



# PROGRAM SUPPORT NOTES

## Multicellular Organisms and Their Nervous Systems

Program Support Notes by:  
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## For Teachers

### Introduction

All organisms are composed of cells – the fundamental units of life. Most organisms are single cells; other organisms including humans are multicellular. In this program, students are introduced to different types of unicellular and multicellular organisms, and explore the structure and function of multicellular organisms including cells, tissues, organs and organ systems. The nervous system of vertebrates is examined in detail and compared to animals with less specialized nervous systems such as jellyfish. Students are able to see up close the nervous system of a cane toad and earthworm during dissections performed by Prof John Donald and Dr Stuart Linton from Deakin University.

### Timeline

00:00:00	Cells: The building blocks of organisms
00:02:37	From cell to organism
00:07:13	The nervous system
00:11:17	Vertebrate nervous systems
00:15:46	Invertebrate nervous systems
00:20:34	Credits
00:21:14	End Program

### Bonus Footage

00:00:00:	Cane Toad Dissection (12.41 min)
00:00:00:	Earthworm Dissection (2 min)
00:00:00:	The Mammalian Brain (1:50mins)

### Related Titles

Transportation Systems in Plants  
Transportation Systems in Animals  
Anatomy

### Recommended Resources

<http://faculty.washington.edu/chudler/neurok.html>  
<http://web.jjay.cuny.edu/~acarpi/NSC/14-anatomy.htm>  
[http://www.bbc.co.uk/schools/ks3bitesize/science/organisms\\_behaviour\\_health/cells\\_systems/revise1.shtml](http://www.bbc.co.uk/schools/ks3bitesize/science/organisms_behaviour_health/cells_systems/revise1.shtml)  
<http://www.bbc.co.uk/schools/gcsebitesize/science/aqa/human/thenervoussystemrev1.shtml>  
<http://www.donatelife.gov.au/>

***Student Worksheet***

**Initiate Prior Learning**

1. Organisms can consist of one cell or many cells. Organisms that are made of just one cell can only be seen with a microscope. Can you name some organisms which are made of only one cell?

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2. Organisms consisting of many cells (multicellular) can be seen with the naked eye. List as many multicellular organisms as you can in 30 seconds.

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## Multicellular Organisms and Their Nervous Systems

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3. Think Pair Share. Using the table below name as many body systems as you can. Try to name some organs that make up each system. When you can't think of any more, pair up with someone else and finally add any missed after discussing as a class.

Body System	Major Organs

## Active Viewing Guide

Cells: The building blocks of organisms

1. Complete the following sentences

- a) All living things contain \_\_\_\_\_.
  
- b) The human body consists of approximately \_\_\_\_\_ cells divided into \_\_\_\_\_ different types.
  
- c) Unicellular organisms consist of only \_\_\_\_\_ cell. Examples include \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.
  
- d) \_\_\_\_\_ organisms consist of many cells. Examples include \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.

2. Why are cells similar in simple multicellular organisms?

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3. Why do complex multicellular organisms need specialized cells?

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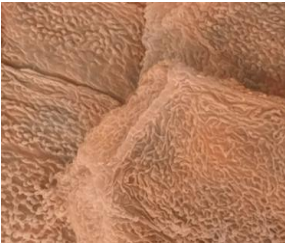
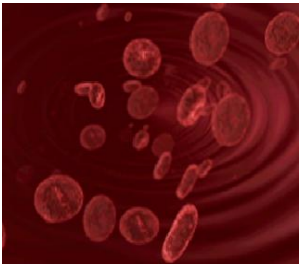
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## Multicellular Organisms and Their Nervous Systems

### From cell to organism

4. Complete the following table.

Diagram of Cell/s	Type of Cell	Function
		
		
		

5. Name four other processes that cells perform in multicellular organisms

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## Multicellular Organisms and Their Nervous Systems

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6. In plants there are three broad types of tissue. Draw a line matching the tissue type to the correct description.

Tissue Type	Tissue Description
Vascular Tissue	Outer layer of leaves
Ground Tissue	Transports water and nutrients inside the plant
Epidermis	Manufactures nutrients by the process of photosynthesis

7. Complete the following table

Type of Animal Tissue	Function
Muscle Tissue	
	Supports and binds other tissue
	Consist of brain, spinal cord and nerves. Transmit signals around the body
Epithelial Tissue	

## Multicellular Organisms and Their Nervous Systems

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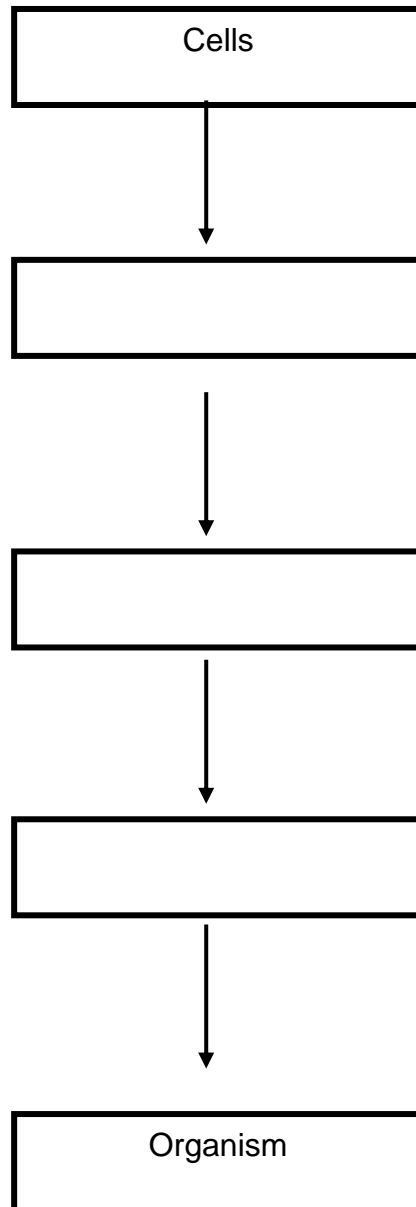
8. What is an organ? Give 3 examples.

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9. Complete the following diagram, which shows the level of organization in multicellular organisms.





## Multicellular Organisms and Their Nervous Systems

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### The Nervous System

10. What is the function of the nervous system?

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11. What are the two main types of cells in the nervous system and what are their functions?

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12. What is the role of the peripheral and central nervous system?

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### Vertebrate Nervous Systems

13. Why do vertebrates have complex nervous systems?

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14. Neurons that detect information and send them to the central nervous system are called.

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15. What is the function of motor neurons?

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## Multicellular Organisms and Their Nervous Systems

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### Invertebrate Nervous Systems

16. Name two invertebrates with simple nervous systems.

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17. How is an earthworm's nervous system similar to vertebrates?

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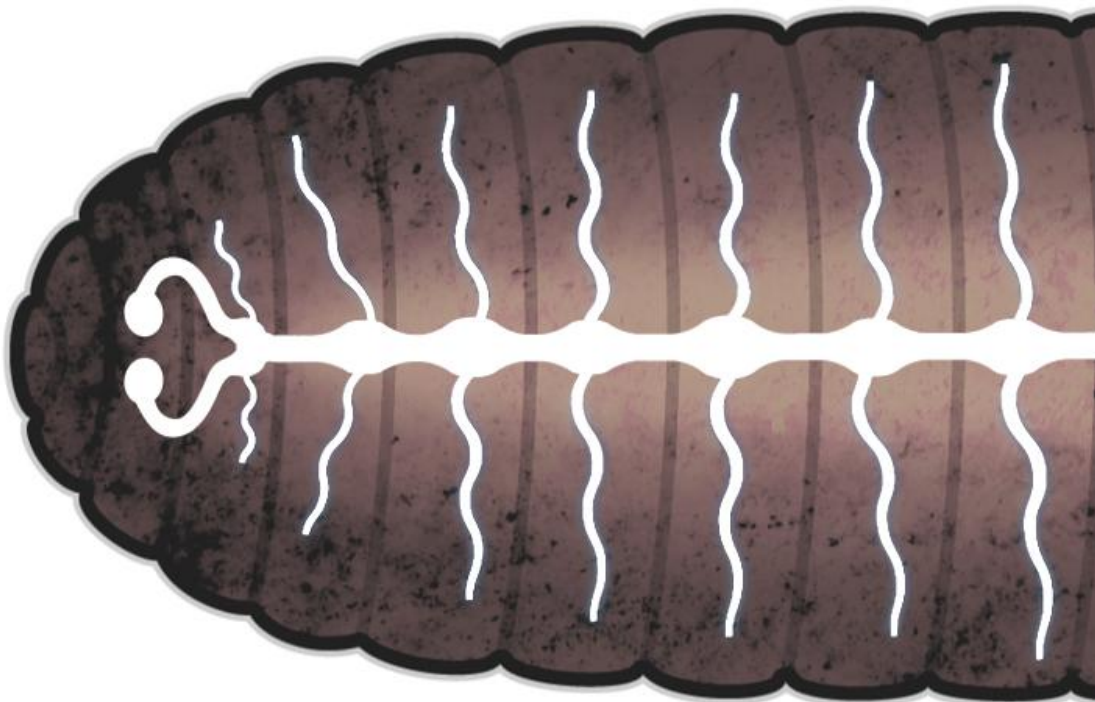
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18. Do you know the nervous system of an earthworm?

a) Label the following on the diagram below.

- nerve cord
- ganglia
- brain
- nerves



b) Color in the central nervous system red and peripheral nervous system blue.

**Extension Activities**

1. Look at the picture of the nerve cell below. How does its shape help to carry out its function?



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2. Describe the sequence of effects that would occur if you stepped on a pin.

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## Multicellular Organisms and Their Nervous Systems

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3. Organ donation takes healthy organs and tissues from one person for transplantation into another. Find out

a) The difference between organ and tissue donation.

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b) The types of organs and tissues that can be donated.

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c) How many people can one donor help?

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d) Why cannot every organ donor donate their organs when they die?

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e) How can one become an organ donor?

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## Multicellular Organisms and Their Nervous Systems

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4. Australia has one of the lowest organ donor rates in the developed world. Each year there are approximately 200 organ donors across Australia. Why do you think this is so low? Discuss as a class.

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5. Do you agree with organ and tissue donation? Provide reasons for your decision.

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6. Unlike other cells in the body, neurons are not easily replaced if they die or are damaged by infection or injury. Disease and disorders of the nervous system include Parkinson disease, epilepsy, meningitis, multiple sclerosis (MS), brain tumor, aneurysm, stroke, autism and Alzheimer's disease. Choose one disorder of the nervous system and find out what causes it, the effect on the body and treatment available

7. Why do you think there is a stigma attached to people with disorders of the nervous system?

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8. Conduct an experiment to see the difference between short term and long term memory. For the long term memory test name 10 objects in your lounge room and state their color. For the short term memory test look at the sheet of paper with 10 objects on it for 15 seconds. After turning the sheet over, wait another 15 seconds and then write down the name and color of each object. Your teacher can prepare this sheet of images, or you can create one and have another student complete it.

9. After watching the bonus feature of the complete toad dissection, dissect a toad and try to identify the major organs as seen in the program.

10. Lie down on a piece of butcher paper and get your partner to draw an outline of your body. Draw in the components of the nervous system and how they are connected. Color in the central and peripheral nervous systems in different colors and remember to label all components.

## ***Suggested Student Responses***

### **Initiate Prior Learning**

1. Organisms can consist of one cell or many cells. Organisms that are made of just one cell can only be seen with a microscope. Can you name some organisms which are made of only one cell?  
**Answers may vary but may include bacteria, protozoa, some algae, fungi and protists, paramecium**
2. Organisms consisting of many cells (multicellular) can be seen with the naked eye. List as many multicellular organisms as you can in 30 seconds.  
**Answers will vary.**
3. Think Pair Share. Using the table below name as many body systems as you can. Try to name some organs that make up each system. When you can't think of any more, pair up with someone else and finally add any missed after discussing as a class.

Body System	Major Organs
<b>Digestive</b>	<b>Mouth, esophagus, liver, stomach, pancreas, small intestine, large intestine, gall bladder</b>
<b>Respiratory</b>	<b>Nose, lungs, trachea, bronchus, alveolus</b>
<b>Excretory</b>	<b>Skin, lungs, kidneys, bladder, urethra</b>
<b>Circulatory</b>	<b>Heart, blood vessels, blood</b>
<b>Nervous</b>	<b>Brain, spinal cord, nerves, eyes, ears, skin</b>
<b>Skeletal</b>	<b>Bones, cartilage, tendons, ligaments</b>
<b>Muscular</b>	<b>Skeletal, smooth and cardiac muscle</b>
<b>Endocrine</b>	<b>Hypothalamus, pituitary, thyroid, pancreas and adrenal glands</b>
<b>Reproductive</b>	<b>Female: ovaries, oviducts, uterus, vagina and mammary glands Male: testes, seminal vesicles and penis</b>


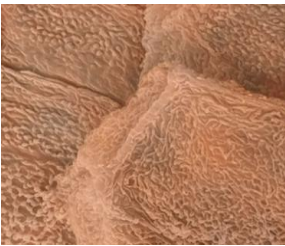
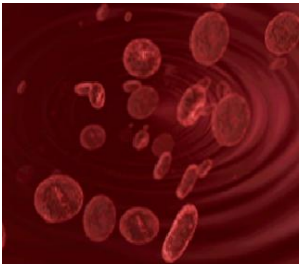
## Active Viewing Guide

Cells: The building blocks for organisms

1. Complete the following sentences
  - a) All living things contain **cells**.
  - b) The human body consists of approximately **10 trillion** cells divided into **200** different types.
  - c) Unicellular organisms consist of only **one** cell. Examples include **.Coli bacteria, amoeba** and **paramecium**.
  - d) **Multicellular** organisms consist of many cells. Examples include **answers may vary**.
2. Why are cells similar in simple multicellular organisms?  
**Processes needed to keep simple multicellular organisms alive are relatively simple therefore no specialized cells are required to carry out specialized functions.**
3. Why do complex multicellular organisms need specialized cells?  
**The processes needed to keep complex multicellular organisms alive are complex therefore they need specialized cells to carry out specialized functions.**

From cell to organism

4. Complete the following table.

Diagram of Cell/s	Type of Cell	Function
	<b>Nerve cell (neuron)</b>	<b>Controls the function of different parts of the body and relays messages around the body.</b>
	<b>Skin cell</b>	<b>Protects the body by acting as a barrier.</b>
	<b>Red blood cell</b>	<b>Delivers oxygen to the body.</b>

## Multicellular Organisms and Their Nervous Systems

5. Name four other processes that cells perform in multicellular organisms

**Take in nutrients**

**Reproducing**

**Removing waste products**

**Exchanging gases**

6. In plants there are three broad types of tissue. Draw a line matching the tissue type to the correct description.

Tissue Type	Tissue Description
Vascular Tissue	Outer layer of leaves
Ground Tissue	Transports water and nutrients inside the plant
Epidermis	Manufactures nutrients by the process of photosynthesis

7. Complete the following table

Type of Animal Tissue	Function
Muscle Tissue	<b>Enable motion and strength in the body</b>
<b>Connective tissue</b>	Supports and binds other tissue
<b>Nervous Tissue</b>	Consist of brain, spinal cord and nerves. Transmit signals around the body
Epithelial Tissue	<b>Covers the surface of the organs of the body</b>



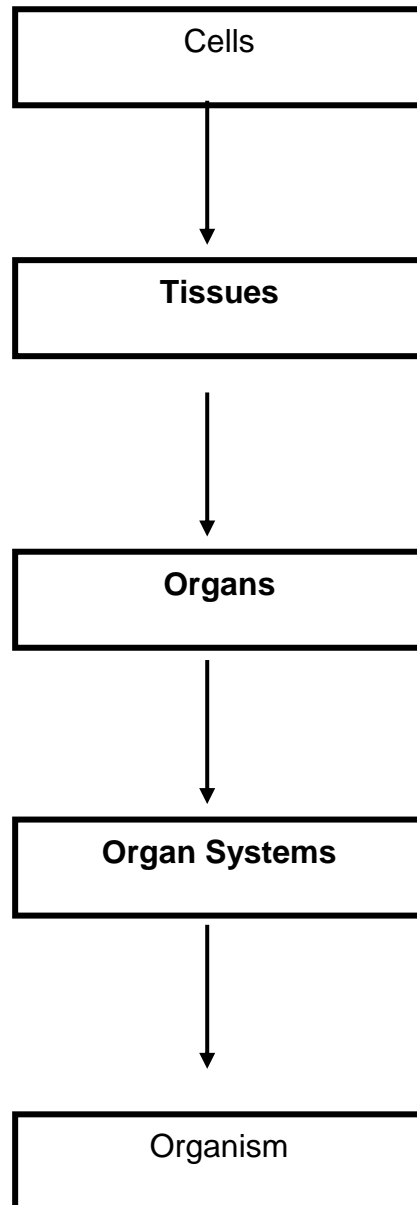
## Multicellular Organisms and Their Nervous Systems

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8. What is an organ? Give 3 examples.

**An organ is a collection of different tissues working together to perform a particular function. Examples may vary but may include eyes, lungs, kidneys, sex organs (animals), leaves, roots, flowers (plants).**

9. Complete the following diagram, which shows the level of organization in multicellular organisms.



## Multicellular Organisms and Their Nervous Systems

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### The Nervous System

10. What is the function of the nervous system?

**Answers may vary but may include: To relay messages throughout the body. The nervous system helps all the parts of the body to communicate with each other. It also reacts to changes both outside and inside the body. The nervous system uses both electrical and chemical means to send and receive messages.**

11. What are the two main types of cells in the nervous system and what are their functions?

**Neurons – transmit electrochemical impulses throughout the body.**

**Support Cells – enable neurons to do their job, provides a way of organisms sensing their environment.**

12. What is the role of the peripheral and central nervous system?

**PNS – responds to stimuli and sends signals to the CNS. Messages are also sent from the CNS to the rest of the body**

**CNS – processes messages from the PNS and determines an appropriate response.**

### Vertebrate Nervous Systems

13. Why do vertebrates have complex nervous systems?

**Because they have complex sensory organs.**

14. Neurons that detect information and send them to the central nervous system are called.

**Sensory neurons**

15. What is the function of motor neurons?

**Carry messages from the CNS to glands or muscles that carry out the response to the stimulus.**

### Invertebrate Nervous Systems

16. Name two invertebrates with simple nervous systems.

**Octopus and jellyfish**

17. How is an earthworm's nervous system similar to vertebrates?

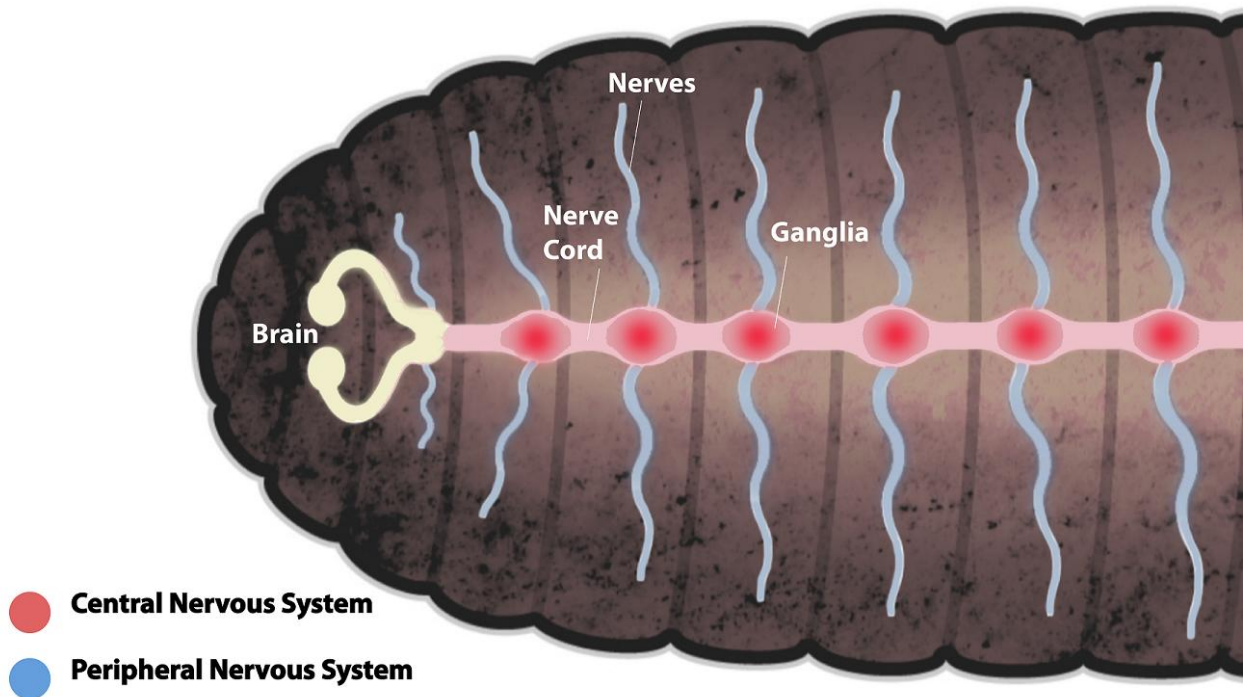
**They have distinct central and peripheral nervous systems.**

## Multicellular Organisms and Their Nervous Systems

18. Do you know the nervous system of an earthworm?

a) Label the following on the diagram below.

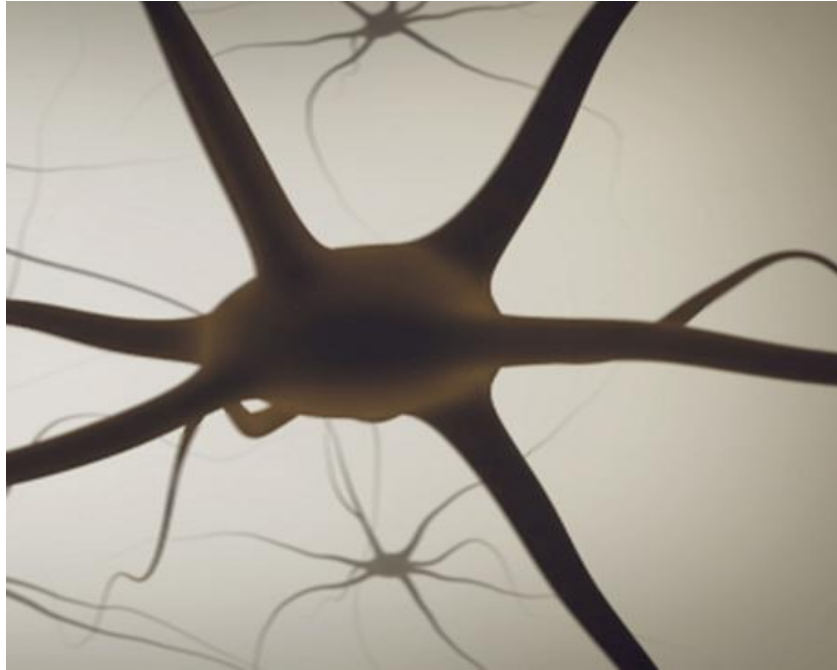
- nerve cord
- ganglia
- brain
- nerves



b) Color in the central nervous system red and peripheral nervous system blue.

### Extension Activities

1. Look at the picture of the nerve cell below. How does its shape help to carry out its function?



**Answer may vary but may include the branch like structures are called dendrites. Dendrites branch out from the cell body and are specialized to receive and transmit signals to the cell body. Nerve cells are long and slender which allow messages to be transmitted at a fast pace.**

2. Describe the sequence of effects that would occur if you stepped on a pin.  
**Answers may vary but may include**  
**Step on pin.**  
**Pain receptors in the skin stimulate the peripheral nervous system.**  
**Sensory neurons send an electrochemical signal to the central nervous system that the pin is sharp.**  
**Central nervous system sends a message back via the motor neurons in the peripheral nervous system to lift up your foot.**
3. Organ donation takes healthy organs and tissues from one person for transplantation into another. Find out
  - a) The difference between organ and tissue donation.  
**Organs- heart, liver, lungs, kidneys and pancreas**  
**Tissues - cornea (the clear film on the front of the eye), bone tissue, heart valves and skin tissue.**
  - b) The types of organs and tissues that can be donated.  
**Organs- heart, liver, lungs, kidneys and pancreas**  
**Tissues - cornea (the clear film on the front of the eye), bone tissue, heart valves and skin tissue.**

## Multicellular Organisms and Their Nervous Systems

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- c) How many people can one donor help?  
**Up to 10 people but it depends on which organs and tissues they allow to be donated and how they die.**
- d) Why cannot every organ donor donate their organs when they die?  
**In Australia a person can only be declared dead if they have suffered cardiac or brain death. When someone suffers a cardiac death, their organs are unfit for transplantation because the blood immediately stops flowing, damaging the organs. If the person suffers brain death while on 'ventilation', the blood continues to provide oxygen to the organs and keeping them in a state suitable for transplantation. Only around 1% of people will die in these circumstances. Unlike organs, tissue remains suitable for donation for hours after the heart stops beating and can be stored prior to transplantation. Eye tissue can be stored for up to seven days while heart valves, bone and skin may be stored for several years.**
- e) How can one become an organ donor?  
**People over 16 can register as an organ donor. Next of kin consent is still required so it is important that family are aware of your wishes.**
4. Australia has one of the lowest organ donor rates in the developed world. Each year there are approximately 200 organ donors across Australia. Why do you think this is so low? Discuss as a class.  
**Answers may vary**
5. Do you agree with organ and tissue donation? Provide reasons for your decision.  
**Answers may vary**
6. Unlike other cells in the body, neurons are not easily replaced if they die or are damaged by infection or injury. Disease and disorders of the nervous system include Parkinson disease, epilepsy, meningitis, multiple sclerosis (MS), brain tumor, aneurysm, stroke, autism and Alzheimer's disease. Choose one disorder of the nervous system and find out what causes it, the effect on the body and treatment available  
**Answers may vary depending on disease chosen.**
7. Why do you think there is a stigma attached to people with disorders of the nervous system?  
**Answers may vary**
8. Conduct an experiment to see the difference between short term and long term memory. For the long term memory test name 10 objects in your lounge room and state their color. For the short term memory test look at the sheet of paper with 10 objects on it for 15 seconds. After turning the sheet over, wait another 15 seconds and then write down the name and color of each object. Your teacher can prepare this sheet of images, or you can create one and have another student complete it.  
**Answers may vary**
9. After watching the bonus feature of the complete toad dissection, dissect a toad and try to identify the major organs as seen in the program.  
**Answers may vary**
10. Lie down on a piece of butcher paper and get your partner to draw an outline of your body. Draw in the components of the nervous system and how they are connected. Color in the central and peripheral nervous systems in different colors and remember to label all components.  
**Answers may vary**