Neurons - Biopsychology

This prep will consider the structure and function of sensory, relay and motor neurons; the process of synaptic transmission, including reference to neurotransmitters, excitation and inhibition.

TASK 1:

Read the information in the biopsych pack titled "what are neurons and how do they work?"

a) Develop between 1-5 questions using the information. Try and make them increase in difficulty, with the first one being really easy and the last one being challenging. *Write down the answers too*. In class you may be asked to pose these questions to each other (like a mini interview to test each other).

Q1)

Q2)

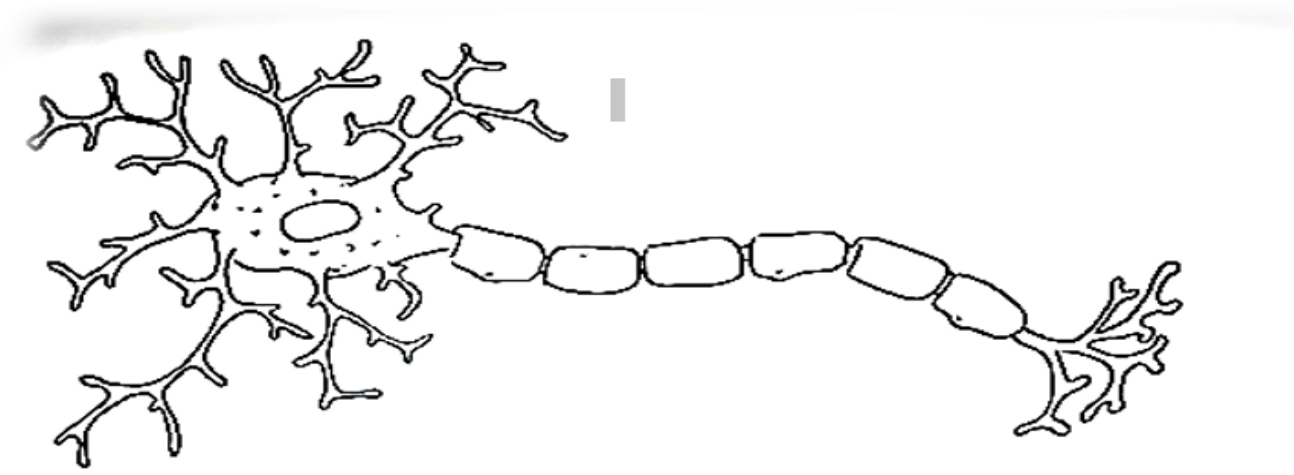
Q3)

Q4)

Q5)

Watch this youtube clip upto 1 min 10 https://www.youtube.com/watch?v=FVo04B0_5R4 **and label the neuron with the terms below:**

Dendrites Cell Body (Soma) Axon Myelin Sheath Synaptic Terminal



Task 2:

Continue watching the youtube clip above (2.19-3.08 mins) and label the diagram of the synapse with the terms below:

Pre-synaptic membrane Post synaptic membrane Synaptic terminal Synaptic Cleft

Vesicles containing neurotransmitters

https://www.youtube.com/watch?v=FVo04B0_5R4

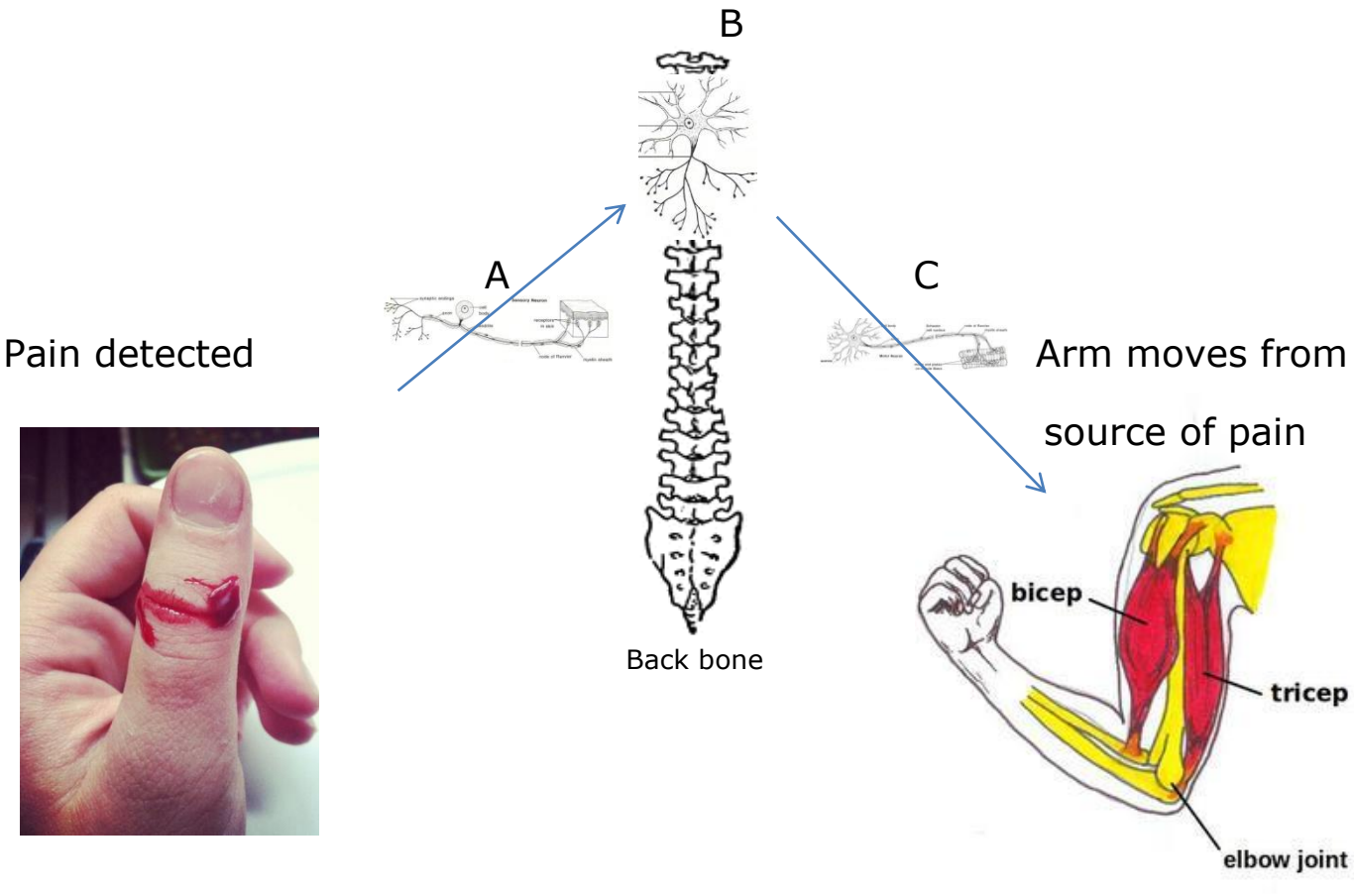
Watch the video on synaptic transmission on psych205

Summarise <u>in your own words</u> the process of synaptic transmission. Include a definition of the terms excitation and inhibition:

Sensory, motor and relay neurons

Read the information in the biopsych pack about the different types of neurons and have a go at Task 3 and 4.

Task 3: Label which neuron is represented in the diagram below (A, B, C)



TASK 4: **True or False? If false, make the corrections.**

a. Motor neurons send signals from the CNS to the muscles and glands

b. Muscles and glands are sometimes called effectors

c. Sensory neurons often have short dendrites and short axons

d. The CNS is consists entirely of motor neurons

e. Relay neurons are also known as interneurons

f. There are over 200 interneurons in the CNS

g. Sensory neurons send signals to the brain and spinal cord from the sense organs

h. Relay neurons only connect to sensory neurons

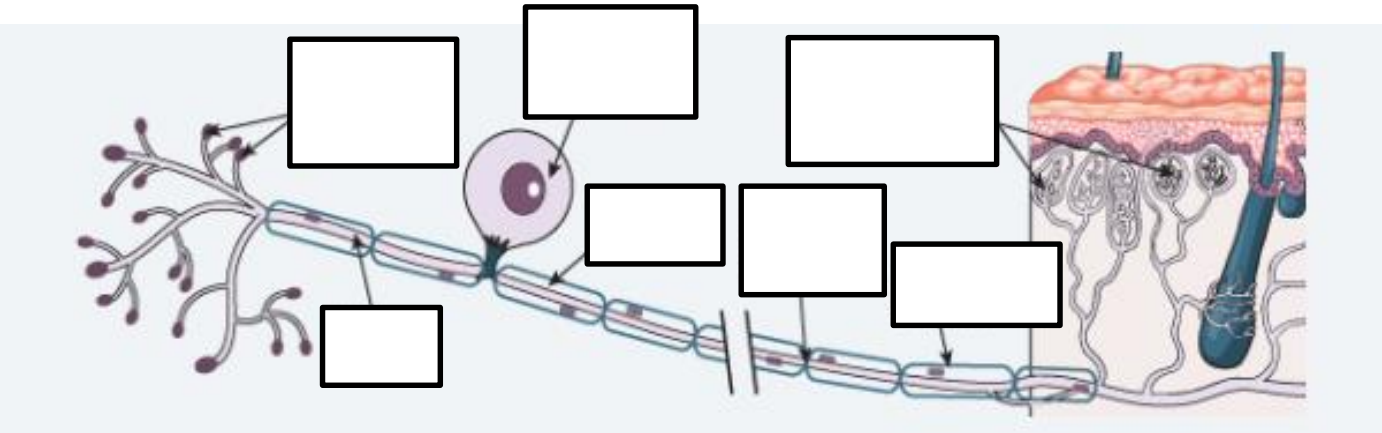
i. Relay neurons can connect to other relay neurons

j. There are gaps between the connections of neurons

Task 5: **label the key structures to each neuron. Use the terms to fill in the boxes**

Sensory Neurons

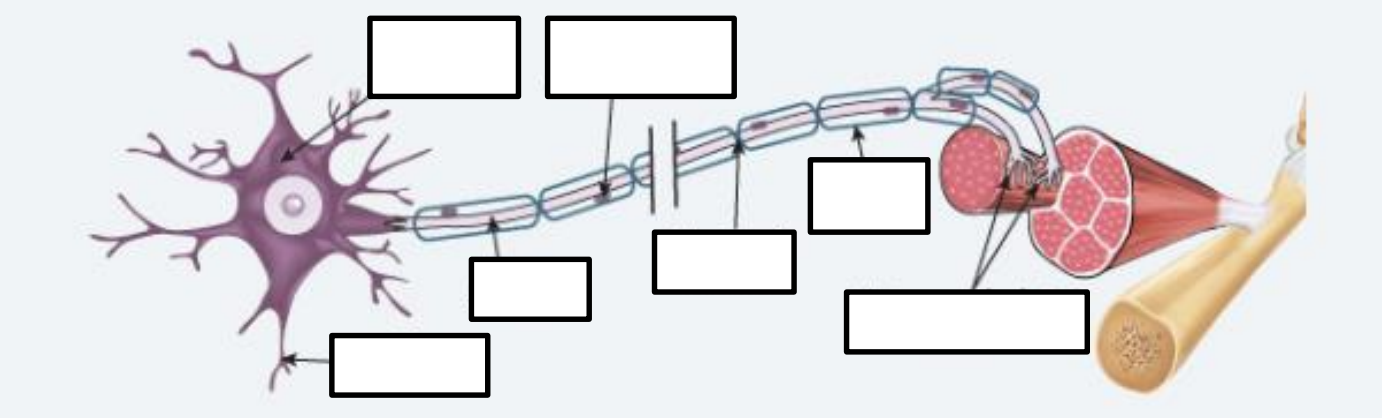
Synaptic endings Node of Ranvier Skin receptors Axon Dendrite Cell body Myelin sheath



Motor Neurons

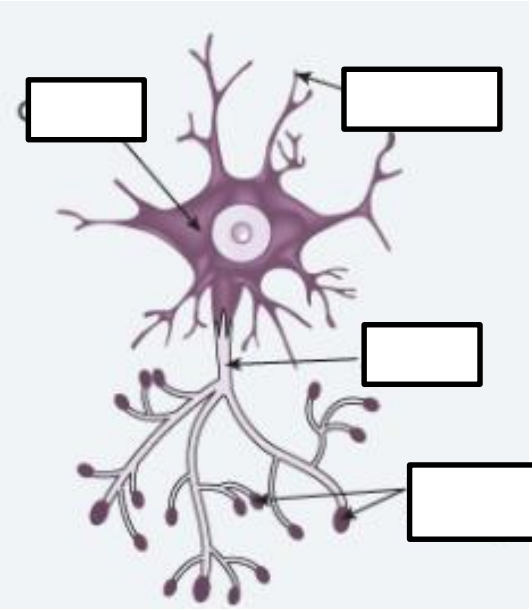
Motor end plates Axon Dendrites Schwann cell nucleus

Node of Ranvier Myelin Sheath Cell body



Relay Neurons

Cell body Axon Synaptic endings dendrites



Task 3b

Draw an arrow to add the direction of impulse to each neuron (in other words, which way is the signal travelling?)

Extension task

Finished quickly? Well done. Go to this site and read more information about nerve cells

TASK 6: Read the further information about each neuron and answer the questions that follow

Sensory neurons are also known as afferent neurons, meaning moving towards a central organ or point, that is they move impulses towards the **CNS** . This type of neuron receives information or stimuli from sensory **receptors** found in various locations in the body, for example the eyes, ears, tongue, skin. This information enters sensory neurons through the **dendrites** and passes it to the cell body – the control centre of the cell. From here it is sent through the axon, until it reaches the end of the neuron (**axon terminals**). Electrical impulses flow in one direction only through a neuron. So just like a series of electrical power lines that pass electricity through the suburbs of a city, so too do electrical impulses flow through the body along thousands of tiny neurons.

In sensory neurons, the cell body and dendrites are located outside the spinal cord in the torso, arms and legs. The dendrites (also known as dendrons) are usually long and the axons short.

Motor neurons are also known as efferent neurons meaning 'moving away from a central organ or point', that is they move impulses away from the CNS. This type of neuron takes information or responses from the brain to muscles or organs, which are referred to as effectors. The information enters a motor neuron through the dendrites, which then passes it into the cell body. From here it is sent down through the axon until it reaches the end of the neuron (axon terminals). If a motor neuron connects with a muscle, the axon terminals are called **motor end plates** . In a motor neuron, the dendrites are usually short and the axons are typically long. Information about a response required has been formulated in the brain and sent through motor neurons in the form of a series of electrical impulses, similar to the impulses sent along sensory fibres.

Interneurons are smaller neurons found only within the brain and spinal cord, and are responsible for linking sensory and motor neurons. They have short dendrites and axons.

Questions

Sensory Neurons (Afferent neurons)

Q1) Where do sensory neurons receive information from?

Q2) Why are sensory neurons called 'afferent' neurons? (Def: afferent means conducting or conducted inwards or towards something)

Q3) where do sensory neurons send information (using an electrical impulse) to?

Q4) which part of the neuron does information enter?

Q5) which part of the neuron is the control centre?

Q6) after information is sent to the control centre, where is it sent next?

Q7) where is the final destination for the information?

Q8) how many directions can electrical impulses flow through each neuron?

Motor neurons (efferent neurons)

Q9) Why are Motor neurons also called 'efferent' neurons? (Def: efferent means conducted or conducting outwards or away from something)

Q10) what are also known as effectors?

Q11) How does information enter the motor neurons?

Q12) where does information go after it has entered the neuron?

Q13) After the information is sent down the axon, where does it terminate?

Q14) if attached to a muscle, what are the axon terminals called?

Q15) what characterises the dendrites and the axons in motor neurons?

Q16) How is the information about the response required sent through motor neurons?

Relay Neurons

Q17) what characterises the sizer of relay neurons (interneurons)

Q18) where are relay neurons found?

Q19) what is the main responsibility of the relay neurons?

Q20) what is the length of their axons and dendrites?

TASK 7- Read the further information about each neuron and answer the questions that follow

Myelin sheath

Many neurons outside the CNS are **myelinated** . Myelin is rich in lipid (fat) and creates an electrically insulative layer around the axon that helps to increase the speed at which impulses travel. Specialised **Schwann cells** produce a tightly wrapped **myelin sheath** around the axon of a neuron. The outer-most membrane that covers the myelin is called the neurilemma. Myelin is rich in lipid (fat) and creates an electrically insulative layer around the axon that helps to increase the speed at which impulses travel. Small gaps between the myelin on the axon are called **nodes of Ranvier** . These help the electrical impulse 'jump' from section to section to increase the speed of the electrical impulse

Axon terminals and the synapse

Axon terminals are found at the end of an axon. This structure allows electrical impulses to be passed from one neuron to the next without the neurons physically touching. The gap between two neurons is called a **synapse** . The axon terminals are short extensions that terminate in tiny knobs that contain chemicals called **neurotransmitters** . When an electrical impulse arrives at the end of the axon, it causes neurotransmitter chemicals to be released from tiny storage **vesicles** . These move across the synaptic gap between the axon and the dendrite of the closest neuron

a) What is the Myelin sheath?

b) What is the function of the Myelin sheath?

c) What are Schwann cells?

d) What is the function of the Nodes of ranvier?

e) What is the gap between the two neurons called?

f) What are axon terminals?

g) What are neurotransmitters?

h) What do neurotransmitters do when the electrical impulse causes their release from the vesicles?