

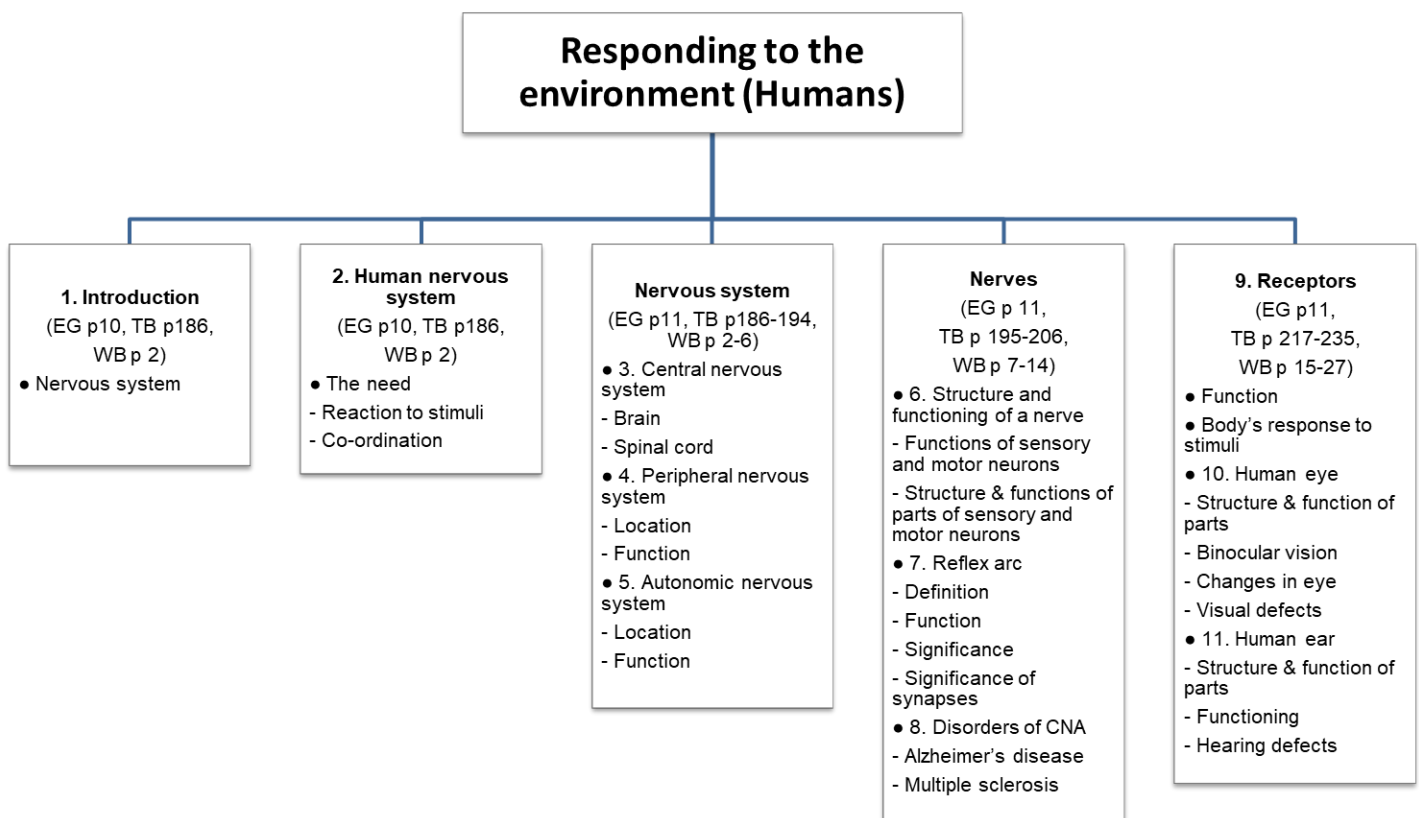
GRADE 12 LIFE SCIENCES WORKBOOK

Topic 6: Responding to the environment (Humans)

(4 weeks, Paper 1: 54 marks)

This topic can be divided in the following subsections:

1. Introduction
2. Human nervous system
3. Central nervous system
4. Peripheral nervous system
5. Autonomic nervous system
6. Structure and functioning of a nerve
7. Reflex arc
8. Disorders in CNS
9. Receptors
10. Human eye
11. Human ear



1. Introduction

☒ Read through the following section.

- * Organisms need to detect and respond to stimuli to adapt and survive in a continuously changing environment
- * Two co-ordinating systems
 - Nervous system (rapid responses involving nerves)
 - Endocrine system (slower responses involving hormones that is chemical)
- * Work together for communication and homeostasis in the body
 - By responding to external and internal environment changes (stimuli)

2. Human nervous system

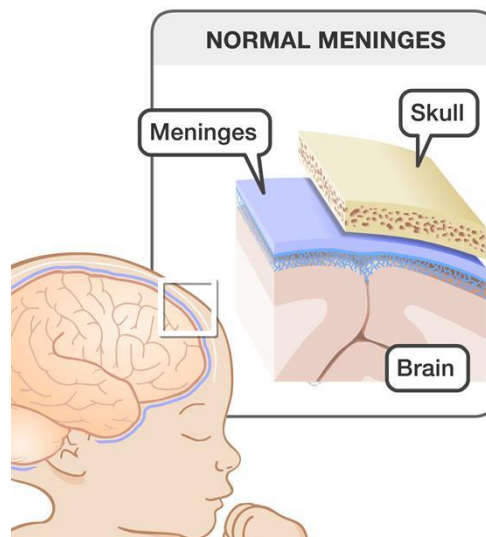
☒ Read through the following section.

- * A nervous system in humans are important so that the body can:
 - React to a stimulus (changes in environment)
 - Regulates body temperature on hot or cold days
 - Reflex action
 - Coordinate the various activities of the body
 - Walking, hearing seeing

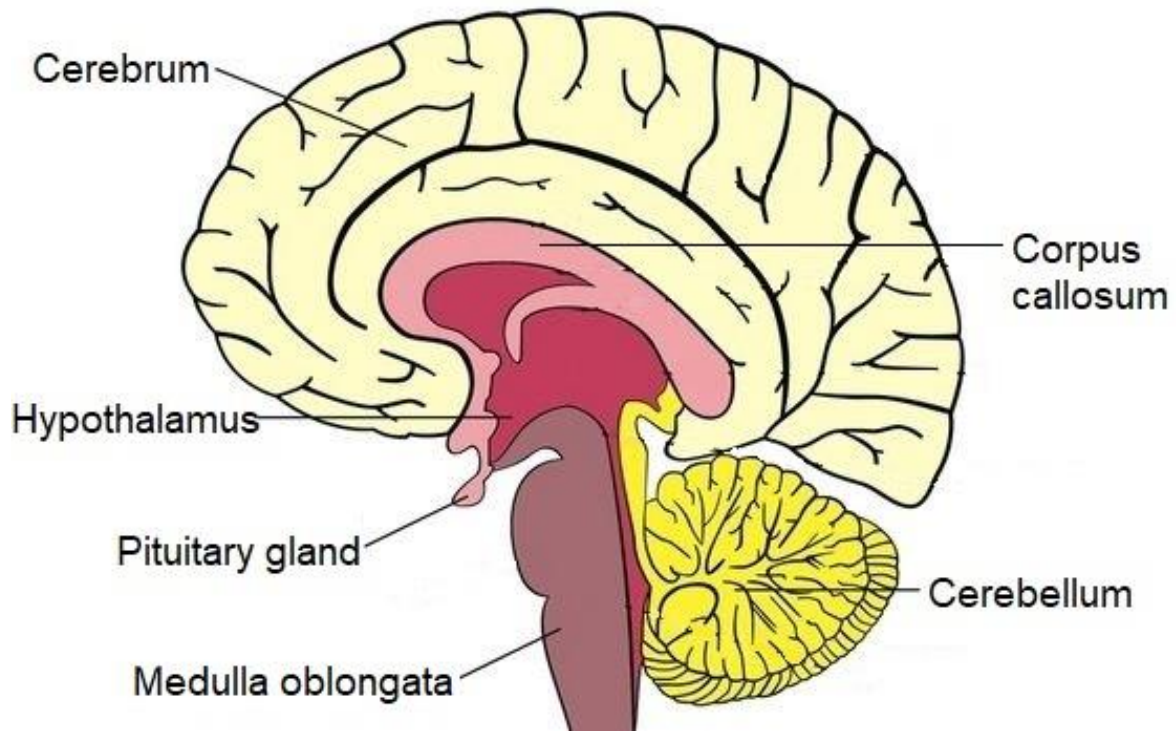
3. Central nervous system (CNS)

☒ Complete the rest of page 2 to 4 using Teacher’s Guidelines slide 3 to 10.

- * Consist of the brain and the spinal cord
 - * Meninges
 - Membrane lining inside of skull and vertebrae
-
- To protect brain and spinal cord
-



The brain



* Cerebrum

-

-

-

-

* Cerebellum

-

-

-

* Medulla oblongata

-

-

* Hypothalamus

-

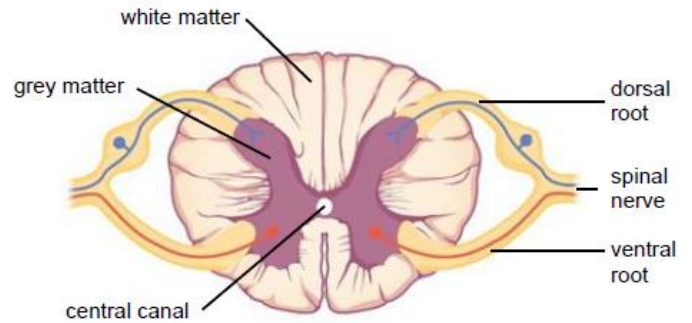
* Corpus callosum

-

-

Spinal cord

- * Long thin tubular structure
- * Extends from medulla oblongata
- * Connects most of peripheral nervous system (PNS) to the brain
- * Part of the reflex action



The Nervous System - CrashCourse Biology #26

🗒️ Do Self-Activity 1.

Self-Activity 1: Identify the parts of the brain which:

1. Controls the heartbeat.
2. Contains the centres that control balance, muscle tone and equilibrium.
3. Communicate between two hemispheres.
4. Has centres that interpret what you see.
5. Co-ordinates voluntary muscle movements.
6. Controls emotions
7. Has grey matter on the inside and white matter on the outside.

Answer to Self-Activity 1 will be shared the morning of Day 2 on the group.

END OF DAY 1

How do you feel about the work from Day 1? 😊 or 😞

If you did not receive 70 % for the Self-Activity, consider working through the content again.

4. Peripheral nervous system (PNS)

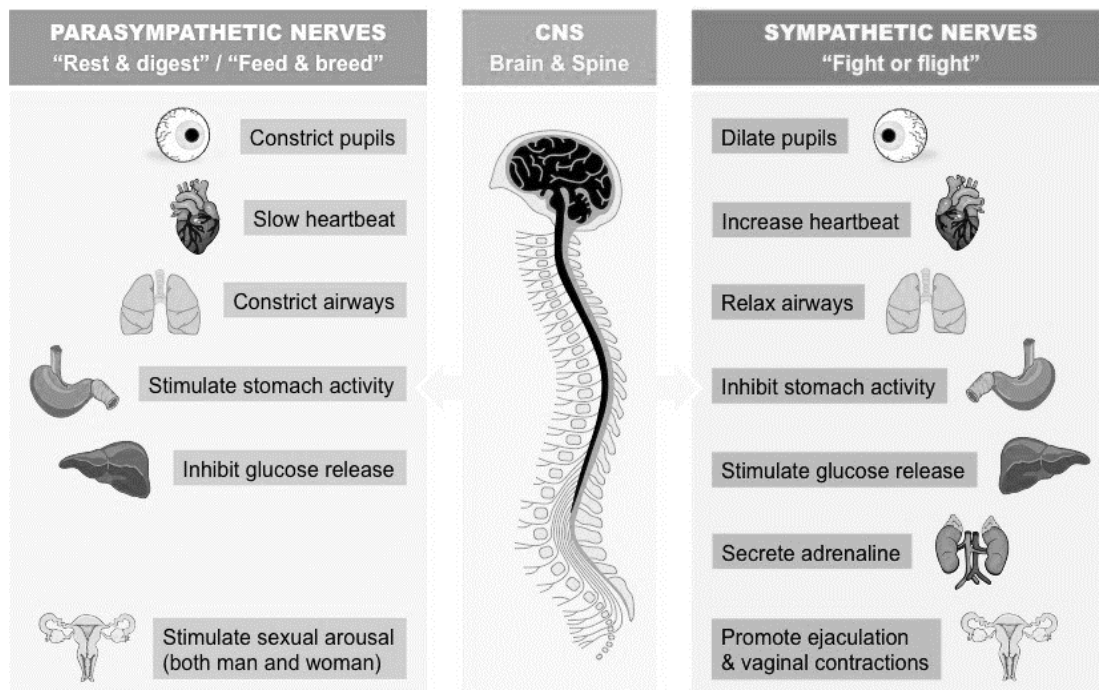
☒ Read through the following section.

- * Nerves found outside the central nervous system (CNS)
- * Carry nerve impulses from the CNS to sites of action (Effectors) in muscles or glands
- * And back to CNS
- * 12 pairs of cranial nerves (head)
- * 31 pairs of spinal nerves (spine)

5. Autonomic nervous system (ANS)

☒ Read through the following section and use slide 13 of the Teacher’s Guidelines to complete the section.

- * Part of the PNS and is found outside the brain and spinal cord
- * Controls internal environment that is regulated by hypothalamus and medulla oblongata
- * Carry nerve impulses from the CNS to sites of action (Effectors) in muscles or glands
- * Divided into:
 -
 -
- * Works antagonistically, e.g.:
In the heart the sympathetic nerves cause the heart rate to increase, while the parasympathetic nerves cause the heart rate to decrease.



☒ Do Self-Activity 2.

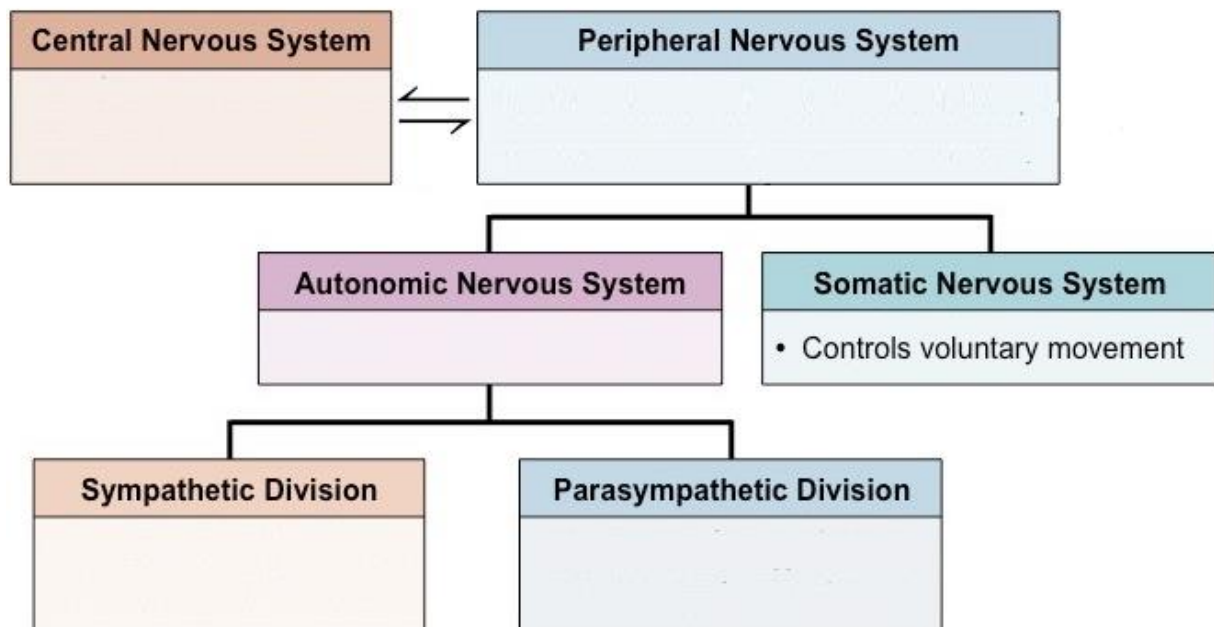
Self-Activity 2: Identify the parts of the brain which:

1. Which part of the nervous systems can be further subdivided to form the sympathetic and parasympathetic systems?

2. Which part of the nervous system is stimulated to release glucose?

3. Which part of the nervous system generally “slows down” body activities?

4. Provide the function for each of the divisions of the nervous system represented in the schematic diagram.



Answer to Self-Activity 2 will be shared the morning of Day 3 on the group.

END OF DAY 2

How do you feel about the work from Day 2? 😊 or 😞

If you did not receive 70 % for the Self-Activity, consider working through the content again.

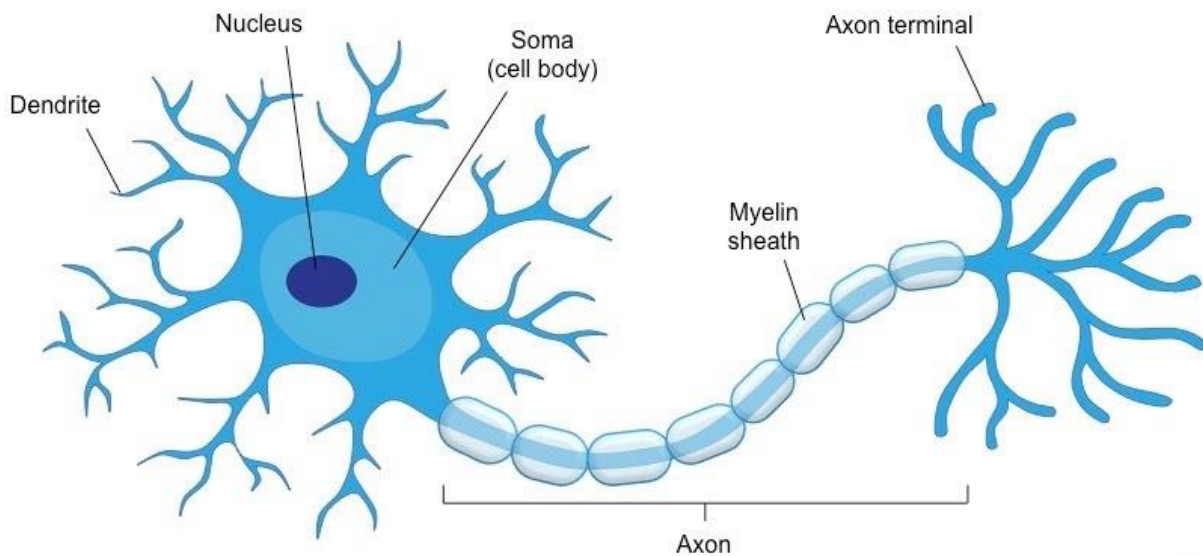
6. Structure and functioning of a nerve

☒ Use slide 16 to 18 of the Teacher’s Guidelines to complete page 7.

Function:

- * A change in the environment is called a stimulus
- * Nervous system consists of nerves
-
- * Nerves are made up of nervous tissue
- * Detect and react to changes in our environment
- * Nerve tissue or sense organs (receptors) pick up stimuli
-
- * Nerve messages are called impulses
- * Neurons carry impulses to the CNS
- * Effectors bring a response to stimuli

Neuron structure



* Cell body

-

* Dendrites

-

* Axon

-

* Myelin sheath

-

* There are **three** types of neurons

1. Sensory neurons (afferent neuron)	2. Motor neuron (efferent neuron)
<ul style="list-style-type: none">- Senses the stimulus- Carry impulses from a sense organ (receptor) to CNS	<ul style="list-style-type: none">- Response to stimulus- Carry impulses from CNS to effector organ (muscle or gland)- Effectors bring about the response

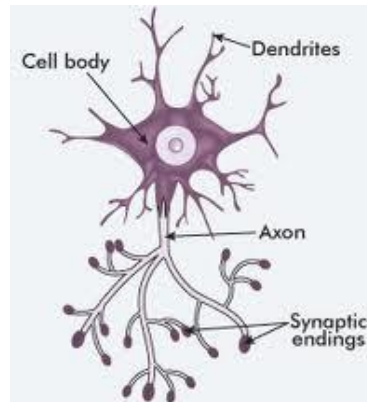
☒ **Do Self-Activity 3: Draw the sensory neuron and a motor neuron from your textbook page 196.**

Diagram	Diagram
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3 Interneuron (connector)

- Found in CNS

- Links sensory and motor neuron



Answer to Self-Activity 3 will be shared the morning of Day 4 on the group.

END OF DAY 3

How do you feel about the work from Day 3? 😊 or 😞

If you are unsure of the work, consider working through the content again.

7. The simple reflex arc

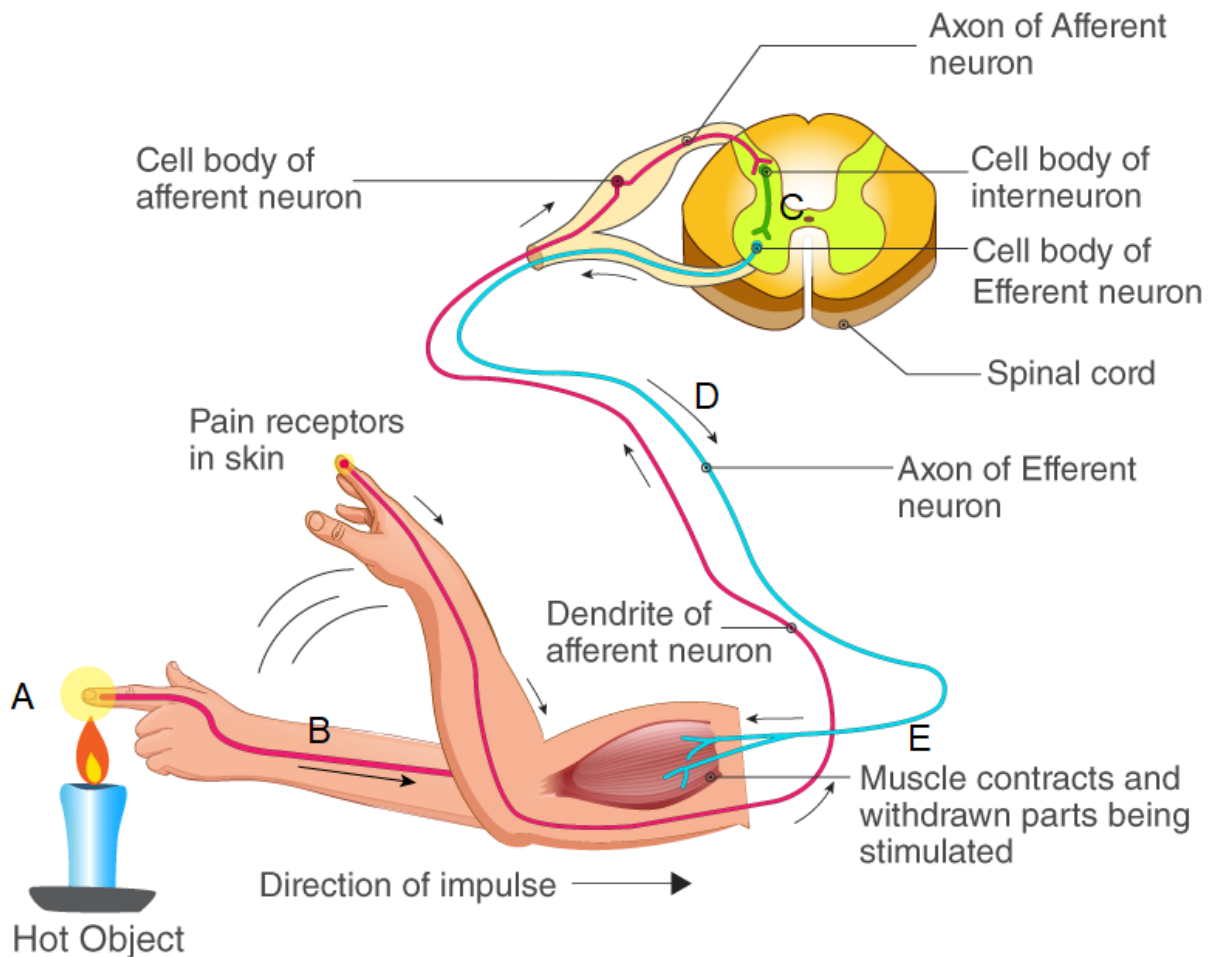
☒ **Read through the following section.**

The **reflex action** is a quick automatic action that involves the spinal cord. It plays a vital role in protecting the body from harm

The **reflex arc** is the path along which an impulse is transmitted to bring about a response.

- Pathway

Receptor (A) → Sensory neuron (B) → Interneuron (C) → Motor neuron (D) → Effector (E)



- A Receptor nerve endings in skin of finger receive the heat stimulus and converts into impulse.
- B Impulse is conducted by the sensory neuron to the spinal cord via dorsal root of spinal nerve.
- C Impulse is carried from the sensory neuron to the motor neuron in the spinal cord
- D Impulse carried through the motor neuron along the ventral root of the spinal nerve to the muscle of the arm.
- E Causes a rapid movement of the hand away from the source of the heat (impulse is conveyed along the spinal cord to brain, where sensation of heat interpreted in the cerebrum as pain – the finger is removed from the flame **before** the impulse travels to the brain.)

You must be able to write a paragraph AND able to label a diagram AND know the flowchart of the pathway.

☒ Use slide 22 to 24 of the Teacher's Guidelines to complete page 11.

* Significance of reflex arc

-

-

-

-

Synapses

* Microscopic gap between the end of the axon of one neuron and the dendrite another of neuron

* Significance of synapses

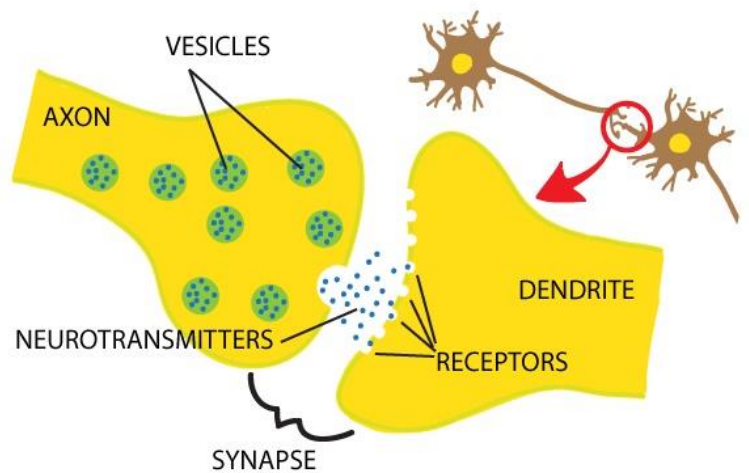
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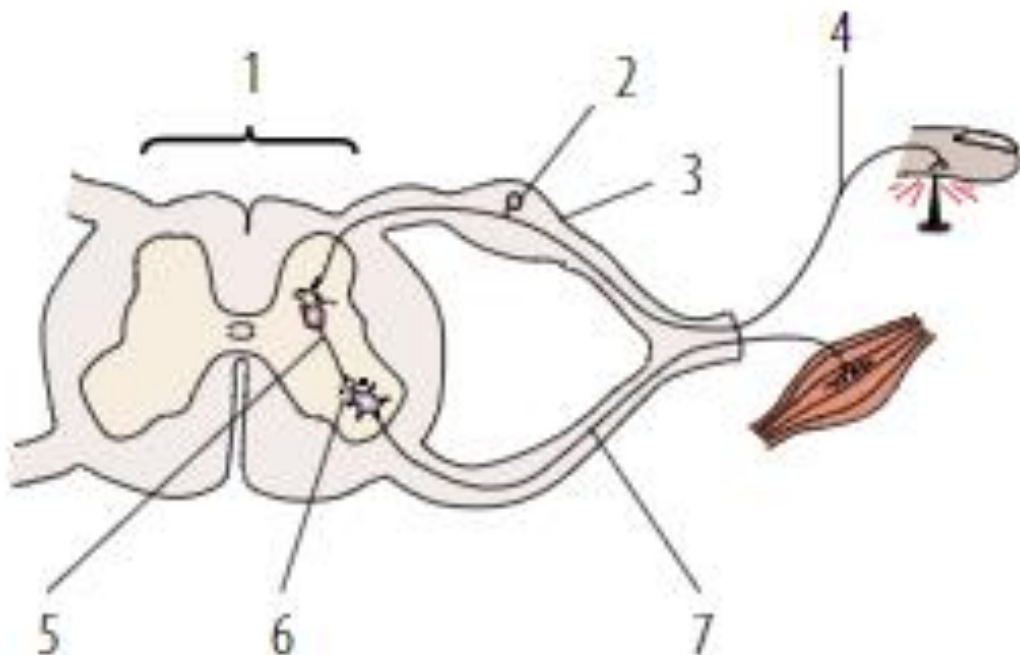
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☒ Do Self-Activity 4:

1. Study the diagram of a reflex arc and answer the questions that follow:



a) What is the difference between a reflex arc and a reflex action?

(4)

b) Identify parts:

1 - _____

2 - _____

3 - _____

4 - _____

5 - _____

(5)

c) What is the tiny (microscopic) gap between two consecutive neurons, shown by 6, called?

d) I Name the part of the neuron numbered 7.

II What part of the neuron is indicated by the number 7?

III State the function of the neuron numbered 7.

e) Mention FIVE examples of a reflex arc in the human body.

(5)

f) What will the consequences be for the body if the part numbered

I - 4 is damaged?

_____ (2)

II - 7 is damaged?

_____ (2)

g) Name, in the correct order, the neurons involved in transmitting an impulse during a reflex action.

_____ (3)

Total: 27

Answer to Self-Activity 4 will be shared the morning of Day 5 on the group.

END OF DAY 4

How do you feel about the work from Day 4? 😊 or 😞

If you did not receive 70 % for the Self-Activity, consider working through the content again.

8. Disorders of the CNS

☒ Use your textbook to complete the following information.

<p>Alzheimer's disease</p> <p>Disease of the brain causing a slow decline in brain functioning. Synapses in the brain become clogged with chemicals</p>	<p>Multiple Sclerosis (MS)</p> <p>Disease whereby scarring on the myelin sheath interrupts nerve impulses. Immune system attacks myelin sheaths of the neuron causing disruption in impulse transmission</p>
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Causes

--	--

Symptoms

--	--

END OF DAY 5

How do you feel about the work from Day 5? 😊 or ☹️

If you are unsure of the work, consider working through the content again.

9. Receptors

Function:

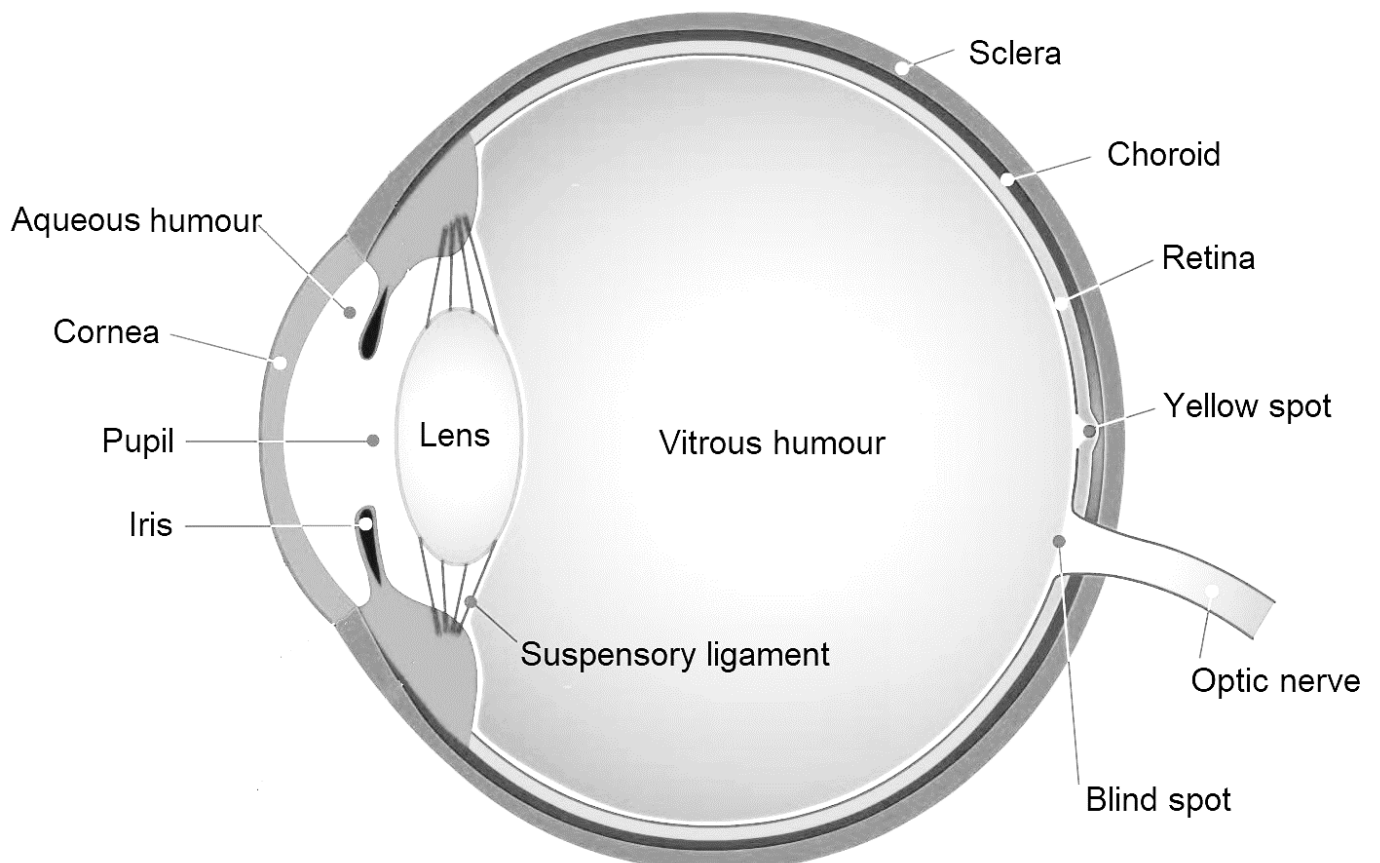
- * Detect different stimuli
- * Converts stimulus into nerve impulse
- * Transported to CNS
- * Impulse is interpreted and the body reacts according to stimuli

☒ Use slide 27 of the Teacher’s Guidelines to complete the table below.

* Stimulus	Receptor position	Sense
Light		
Sound		
Movement / change of body position		
Chemicals in gaseous form		
Chemicals in solution		
Pressure		
Temperature change		

10. Human eye

Structure



☒ Use slide 29 to 33 of the Teacher's Guidelines to complete page 16.

Sclera

* _____
F - _____

Lens

F _____

Choroid

* _____
F - _____
- _____

Suspensory ligaments

F _____

Retina

* _____
F - _____
- _____

Iris

* _____

Yellow spot

* _____
F - _____

Aqueous humour (front)

* _____
F - _____

Optic nerve

* _____

Pupil

* _____
F _____

Blind spot

* _____

Cornea

F - _____

- _____

Vitreous humour (inside)

* _____
F - _____

END OF DAY 6

How do you feel about the work from Day 6? 😊 or 😞

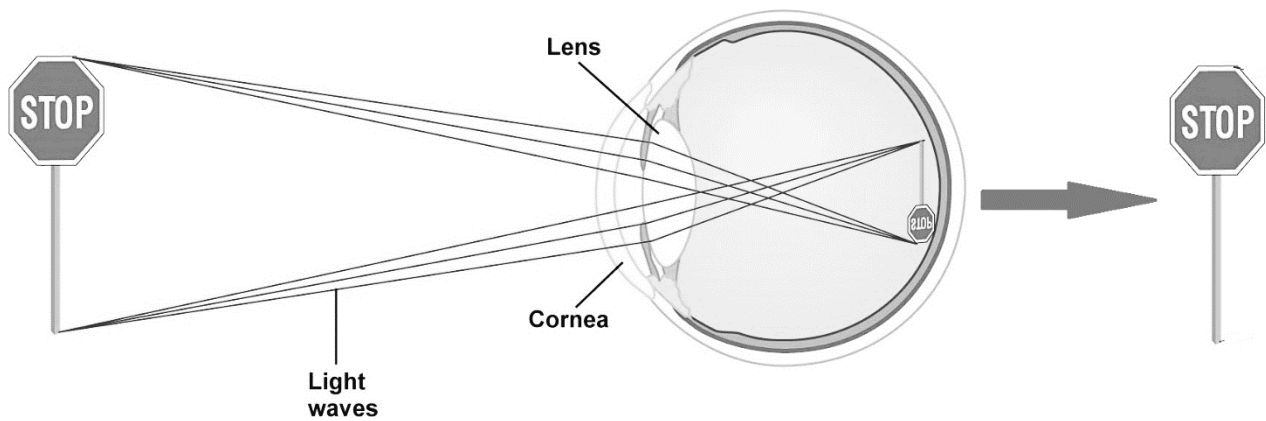
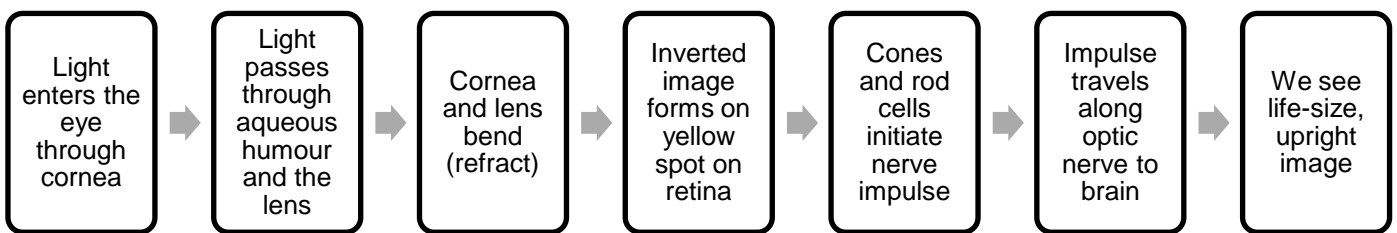
If you are unsure of the work, consider working through the content again.

☒ **Read through the following section.**

Functioning

- * Binocular vision (two eyes in humans)
 - Light rays enter eye and becomes focuses on retina
 - Eyes are used together
 - Wider field of view

Sequence



 **Vision- Crash Course A&P #18**

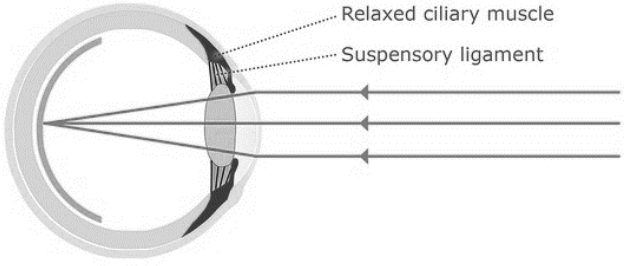
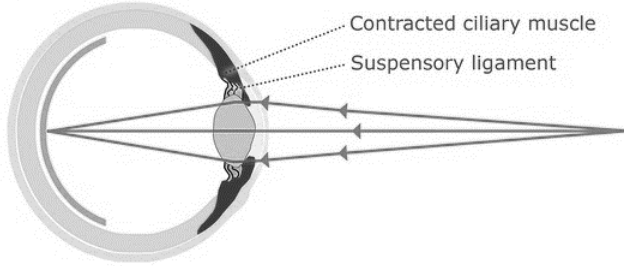
Changes in the eye

* Accommodation

Must know the steps and identify by means of diagram.

Definition: Adjustment of the shape of the lens to see objects clearly whether they are far away or close by.

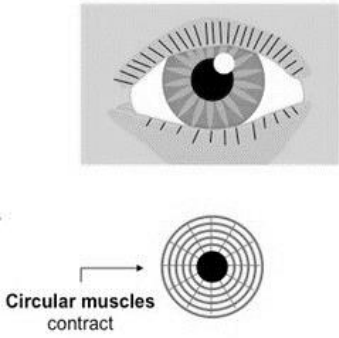
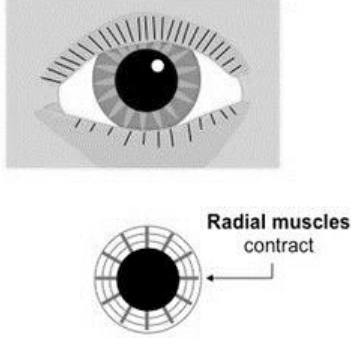
☒ Use slide 36 to 39 of the Teacher's Guidelines to complete the following table.

Distant vision (objects further than 6m)	Near vision (objects closer than 6m)
	
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.

* Pupillary mechanism / Pupil reflex (reflex action)

Definition: Regulating the amount of light entering the eye by adjusting the size of the pupil.

☒ Use slide 40 to 41 of the Teacher's Guidelines to complete the following table.

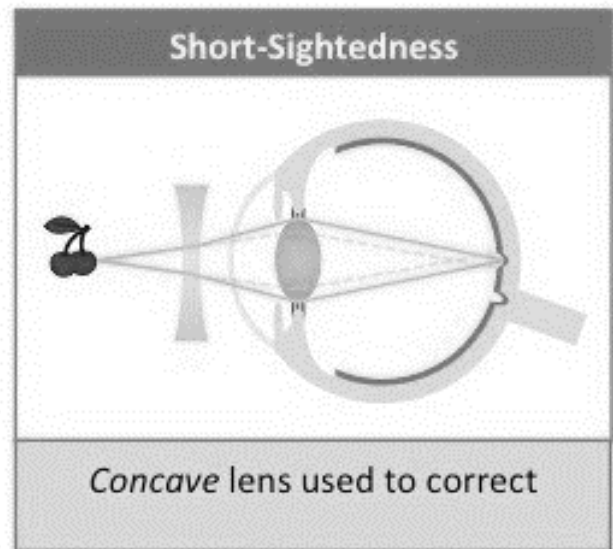
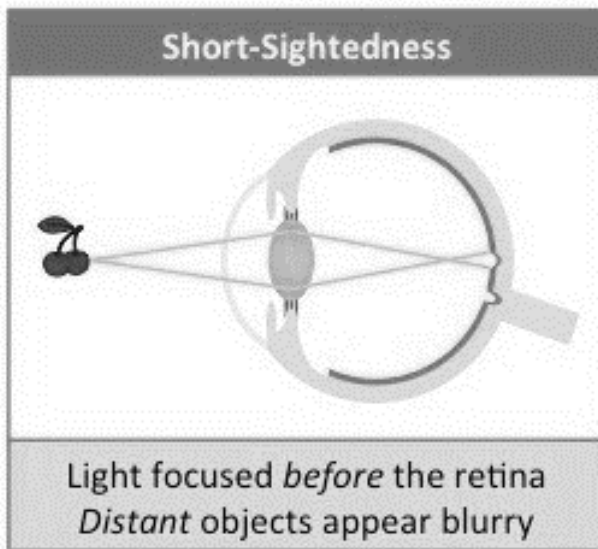
Bright light	Dim light
	
1.	1.
2.	2.
3.	3.
4.	4.

☒ Read through the following two pages.

Visual defects

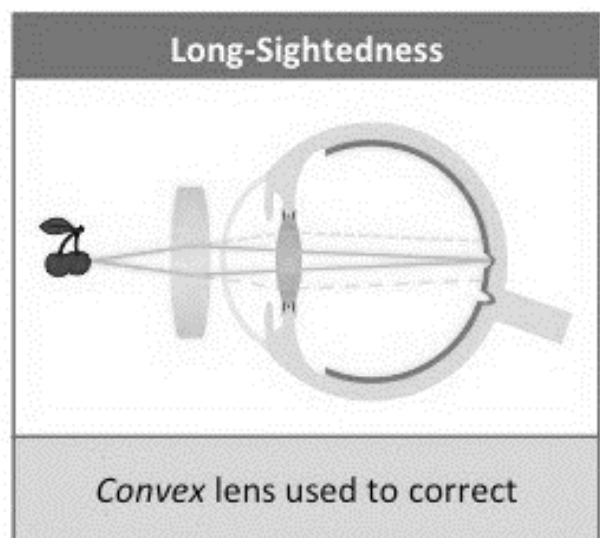
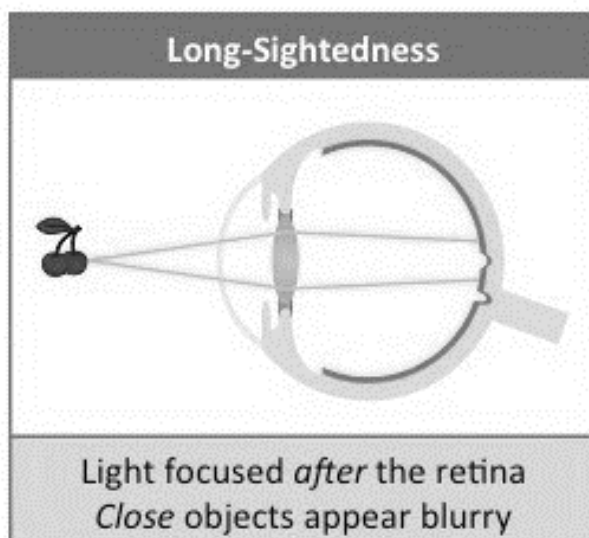
* Short-sightedness (Myopia)

- Near objects can be seen clearly
- Lens cannot become more flat / eyeball is longer than normal
- Lens bends light rays too much
- Light falls in front of retina causing image to blur



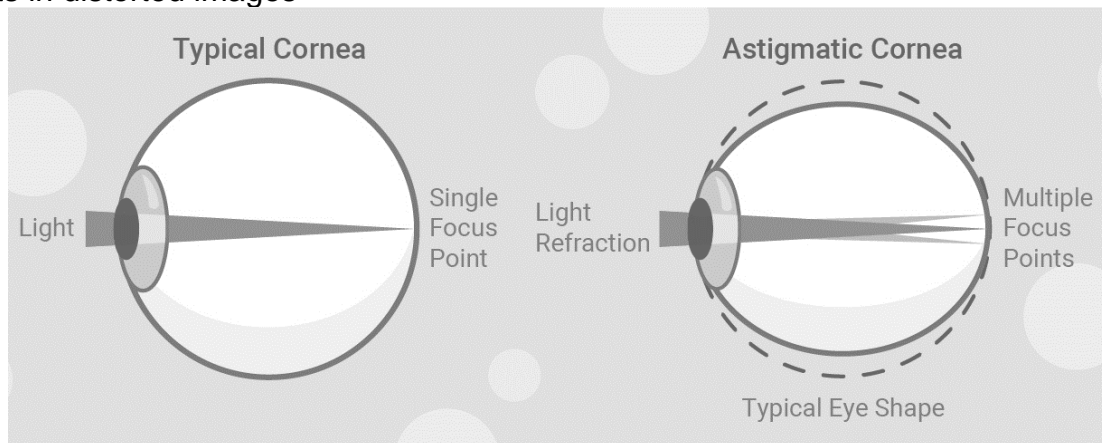
* Long-sightedness (Hyperopia)

- Objects far away are seen clearly
- Lens cannot become more convex / eyeball shorter than normal
- Lens does not bend light rays enough
- Light falls behind retina causing a blurry image



* Astigmatism

- Curvature of lens or cornea uneven
- Results in distorted images



- Corrected with glasses shaped to correct distortion

* Cataracts

- Lens becomes cloudy and opaque
- Light not properly transmitted through retina
- Blurred vision
- Corrected with surgery to replace the lens with a synthetic lens

☒ Do Self-Activity 5:

Self-Activity 5

A ball was hit 50 m high during a day-night cricket match. Amla ran very fast to position himself under the ball and caught it against the bright flood light.

1. Describe the changes that occurred in Amla's eyes while he focused on the ball as it reached his hands. (4)

2. Describe the changes that occurred when he looked at the bright light. (5)

3. Explain the role of adrenalin in enabling him to run fast. (8)

Answer to Self-Activity 5 will be shared the morning of Day 8 on the group.

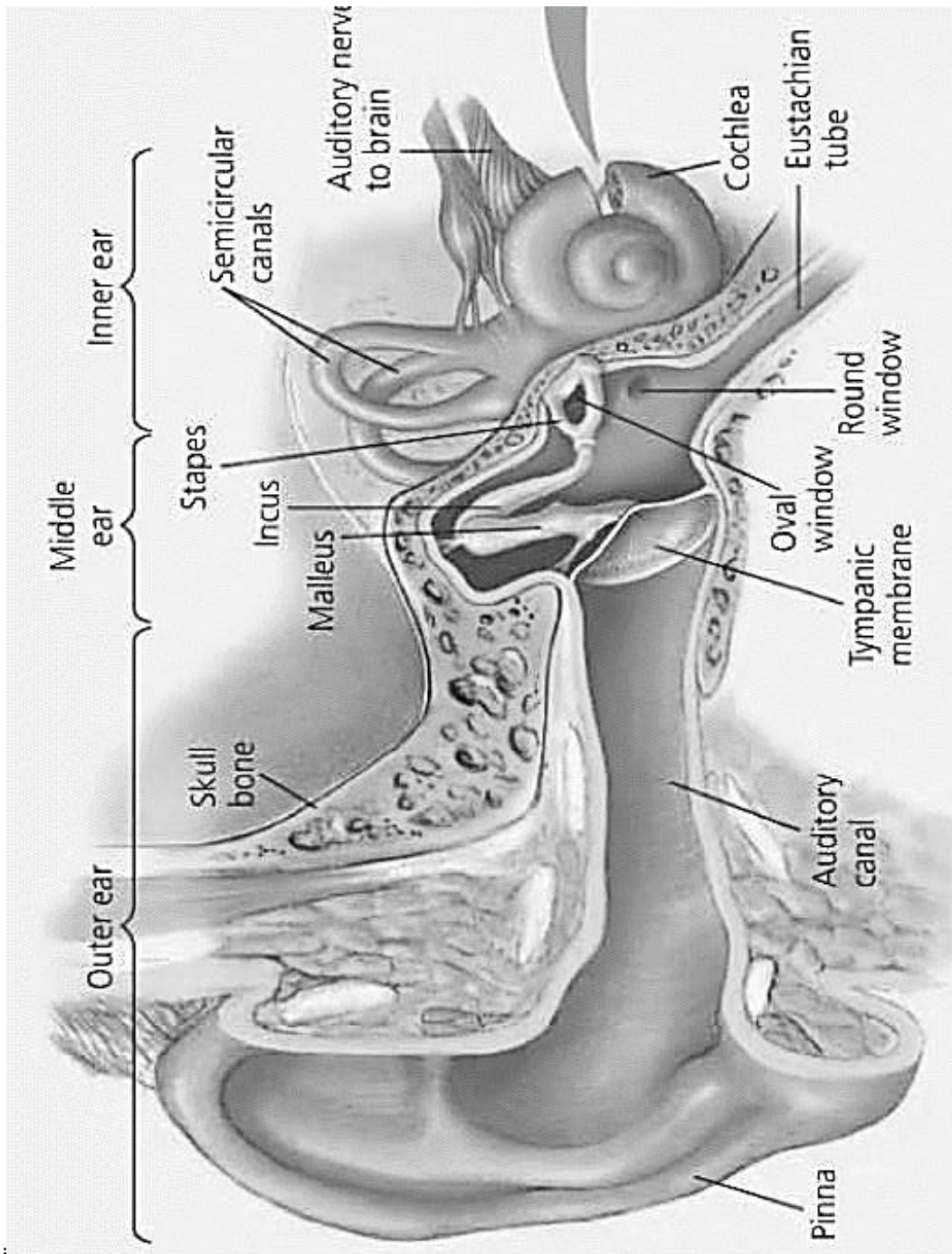
END OF DAY 7

How do you feel about the work from Day 7? 😊 or 😞

If you did not receive 50 % for the Self-Activity, consider working through the content again.

11. Human ear

Structure



☒ Use slide 48 to 53 of the Teacher's Guidelines to complete page 23.

A. Outer ear

Pinna

*

Auditory canal (Ear canal)

*

B. Middle ear

Tympanum / Tympanic membrane

*

*

Eustachian tube

*

*

Ossicles (small bones)

*

*

C. Inner ear

Oval window

*

Semi-circular canal

*

Cochlea

*

*

Round window

*

Sacculus and utriculus

*

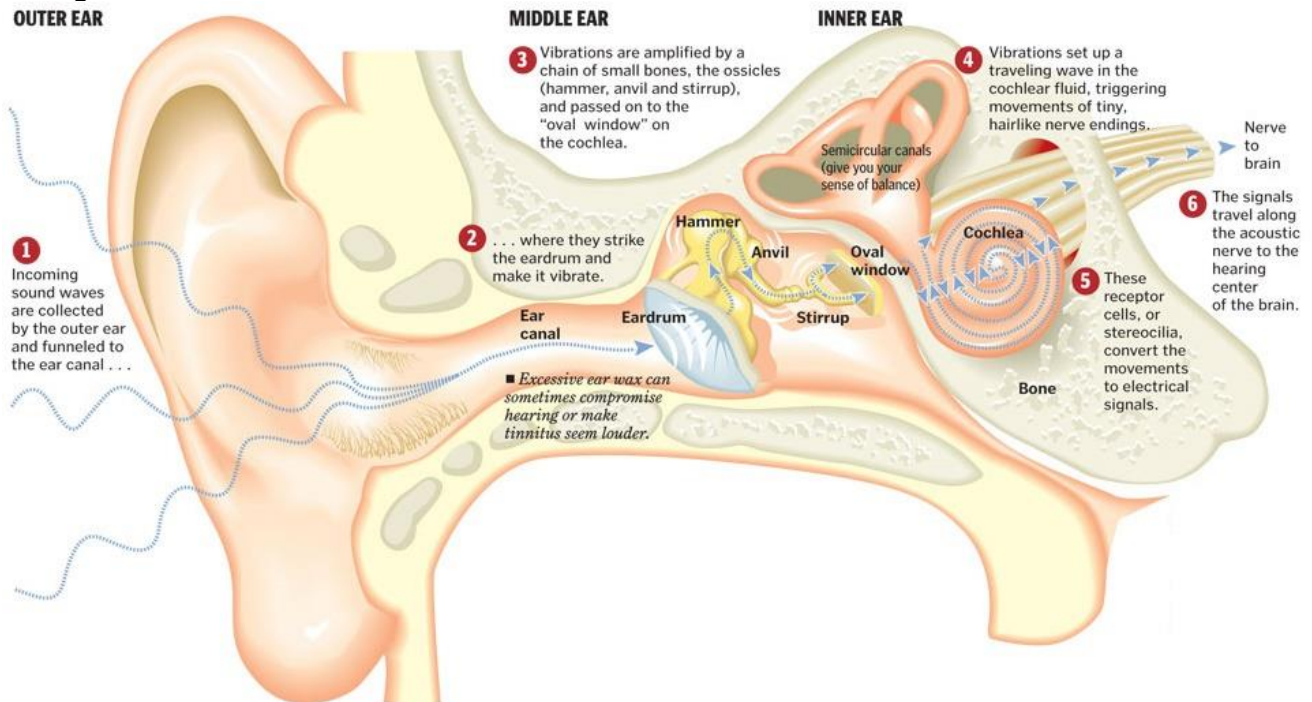
Auditory nerve

*

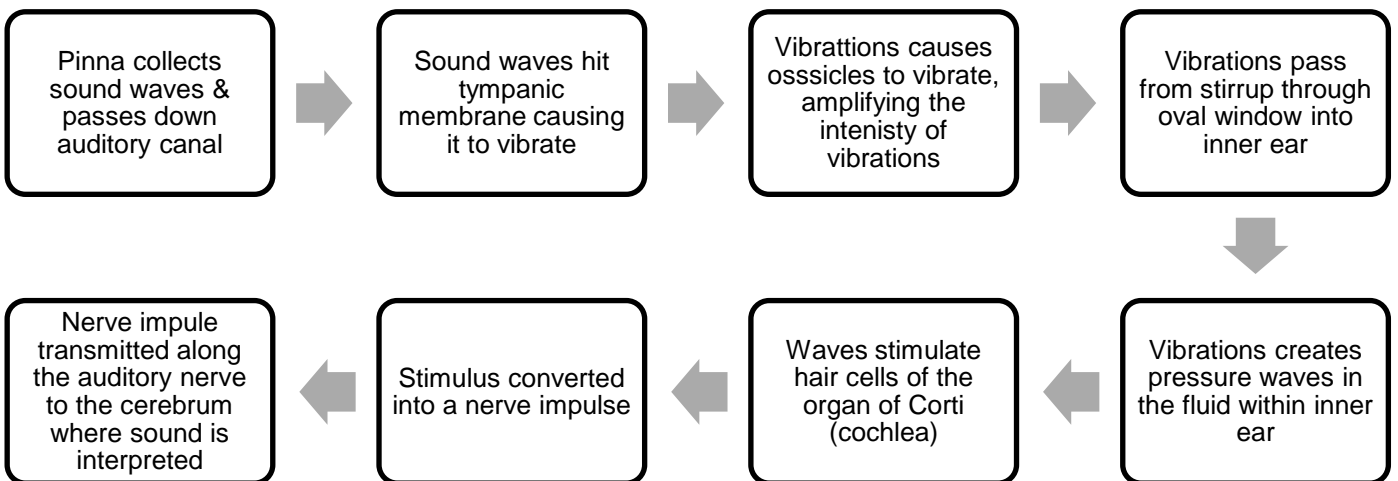
☒ Read through the following page.

Functioning

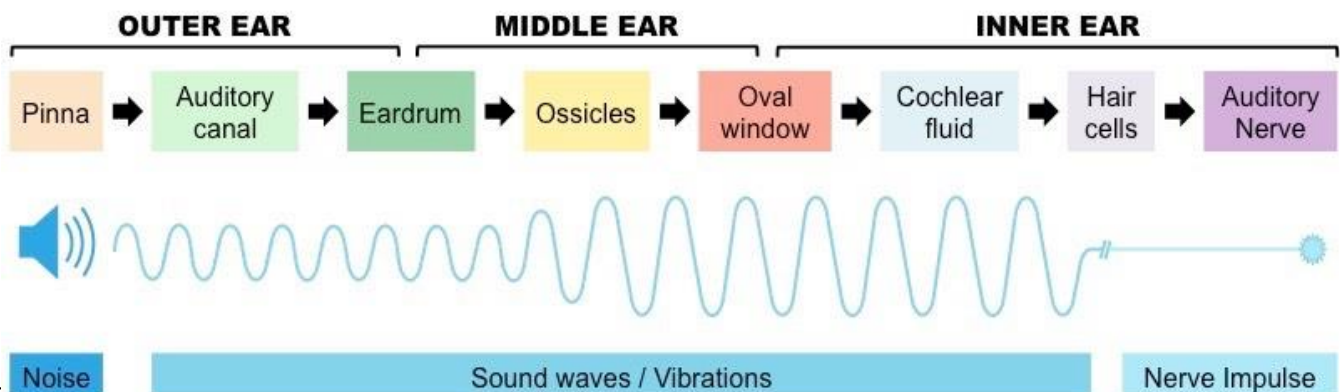
Hearing



Sequence

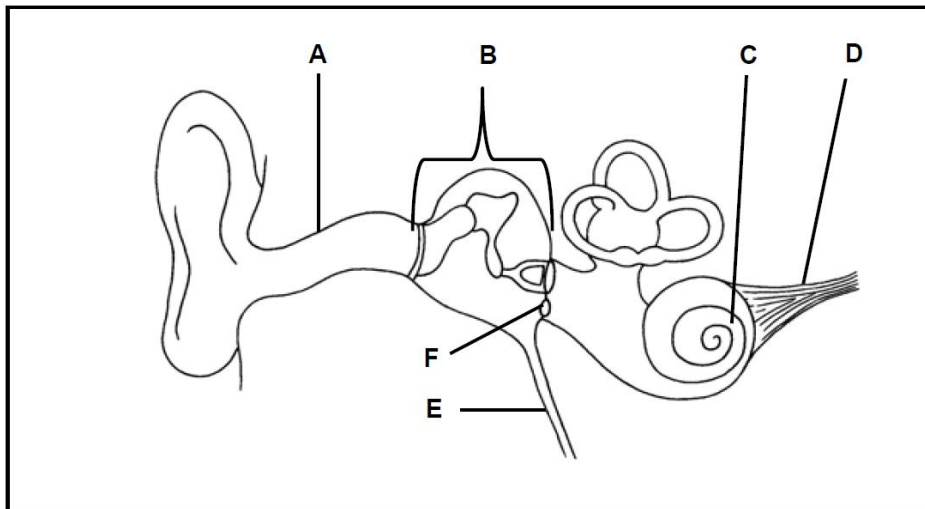


The sound vibrations are transmitted from the **large tympanic membrane** to the **smaller oval window** through the ossicles which are arranged from **largest to smallest**. This concentrates the vibrations, amplifying them.



☒ Do Self-Activity 6:

Self-Activity 6: Study the diagram below.



- 1 Give ONE function of part:
 - a) A _____ (1)
 - b) E _____ (1)
 - c) F _____ (1)

2. Write down only the LETTER of the part where sound is transmitted in the form of:
 - a) A pressure wave in a liquid _____ (1)
 - b) An electrical impulse _____ (1)

3. Explain the effect if the receptors in region C are damaged. (3)

4. Describe how the parts of the middle ear, including the membranes, assist with amplifying sounds. (3)

Total: 11

Answer to Self-Activity 6 will be shared the morning of Day 9 on the group.

END OF DAY 8

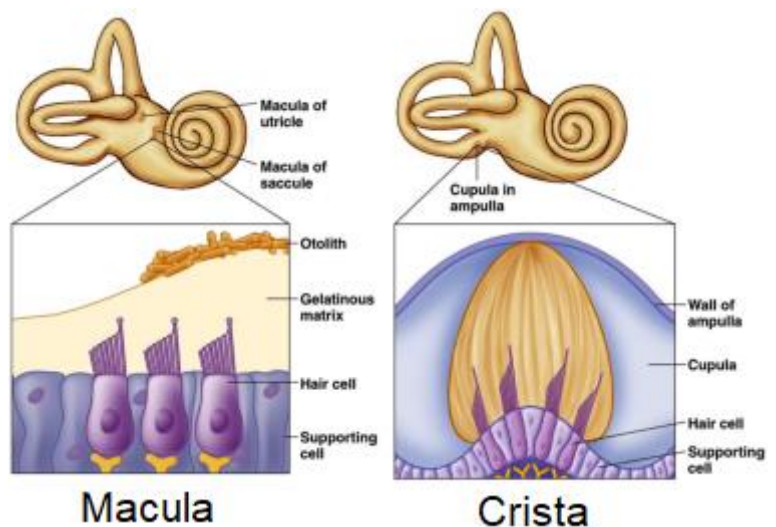
How do you feel about the work from Day 8? 😊 or 😞

If you did not receive 50 % for the Self-Activity, consider working through the content again.

☒ Read through the following section.

Balance

- * Controlled by three semi-circular canals in inner ear that lies at right angles with one another
- * Cristae in semi-circular canals stimulated by changes in direction and speed of movement
 - As head turns in one direction the liquid in the canal will move
 - This moves the jelly-like cupula of crista
 - Pulling force exerted on sensory hair cells (hair cells are stimulated).
- * Maculae in sacculus and utricle stimulated by changes in position of head
 - Responds to gravity
 - As head changes position pressure increases on the hair cells
- * When stimulated
 - Cristae and maculae convert stimuli received into nerve impulses
 - Transported along auditory nerve to cerebellum
 - Cerebellum sense impulses to muscle to restore balance



Balance can be combined with a reflex.

📺 Hearing & Balance- Crash Course A&P #17

☒ Do Self-Activity 7:

Self-Activity 7

A person walking barefoot stepped on a thorn with his left foot. He immediately withdrew his left foot, balancing himself on his right foot., as well as

1. Describe the process of the reflex action that takes place. (8)

2. Describe how the person maintained their balance and body position.

Total: 17

Hearing defects

☒ Use your textbook to complete the following table.

Middle ear infection	Deafness
Causes	
-	-
-	-
	-
-	
-	
Middle ear infection	Deafness
Treatment	
-	-
-	-

Answer to Self-Activity 7 will be shared the morning of Day 10 on the group.

END OF DAY 9

How do you feel about the work from Day 9? 😊 or 😞

If you are unsure of the work, consider working through the content again.

☒ Do Self-Activity 8:

Self-Activity 8: Questions from previous Grade 12 NSC Examinations (Feb 2017).

QUESTIONS 1.1.7 AND 1.1.8 REFER TO THE INVESTIGATION BELOW.

An investigation was carried out to determine the fertility levels of healthy males in different age groups.

The procedure followed was as follows:

- 50 healthy males in each of the following age groups were asked to participate: 20–29, 30–39, 40–49, 50–59 and 60–69.
- Semen was collected from each of the males.

The number of active sperm cells present in the semen was counted for each man in each age group and averages were calculated.

1.1.7 Which ONE of the following is the dependent variable in the investigation?

- A Fitness levels of the males
- B Age groups of the males
- C Number of active sperm cells
- D Amount of semen

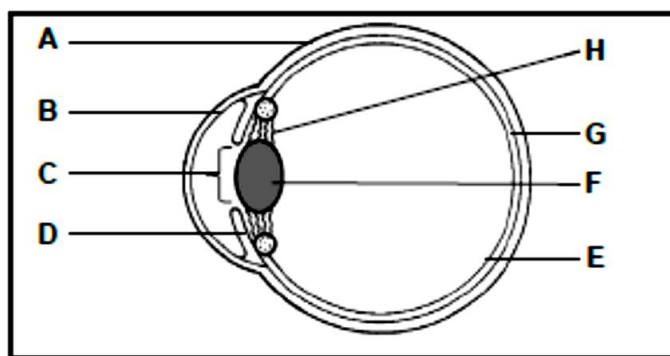
1.1.8 Which ONE of the following variables was kept constant during this investigation?

- A Number of participants in each age group
- B Fertility levels of males in each age group
- C Number of active sperm cells
- D Age groups of the males

1.2.3 A disorder of the nervous system that is characterised by the breakdown of the myelin sheath of neurons

1.2.7 A part of the neuron that conducts impulses towards the cell body

1.5 The diagram below represents a section through a human eye.



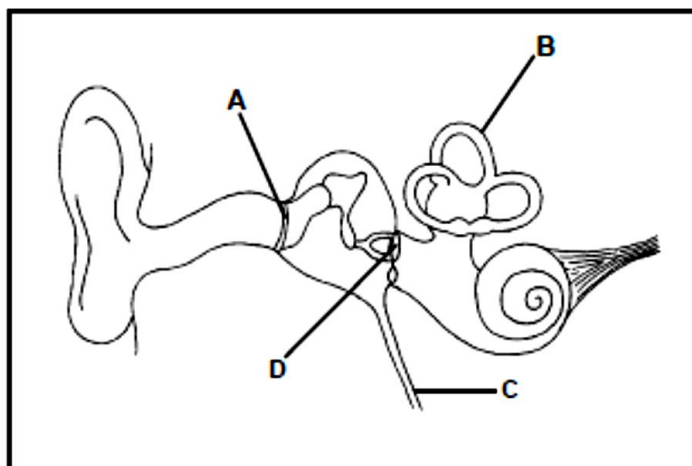
1.5.1 Identify:

- (a) A (1)
 (b) B (1)
 (c) C (1)

1.5.2 Give the LETTER and NAME of the part that:

- (a) Regulates the amount of light entering the eye (2)
 (b) Contains a dark pigment that absorbs excess light in the eye (2)
 (c) Contains receptors sensitive to light (2)
(9)

2.4 The diagram below represents parts of the human ear.



2.4.1 Identify parts:

- (a) B (1)
 (b) C (1)
 (c) D (1)

2.4.2 Explain how parts A and D together are adapted to amplify sound. (3)

2.4.3 State ONE advantage of the middle ear being filled with air. (1)

(7)

2.5 Read the extract below.

A LINK BETWEEN CONCUSSION AND BRAIN DAMAGE

In 2002 a former American football player was found dead in his truck. The doctor who handled the autopsy discovered that the football player had severe brain damage and that his death was caused by repeated blows to the head or repeated concussions. He called this disorder chronic traumatic encephalopathy (CTE).

A more recent study was conducted which involved the brains of 165 people who played football at high school, college or professional level. The study found evidence of CTE in 131 of the brains.

[Adapted from www.wikipedia.org and www.theatlantic.com]

- 2.5.1 The part of the brain affected by CTE is the cerebrum.
State TWO possible symptoms of this disorder. (2)
- 2.5.2 State ONE way in which the brain is protected. (1)
- 2.5.3 Explain why CTE does not usually affect essential life processes such as breathing or heart rate. (2)
(5)

QUESTION 4

Nontobeko had been walking in the desert, without water, for two days, when she suddenly heard a sound behind her. She turned her head and saw a snake coming towards her. She became scared and turned around to run away. As she was running, she tripped and fell.

describe how her balance would have been restored after she fell down.

Content (5)

Synthesis (3)

TOTAL: 42

Answer to Self-Activity 6 will be shared the morning of Day 11 on the group.

END OF DAY 10

How do you feel about the work from Day 10? 😊 or 😞

If you did not receive 50 % for the Self-Activity, consider working through the content again.

END OF TOPIC 6