ACTIVITY 5.1 Circulatory and respiratory systems

SKILLS › Describing

1 List the main parts of the:

a circulatory system

b respiratory system

2 Describe the role of the:

a circulatory system

b respiratory system

3 Outline what the following body parts do:

a heart

b lungs

c aorta

d pulmonary veins

e coronary arteries

4 Write the definition of:

a arteries

b coronary circulation

c blood plasma

d alveoli

5 Write two problems that can occur in the:

a circulatory system

b respiratory system

6 Explain how the brain is kept alive by the circulatory system.

7 Describe the changes in the composition of air as we breathe (inhale and exhale).

8 Write a series of steps tracing what happens to the blood as the heart is beating.

9 Define 'respiration' and write a word or chemical equation for this process. Discuss whether or not the circulatory system and the respiratory system are both involved with respiration.

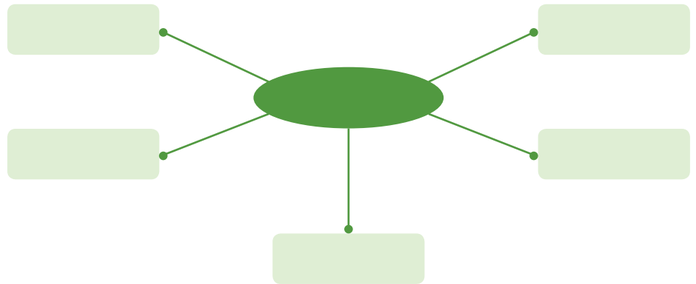
ACTIVITY 5.2 Design: Body systems and transplants

SKILLS
- Using models
- Researching

With a partner, choose one of the following body systems to carry out the research activities. You can then present your research findings to your class.

- respiratory
- circulatory
- digestive
- immune
- nervous
- muscular
- skeletal
- excretory.

1 Draw a concept map showing the system at the centre, linked to different organs involved and tasks carried out.



2 State the parts of the system you chose and their function.

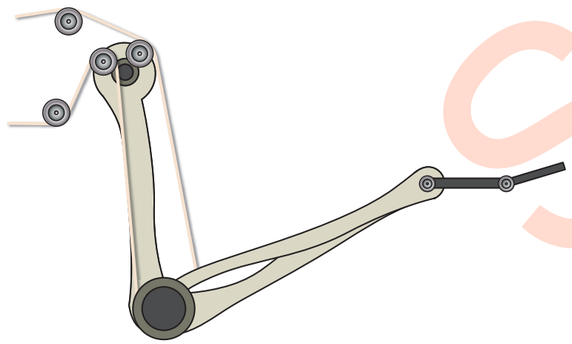
3 Outline the ways in which the system you chose interacts with one other body system.

4 Discuss whether an organ or part of the system you chose can currently be transplanted/replaced, and explain why it might need to be.

5 Outline what the surgery involves and the benefits and problems associated with this procedure.

6 Discuss whether or not the scientific research into transplantation/replacement has been beneficial for people.

7 Draw and label a diagram of a machine model that would have a role similar to the system you chose. For example, the arm can be modelled by a system of metal levers and gears. The movement of the strings is similar to the movement of tendons in the arm. Your design should help people compare and understand the system more easily. Construct a poster to show your ideas.



ACTIVITY 5.3 Research: Body myths, health and disease

SKILLS
- Critical and creative thinking
- Researching

1 Myth or fact? Investigate and write 'true' or 'false', along with a brief explanation.

a The blood in your veins is blue and the blood in your arteries is red.

b Five areas located around the tongue detect five separate tastes.

c Light emerges from the eye to enable you to see.

d You have many more than five senses.

e You inhale oxygen and exhale carbon dioxide.

f Humans are carnivores.

2 Investigate each medical treatment or health issue and briefly describe the science involved.

a kidney dialysis—What is it and how does it work?

b pacemaker—What does it do and when is it needed?

c liver transplant—Why is it needed and how successful is it?

d blood transfusion—What is it and when is it used?

e alternative medicine—What types exist and how does it compare with conventional medicine?

f Indigenous health—What are the trends for life expectancy compared to the overall population, and what are some possible approaches?

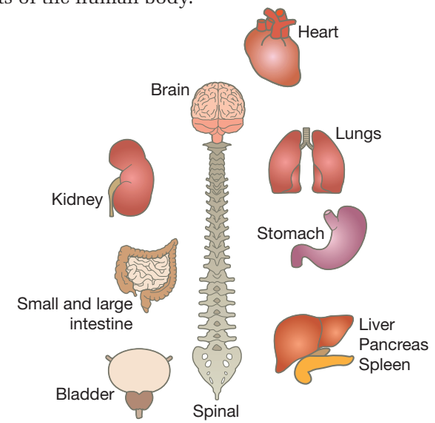
g smoking and health—What are the trends for life expectancy compared to the overall population, and what are some possible approaches?

h alcohol and health—What are the effects on the body and what are current trends?

ACTIVITY 5.4 Body tissues, organs and systems

SKILLS
- Communicating
- Describing systems

This picture shows several parts of the human body.



1 State two facts about the structure and function of each body part shown.

2 Name five of the main body systems.

3 Complete a table, like the one shown, for each of the body parts shown in question 1.

Body part	System	Main function

4 Use the organs listed in question 1 to explain the role of each of them in the process of respiration. In your answer, explain how the reactants and products are distributed, stored and removed.

ACTIVITY 5.5 Article study: Growing organs

SKILLS
- Using systems
- Literacy
- Evaluating

Medicine's cutting edge: Re-growing organs

By Wyatt Andrews, 11 February 2009

Three years ago, Lee Spievack sliced off the tip of his finger in the propeller of a hobby shop airplane. What happened next, Andrews reports, propelled him into the future of medicine. Spievack's brother, Alan, a medical research scientist, sent him a special powder and told him to sprinkle it on the wound. 'I powdered it on until it was covered,' Spievack recalled. To his astonishment, every bit of his fingertip grew back.

'Your finger grew back,' Andrews asked Spievack, 'flesh, blood vessels and nail?'. 'Four weeks,' he answered. Andrews spoke to Dr Steven Badylak of the University of Pittsburgh's McGowan Institute of Regenerative Medicine and asked if that powder was the reason behind Spievack's new finger tip. 'Yes, it is,' Badylak explained. 'We took this and turned it into a powdered form.' That powder is a substance made from pig bladders called extracellular matrix. It is a mix of protein and connective tissue surgeons often use to repair tendons and it holds some of the secrets behind the emerging new science of regenerative medicine.

'It tells the body, start that process of tissue regrowth,' said Badylak. Badylak is one of the many scientists who now believe every tissue in the body has cells which are capable of regeneration. All scientists have to do is find enough of those cells and 'direct' them to grow. 'Somehow the matrix summons the cells and tells them what to do,' Badylak explained. 'It helps instruct them in terms of where they need to go, how they need to differentiate—should I become a blood vessel, a nerve, a muscle cell or whatever.' If this helped Spievack's finger regrow, Badylak says, at least in theory, you should be able to grow a whole limb.

In his lab at Wake Forest University, a lab he calls a medical factory, Dr Anthony Atala is growing body parts. Atala and his team have built, from the cell level up, 18 different types of tissue so far, including muscle tissue, whole organs and the pulsing heart valve of a sheep. 'And is it growing?' Andrews asked. 'Absolutely,' Atala said, showing him. 'All this white material is new tissue. When people ask me "What do you do?" I say, "We grow tissues and organs". We are making body parts that we can implant right back into patients.'

Dr Atala, one of the pioneers of regeneration, believes every type of tissue already has cells ready to regenerate if only researchers can prod them into action. Sometimes that prodding can look like science fiction. Emerging from an everyday ink jet printer is the heart of a mouse. Mouse heart cells go into the ink cartridge and are then sprayed down in a heart-shaped, pattern layer by layer. Dr Atala believes it's a matter of time before someone grows a human heart.

1 Summarise the information in the article by writing the important points from each paragraph.

2 Copy the table and list the body tissue, organs, systems and organisms mentioned in the article.

Tissue	Organ	System	Organism

3 List the features of the article that make the information more reliable.

4 Define the following terms:

a surgeon

b blood plasma

c tissue engineering

d implant

e differentiate

5 Explain why the scientist is trying to make cells differentiate.

6 Using the information given, discuss the benefits and drawbacks of carrying out research into medical science.

ACTIVITY 5.6 The nervous and endocrine systems

SKILLS
- Describing systems
- Analysing information

1 True or false?

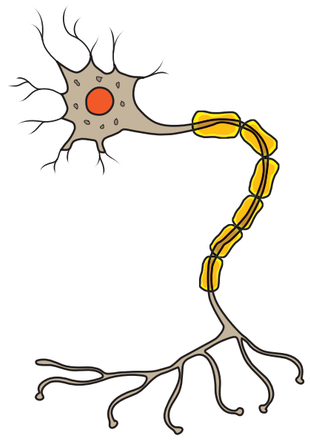
a The nervous system provides a slow action control system. _____

b The endocrine system uses hormones to control the body. _____

c The nerve cell is able to send electrochemical impulses. _____

d The pituitary gland is an organ of the nervous system. _____

2 Label the parts of the nerve cell shown. Draw arrows on the diagram to indicate the path along which an impulse would move.



3 Explain how the shape of this cell helps it to carry out its function.

_____

_____

4 Explain how an electric cable can be compared to a nerve.

_____

_____

5 The gap between a nerve cell and another cell is called a synapse and messages pass the gap by using tiny chemicals called neurotransmitters. Explain what could occur if the following substances entered the body:

a substances that increased the flow of neurotransmitters

_____

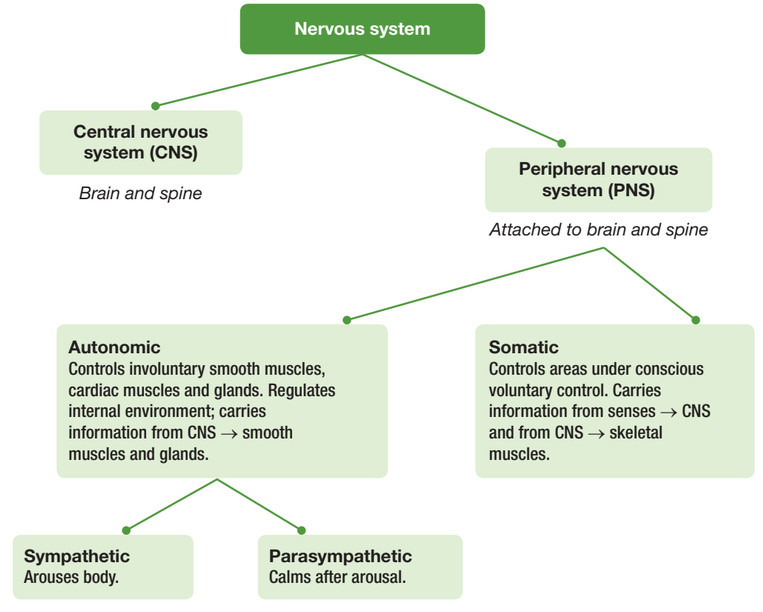
b substances that inhibited the neurotransmitters

_____

6 Complete the table for the three types of neuron.

Neuron type	Location	Function
Sensory neuron		
Motor neuron		
Interneuron		

7 Examine the following diagram about the nervous system.



a What are the two main divisions of the nervous system?

b What does the autonomic part of the nervous system do?

c Which part controls the beating of the heart?

d Which part activates and prepares the body for vigorous muscular activity, stress and emergencies?

e Which part provides almost every organ with a double set of nerves—the sympathetic and parasympathetic?

8 The reflex arc is an automatic, involuntary reaction to a stimulus. When testing your reflexes a doctor may tap your knee with a small hammer. The impulse goes from the sense receptor (pressure/pain detecting nerve) to the spinal column, to the motor nerve connected to the muscle. The result is a rapid kick from the leg without the brain being consciously aware. This can be shown as:

hit → pain detected by receptor → signal sent to effector → muscle moves

Use a flow chart to describe a similar reflex arc for the following:

a blink reflex

b rebalancing when tripping

c pulling away after touching a hot object

ACTIVITY 5.7 Pathogens and disease

SKILLS
- Critical and creative thinking
- Researching

1 True or false?

a A pathogen cannot cause disease. _____

b A virus cannot reproduce on its own. _____

c The common cold is caused by a virus. _____

d All bacteria are harmful to humans. _____

e Red blood cells can attack and engulf foreign particles. _____

2 Complete the following table for types of pathogen.

Type	Virus	Bacteria			
Example			Ringworm	Malaria	
Features					Multicellular, long thin body, parasite to host

3 Use your textbook and the Internet to complete this table on the body's defences.

Line of defence	Where it is in the body	What it does
1st	Skin, mucous membranes in your nose and throat, tears	
2nd		Uses some types of white blood cell, such as phagocytes, to envelop and destroy pathogens
3rd		

4 Are all the bacteria in our bodies harmful? Explain your answer.

5 *Mycobacterium tuberculosis* is the disease agent for tuberculosis. Find out what type of pathogen this is and what it does to the body.

6 Discuss why we need research to be carried out on pathogens and how this is carried out.

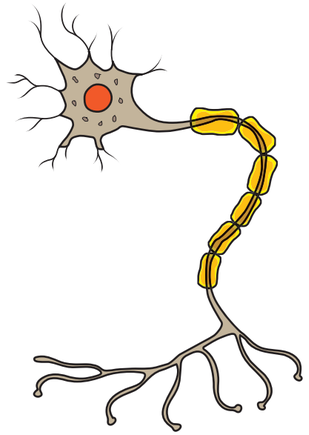
ACTIVITY 5.8 Review: Responding to the world

SKILLS › Processing and analysing data

1 Which two body systems are lungs part of?
- **A** respiratory and circulatory
- **B** respiratory and immune
- **C** digestive and respiratory
- **D** digestive and circulatory

2 Which of the following is the smallest type of pathogen?
- **A** bacterium
- **B** prion
- **C** virus
- **D** parasitic worm

3 What type of cell is shown here?



- **A** nerve cell
- **B** fat cell
- **C** cancer cell
- **D** muscle cell

4 What are the two parts of the nervous system?
- **A** cerebellum, cerebrum
- **B** CNS and PNS
- **C** brain, cerebrum
- **D** spine, senses

5 Hormones are released by:
- **A** endocrine glands
- **B** the brain
- **C** the cerebrum
- **D** nerve cells

6 Which organ pumps the blood in the body?
- **A** kidneys
- **B** lungs
- **C** heart
- **D** arteries

7 Which system puts wastes out of the body?
- **A** digestive
- **B** excretory
- **C** circulatory
- **D** skeletal

8 A disease that spreads from person to person is:
- **A** infectious
- **B** a reflex arc
- **C** a pathogen
- **D** a virus

9 The master gland, which controls all others, is:
- **A** the hypothalamus
- **B** the pancreas
- **C** thyroxine
- **D** the pituitary gland

10 True or false?

a Parasitic worms are small parasitic animals that can cause disease. _____

b Ringworm is a fungal parasite. _____

c A virus is a tiny animal. _____

d A bacteria is a tiny single-celled organism. _____

11 Complete these sentences:

a The general name of a disease-causing organism is a _____.

b The system that provides a supporting frame for the body is _____.

c The vessels carrying blood from the heart to the rest of the body are _____.

d The cells that carry oxygen around the body are _____.

12 Describe the reflex arc in each case:

a Your knee is hit and it flicks out.

b Your hand senses heat from a hot cup of tea.

13 Insulin is responsible for taking glucose out of the bloodstream and giving it to the body cells, where it can be used immediately as energy or put into 'storage' for later use.

a Which systems are involved with putting sugar into the blood?

b Explain why a sharp peak in blood sugar causes a sharp rise in insulin.

c Describe what low blood sugar, or a 'crash', may bring about for the person affected.

14 Copy and complete the following table for the body systems.

System	Main parts	What it does
Circulatory		
Respiratory		
Nervous		
Muscular		
Endocrine		

15 Pneumonia is a respiratory condition in which there is infection of the lung.

a Identify which two body systems are mainly involved with a pneumonia infection.

b Outline the symptoms of pneumonia.

c Discuss how the body fights pneumonia.