneys will filter 1500 litres of blood to produce 1.5 litres of urine.

The secret message about our circulatory system is:

2 million new red blood cells are made each second.

Activity 8: Jig-saw skeleton
Activity 9: The body’s bony frame
Activity 10: Muscles mean movement

Level 3: Describe the major bones that make up the human skeleton and identify how muscles and the bony joints allow us to move in certain ways. Describe how the bones, muscles and joints work together as a system which supports human survival (Science - knowledge and understanding). Work in teams (Interpersonal relationships) to collect information from a range of sources to answer questions and question the validity of sources (Thinking Processes - Reasoning, processing and inquiry). Apply creative ideas in practical ways and test the possibilities of ideas they generate (Thinking Processes - Creativity). Use appropriate language to explain thinking, identify and provide reasons for a point of view, and justify changes in thinking (Thinking Processes - Reflection, evaluation and metacognition).

Level 4: Apply the terms models and systems appropriately to the human skeleton, muscles and the bony joints. Identify and explain the connection between the muscular and skeletal systems in the human body and their various functions (Science - Knowledge and understanding). Use diagrams and symbols to explain procedures (Science at work). Work in teams (Interpersonal relationships) and develop questions for investigation, collect relevant information from a range of sources and make judgments about its worth (Thinking Processes - Reasoning, processing and inquiry). Demonstrate creativity in thinking in a range of contexts and test the possibilities of concrete and abstract ideas generated (Thinking Processes – Creativity). Use appropriate language to explain thinking, identify and provide reasons for a point of view, and justify changes in thinking (Thinking Processes - Reflection, evaluation and metacognition).

What to do:
Refer to Activity 8 Worksheet: Jig-saw skeleton (p162) and Activity 9 Worksheet: The body’s bony frame (p163) and Activity 10 Worksheet: Muscles mean movement (p164).
Activity 7 Worksheet
Our Circulation: The round trip

In order for us to survive, many things must go into our bodies and many things must also come out. Our heart pumps blood to nearly every part of our bodies, delivering a constant supply of oxygen, nutrients and chemical messengers that tell the cells of the body what to do. Our blood picks up wastes from our cells and tissues, so that they may be disposed of by the kidneys, skin and lungs. An endless flow of blood carries all of these substances in a continuous circulation around our body.

Read the clues below and see if you can find the missing words in the table below. The words may be hidden horizontally, vertically, forward or even back-to-front. Good luck.

~ nutrients, capillaries, day, oxygen, kidneys, cells, arteries, veins, produce, heart, intruders, dioxide, wastes, watery, thin, litres, billions, tissues, urine, haemoglobin, plasma, white, red*

(note: in this search the word red that you are looking for is shown downward in the table, not across)

Write down the letters that are not used in the word search and find out what the secret message about our circulatory system is.

A Museum Victoria experience.
Use the words above to fill in the blanks in the sentences below.

Our ______________ demand ______________ and oxygen constantly.

The ______________ part of blood is called ______________ and it carries dissolved nutrients and ______________ from cells.
Suspended in the plasma are ______________ of blood cells.

Most of the cells are ______________ blood cells. ______________ attaches to a chemical called ______________ that is inside red blood cells. It is delivered to the different cells and tissues of the body. Some cells are ______________ blood cells, which attack ______________ (such as bacteria), or sick cells (such as cancer).

Two and a half ______________ of blood is pumped through our ______________ every minute.

Blood travels away from the heart in ______________, which carry the blood to the different ______________ of the body.
Blood travels back to the heart in ______________.

______________ are the smallest of all blood vessels. They have extremely ______________ walls and are only one cell wide.

Capillaries off-load nutrients and oxygen into cells and pick up wastes such as carbon-__________.

Most of these wastes are removed from our blood by our ______________, which make ______________ by filtering the wastes out of our blood. In one day, our kidneys will filter 1500 litres of blood to ______________ 1.5 litres of urine.
Activity 8 Worksheet
Jig-saw Skeleton

Draw the parts of the skeleton in the correct places of the body

How many bones can you label?
Activity 9 Worksheet
The body’s bony frame

Our skeleton is the body’s supporting framework. It is made of bones, joints and cartilage and makes up 20% of our body weight. To stay strong, bone cells are constantly making new bone. When bones break, they repair themselves.

A joint occurs where one bone meets another one. Cartilage covers the ends of bones at the joints. When muscles pull on different parts of our skeleton, movements occur around our joints. Bones provide body support, and they provide strength. Soft tissues, like the brain and heart, are protected by bone. Bone provides storage of minerals, such as calcium, for the body’s use. New blood cells are also made inside the soft bone marrow of bones.

- What are five things that muscles do in the body?
  1.
  2.
  3.
  4.
  5.

- Label the following bones onto the skeleton?
  skull, vertebrae, sternum, scapula, ribs, humerus, ulnar, radius, phalanges, pelvis, femur, patella, fibula, tibia, phalanges.

Movement of the skeleton occurs at joints – places where bones meet. The structure of our joints enables us to move the way we do. Some joints allow bending movements; some allow twisting. In these mobile joints, the bones are protected by cartilage. The smooth cartilage and a slippery fluid lubricate a joint’s movement. Gristly bands, called ligaments, are attached to the bones around a joint, holding them in position. Not all joints move. Some bones, like the skull plates, are locked rigidly in position.

- Draw one part of the body that has a joint that would look like each of the diagrams below.

  hinge joint      ball and socket        gliding joint      saddle joint      rotating joint

- Draw arrows and describe the movement and directions that are possible at each of these joints
- Can you draw the type of joint that enables the head to ‘rotate’ around the neck?
Activity 10 Worksheet

Muscles mean movement

No part of our body moves without muscles. Muscles move the food in our intestines and they make the muscular irises in our eyes open and close to adjust to the light. Cardiac muscle, found in our heart, and smooth muscle found in our digestive tract and blood vessels, moves without our conscious involvement. Skeletal muscles are the muscles attached to bones. These muscles move when we consciously make the decision to move them. Skeletal muscles often work in pairs, one contracting and the other relaxing in turn, to move bones at our joints.

What to do:
Perform each of the actions overleaf, very slowly. Feel the muscles that are tensing up as you do them. Colour in each of the muscles that contract with each movement onto the diagrams below.

1. Bend your knee and lift it up in front of your body. Imagine there is tacky glue sticking your foot to the ground.
2. Imagine you are lifting a very heavy jug off a table and up towards your mouth.
3. Imagine you are putting the heavy jug back on the table.
4. Plant your feet on the ground side by side. Imagine that a very strong wind is blowing into your face almost blowing you over but you are standing up against it.
5. Imagine you are kicking a football in slow motion.
6. Imagine you are rowing a very heavy boat by pulling the oars back against the water in slow motion.
7. Lift your heels off the ground and carefully roll your weight onto the front of your feet like a dancer.
8. Drop your chin on to your chest then slowly lift your head up so that you are looking straight ahead of you.
9. Imagine that you are about to bowl a bowling ball in slow motion and you are swinging your arm backwards for the bowl.

What actions can you think of that use other muscles in your body?
Work in groups of 3 or 4 to choose a song and make up an aerobics routine. Choose ten different muscles in the body and think of exercises that moves each of them. Present – your aerobics routine to the class and make sure you call out which muscles you are exercising as you do each new movement.
Activity 11: Our nervous system – makes sense

**Level 3:** Describe the major organs of the human nervous system and identify how each of these organs work together as a system to support human survival (*Science - knowledge and understanding*). Work in teams (*Interpersonal relationships*) to collect information from a range of sources to answer questions and question the validity of sources (*Thinking Processes - Reasoning, processing and inquiry*). Apply creative ideas in practical ways and test the possibilities of ideas they generate (*Thinking Processes – Creativity*). Use appropriate language to explain thinking, identify and provide reasons for a point of view, and justify changes in thinking (*Thinking Processes - Reflection, evaluation and metacognition*).

**Level 4:** Apply the terms *models* and *systems* appropriately to the human nervous system. Identify and explain the connection between the organs of the nervous system and their various functions (*Science - Knowledge and understanding*). Use diagrams and symbols to explain procedures (*Science at work*). Work in teams (*Interpersonal relationships*) and develop questions for investigation, collect relevant information from a range of sources and make judgments about its worth (*Thinking Processes - Reasoning, processing and inquiry*). Demonstrate creativity in thinking in a range of contexts and test the possibilities of concrete and abstract ideas generated (*Thinking Processes – Creativity*). Use appropriate language to explain thinking, identify and provide reasons for a point of view, and justify changes in thinking (*Thinking Processes - Reflection, evaluation and metacognition*).

**What to do:**
Refer to Activity 11 Worksheet: Our nervous system – makes sense (p168).

Activity 12: Men and women are different

**Level 4:** Apply the terms *models* and *systems* appropriately to the human reproductive system. Identify and explain the connection between the organs of the reproductive system and human survival (*Science - Knowledge and understanding*). Use diagrams and symbols to explain procedures (*Science at work*). Work in teams (*Interpersonal relationships*) and develop questions for investigation, collect relevant information from a range of sources and make judgments about its worth (*Thinking Processes - Reasoning, processing and inquiry*). Use appropriate language to explain thinking, identify and provide reasons for a point of view, and justify changes in thinking (*Thinking Processes - Reflection, evaluation and metacognition*).

**Level 5:** Explain the structure and function of cells of the reproductive organs and how these cells work together. Develop an understanding of the human body as composed of different cells and tissues working together. Explore how scientific work has led to the discovery of new knowledge and understanding about the medicine, technology and Human Body (*Science - Knowledge and understanding*). Identify, analyse and ask questions in relation to scientific ideas or issues of interest (*Science at work*). Use a range of question types, and locate and select relevant information from varied sources when undertaking investigations (*Thinking Processes - Reasoning, processing and inquiry*).

**What to do:**
Refer to Activity 12 Worksheet: Men and Women are different (p169).

Activity 13: X-Rays – An accidental discovery

**Level 4:** Analyse a range of issues associated with x-rays and other medical imaging *technology used to explore and investigate the human body*, and describe the relevance of these fields of science to people's lives (*Science at work*). Work in teams (*Interpersonal relationships*) and develop questions for investigation, collect relevant information from a range of sources and make judgments about its worth (*Thinking Processes - Reasoning, processing and inquiry*). Ask clarifying questions about ideas and information listened to and viewed. Develop interpretations of the content and provide reasons for them and explain why peers may develop alternative interpretations. Describe the purpose of a range of communication strategies, including non-verbal strategies, and evaluate their effectiveness for different audiences (*Communication - Listening, viewing and responding*). Use creative thinking strategies to generate imaginative solutions when solving problems (*Thinking Processes – Creativity*). Summarise and organise ideas and information, logically and clearly in a presentation (*Communication – Presenting*). Use appropriate language to explain thinking, identify and provide reasons for a point of view, and justify changes in thinking (*Thinking Processes - Reflection, evaluation and metacognition*).
Level 5: Explore how scientific work has led to the discovery of new knowledge and understanding about medicine, technology and Human Body (Science - knowledge and understanding). Use appropriate diagrams and symbols when reporting on investigations. Identify, analyse and ask questions in relation to scientific ideas or issues of interest (Science at work). Use a range of question types, and locate and select relevant information from varied sources when undertaking investigations. Identify and synthesise relevant information, use appropriate strategies of reasoning and analysis to evaluate evidence (Thinking Processes - Reasoning, processing and inquiry) and consider different points of view, apply prior knowledge to new situations, challenge assumptions and justify interpretations (Communication - Listening, viewing and responding). Demonstrate creativity, in engaging with and exploring ideas in a range of contexts (Thinking Processes – Creativity). Use the communication conventions, forms and language appropriate to the subject to convey a clear message through presentation forms to meet the needs of the context, purpose and audience. Provide and use constructive feedback and reflection to develop effective communication skills (Communication – Presenting). Describe and explain changes that may occur in ideas and beliefs over time (Thinking Processes - Reflection, evaluation and metacognition).

What to do:
Refer to Activity 13 Worksheet: X-Rays – an accidental discovery (pp170-171).
Activity 11 Worksheet
Our nervous system – makes sense

The brain and the nervous system organise all of our body parts so that they can work together in a coordinated way. Our complex brain is made up of 75 km of nerves. Some nerves travel from our brain down our spine, to different parts of our body. They tell the body parts what to do. Other nerves travel from different parts of the body to our brain. They tell the brain what is happening in the body. Messages are sent to and from our brain all the time. Our nervous system organises and keeps track of everything that goes on inside us. The brain senses our environment; it tells the body how to respond to what is going on; it thinks about what we should do; and it remembers things.

Draw a picture of your brain and write down five things that it does for you.

Look at a sheep’s brain from a butcher and describe its size and what it looks like.

Read the poem below
My brain
My best friend would be my brain
It understands why things are funny
And it feels it when I feel pain
It remembers why I like some things
And knows when other things are a drain
In fact it knows everything about me,
That’s why….My best friend’s my brain

Write a short poem or story about your brain.
Activity 12 Worksheet
Men and women are different

The male reproductive system:
The testes give males their male characteristics. At puberty, hormones produced by the brain and pituitary gland trigger the testes to produce testosterone, the major male sex hormone. Testosterone stimulates the development of male sexual organs and sperm production. Testosterone stimulates muscular development and also causes hair loss.

• Draw a line from the labels to each of the anatomical parts on the male reproductive system.

Bladder,
Prostate gland,
Seminal vesicles,
Urethra,
Penis,
Testis,
Epididymis,
Vas deferens

The female reproductive system:
Ovaries give women their female characteristics. Besides producing eggs, the ovaries make the female sex hormones oestrogen and progesterone. Oestrogen causes breast enlargement at puberty. Progesterone is important in preparing the lining of the uterus for a developing embryo.

• Draw a line from the labels to each of the anatomical parts on the female reproductive system

Ovary,
Uterus,
Uterine tube,
Cervix,
Bladder,
Vagina,
Clitoris
Activity 13 Worksheet
X-Rays – an accidental discovery

Just over a hundred years ago, in 1895, Wilhelm Roentgen noticed an unusual glow on a fluorescent screen that was sitting beside a cathode tube. This tube emitted a ray that was able to pass through solid objects and was only slowed down by very dense materials, like bone and lead. Quite by accident Roentgen had discovered a new form of radiation, called X-ray. If objects were put in front of X-rays, their shadows could be recorded permanently on photographic plates.

After this discovery X-ray imaging quickly became popular around the world. The machines were very cheap and easy to use and newspaper reporting, advertising and public demonstrations and lectures increased many people’s enthusiasm about this novel way of photographing themselves. X-ray boxes were put into shoe shops to show customers how well their feet would fit into their new shoes. X-ray studios were built where ‘portraits’ were taken. Engaged couples had X-rays taken of their clasped hands showing their engagement rings. People came to have their insides photographed, and for the first time doctors could see into the body without having to cut it open first, providing an amazing breakthrough in medical imaging and diagnoses.

X-rays rapidly became part of popular culture. As early as 1897, books such as The Invisible Man by H.G. Wells, and paintings, such as those from Braque and Picasso, were influenced by X-ray images. Superman, endowed with X-ray vision, suddenly made his appearance in comic strips.

Some people, however, thought that X-rays invaded their idea of privacy. Doctors, and anyone else with X-ray machines, could look right through the private parts of the body that had until then been quite hidden from view. Some people described this idea as the ‘revolting indecency’ of X-rays and a risk to notions of modesty. In response to this fear, a London firm even attempted to market and sell X-ray proof underwear.

One hundred years ago, creating an X-ray image required focusing x-rays through the body directly onto a single piece of film inside a special cassette. This could take up to 11 minutes of exposure. The dangerous effect of X-ray radiation at this time was not fully understood until many years later. Many early users actually used their own hands to test the strength of the X-ray beam before they used it on others. Many doctors, researchers and radiographers died from cancers caused by over exposure to X-ray radiation.

Today, X-rays take milliseconds and the X-ray dose is 2% of what it was 100 years ago. Modern X-ray techniques also have significantly more spatial resolution and contrast detail which improves image quality and allows the diagnosis of smaller problems that could not be detected with older technology.

(Left to right): X-ray picturegram of hand; Shoe shop X-ray machine in use in department store c1938. Source: David Jones Limited Archive; Advertisements for X-ray spex. Source: Transcience Corporation.
What to do:
Work in groups to explore the history and use of x-ray technology and subsequent medical imaging technology and the relevance of these fields of science to people’s lives.

Research the following events and provide reasons for your point of view. Organise your ideas and information into a creative presentation (poster presentation, powerpoint, or short play) for the other class members.

• Imagine that you are Wilhelm Roentgen in 1895. You have just discovered the glow from the x-ray and the cathode tube. Research and describe the science of x-ray technology.

• What is the world of Wilhelm Roentgen like, in 1895? What attitudes and beliefs do people have about themselves, society, medicine, the human body?

• Write a diary entry of Wilhelm Roentgen on the day he discovered the x-ray beams. What thoughts and creative ideas might he have had for the practical application of this new discovery? How does he think x-rays will be used by other people and groups in society? Does he agree with these uses?

• What effect has x-ray technology had on medicine and disease diagnosis? How has x-ray technology changed over the last 100 years? How is it used to diagnose different medical conditions?

• What other medical imaging techniques and technologies are available today? How are they different to x-ray technology? Describe how these technologies work. How have these imaging tools changed medical practices?

Discussion and other activities:
How were medical conditions and disease diagnosed prior to the discovery of X-rays?
Discuss how individuals and various community groups accept or reject new medical technologies.
What responses were there to the introduction of X-rays? Why do you think people had these responses?
What other, more recent medical technologies have generated controversial responses from the public. Discuss why you think people had these views about the technology
Develop a powerpoint presentation or poster that illustrates how X-ray machines work and how X-ray images are produced.

(Left to right): Skull X-ray showing sinuses and possible fracture. Source: Royal Melbourne Hospital; This skiagram was prepared by injecting a red lead compound into the blood vessels of a skull. Source: University of Melbourne.