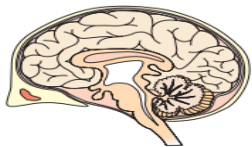


CHAPTER 7

Control and Coordination



In the previous chapter, we looked at life processes involved in the maintenance functions in living organisms. There, we had started with a notion we all have, that if we see something moving, it is alive. Some of these movements are in fact the result of growth, as in plants. A seed germinates and grows, and we can see that the seedling moves over the course of a few days, it pushes soil aside and comes out. But if its growth were to be stopped, these movements would not happen. Some movements, as in many animals and some plants, are not connected with growth. A cat running, children playing on swings, buffaloes chewing cud – these are not movements caused by growth.

Why do we associate such visible movements with life? A possible answer is that we think of movement as a response to a change in the environment of the organism. The cat may be running because it has seen a mouse. Not only that, we also think of movement as an attempt by living organisms to use changes in their environment to their advantage. Plants grow out into the sunshine. Children try to get pleasure and fun out of swinging. Buffaloes chew cud to help break up tough food so as to be able to digest it better. When bright light is focussed on our eyes or when we touch a hot object, we detect the change and respond to it with movement in order to protect ourselves.

If we think a bit more about this, it becomes apparent that all this movement, in response to the environment, is carefully controlled. Each kind of a change in the environment evokes an appropriate movement in response. When we want to talk to our friends in class, we whisper, rather than shouting loudly. Clearly, the movement to be made depends on the event that is triggering it. Therefore, such controlled movement must be connected to the recognition of various events in the environment, followed by only the correct movement in response. In other words, living organisms must use systems providing control and coordination. In keeping with the general principles of body organisation in multicellular organisms, specialised tissues are used to provide these control and coordination activities.

7.1 ANIMALS – NERVOUS SYSTEM

In animals, such control and coordination are provided by nervous and muscular tissues, which we have studied in Class IX. Touching a hot

object is an urgent and dangerous situation for us. We need to detect it, and respond to it. How do we detect that we are touching a hot object? All information from our environment is detected by the specialised tips of some nerve cells. These receptors are usually located in our sense organs, such as the inner ear, the nose, the tongue, and so on. So gustatory receptors will detect taste while olfactory receptors will detect smell.

This information, acquired at the end of the dendritic tip of a nerve cell [Fig. 7.1 (a)], sets off a chemical reaction that creates an electrical impulse. This impulse travels from the dendrite to the cell body, and then along the axon to its end. At the end of the axon, the electrical impulse sets off the release of some chemicals. These chemicals cross the gap, or synapse, and start a similar electrical impulse in a dendrite of the next neuron. This is a general scheme of how nervous impulses travel in the body. A nervous synapse finally allows delivery of such impulses from neurons to other cells, such as muscle cells or gland [Fig. 7.1 (b)].

It is thus no surprise that nervous tissue is made up of an organised network of nerve cells or neurons, and is specialised for conducting information via electrical impulses from one part of the body to another.

Look at Fig. 7.1 (a) and identify the parts of a neuron (i) where information is acquired, (ii) through which information travels as an electrical impulse, and (iii) where this impulse must be converted into a chemical signal for onward transmission.

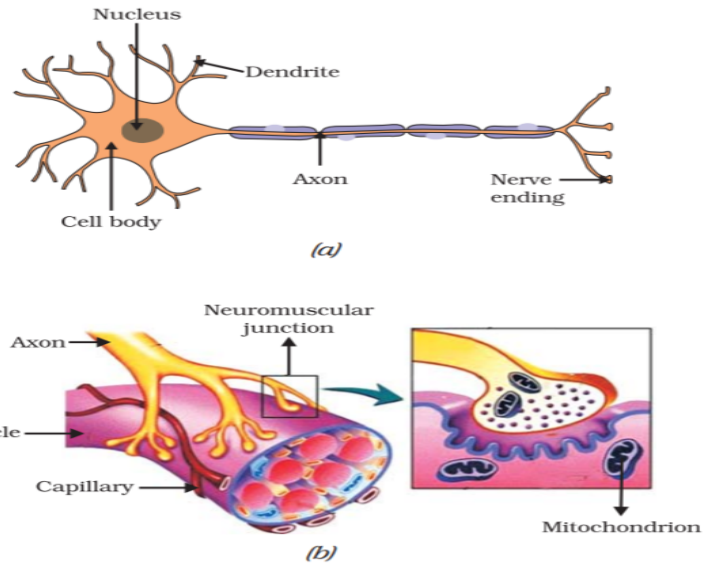
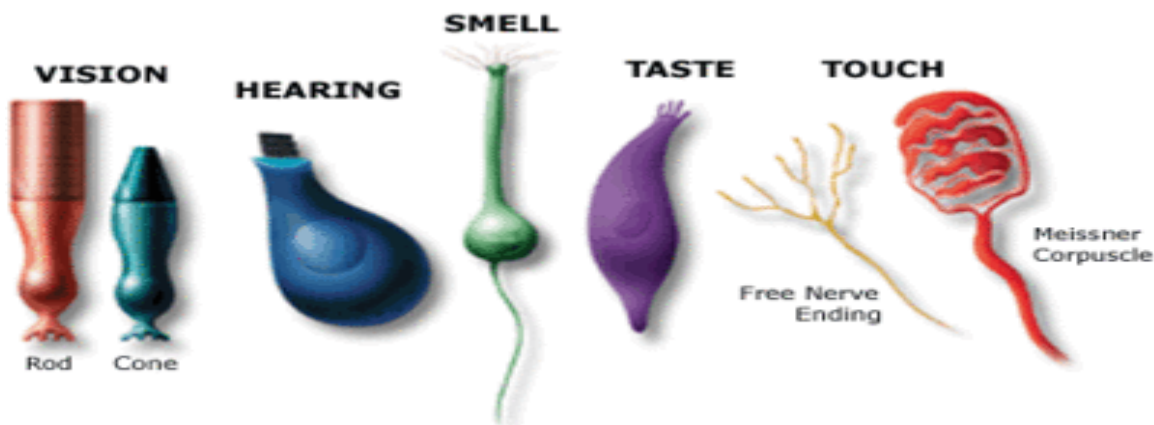


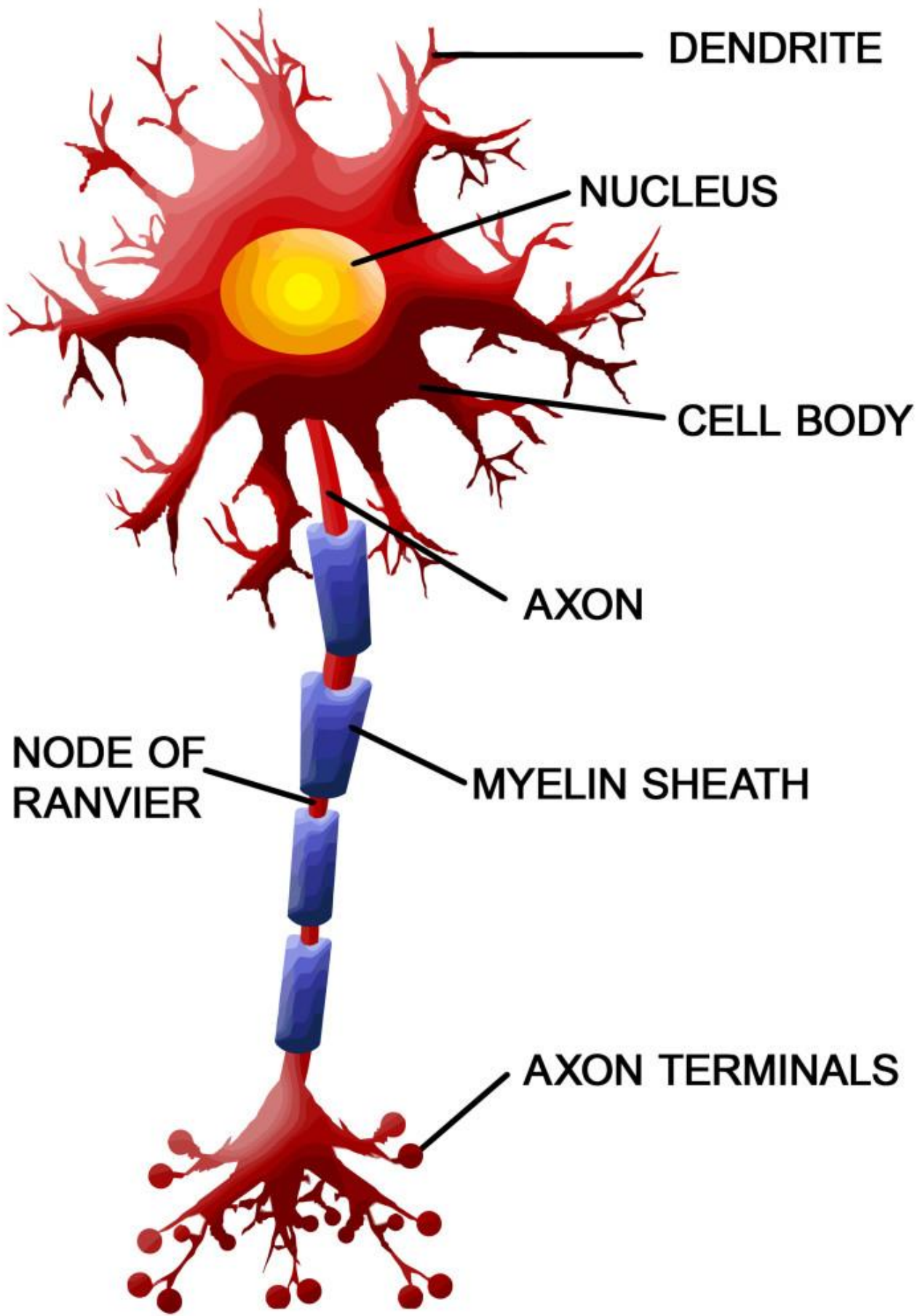
Figure 7.1 (a) Structure of neuron, (b) Neuromuscular junction

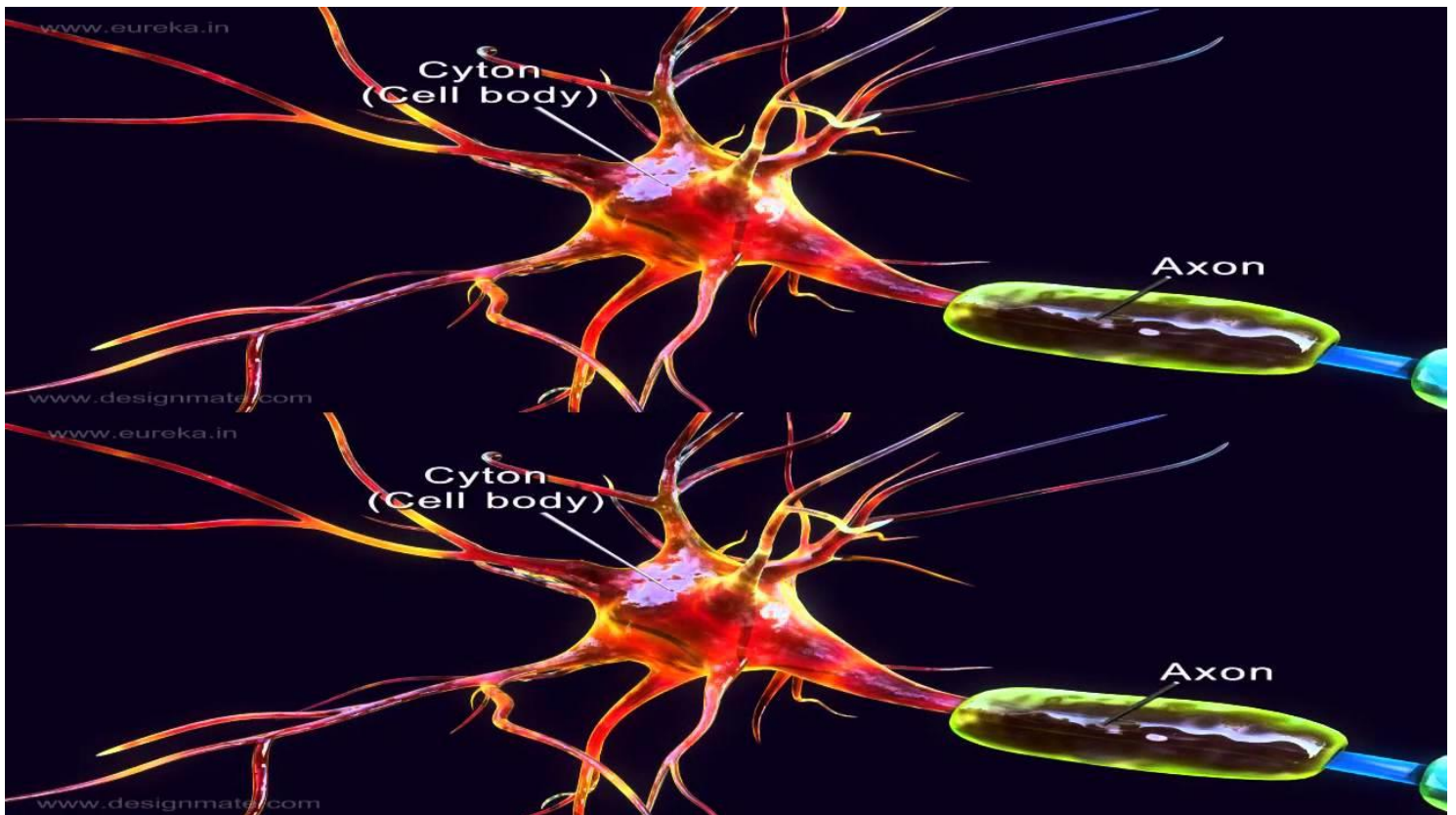
Activity 7.1

- Put some sugar in your mouth. How does it taste?
- Block your nose by pressing it between your thumb and index finger. Now eat sugar again. Is there any difference in its taste?
- While eating lunch, block your nose in the same way and notice if you can fully appreciate the taste of the food you are eating.

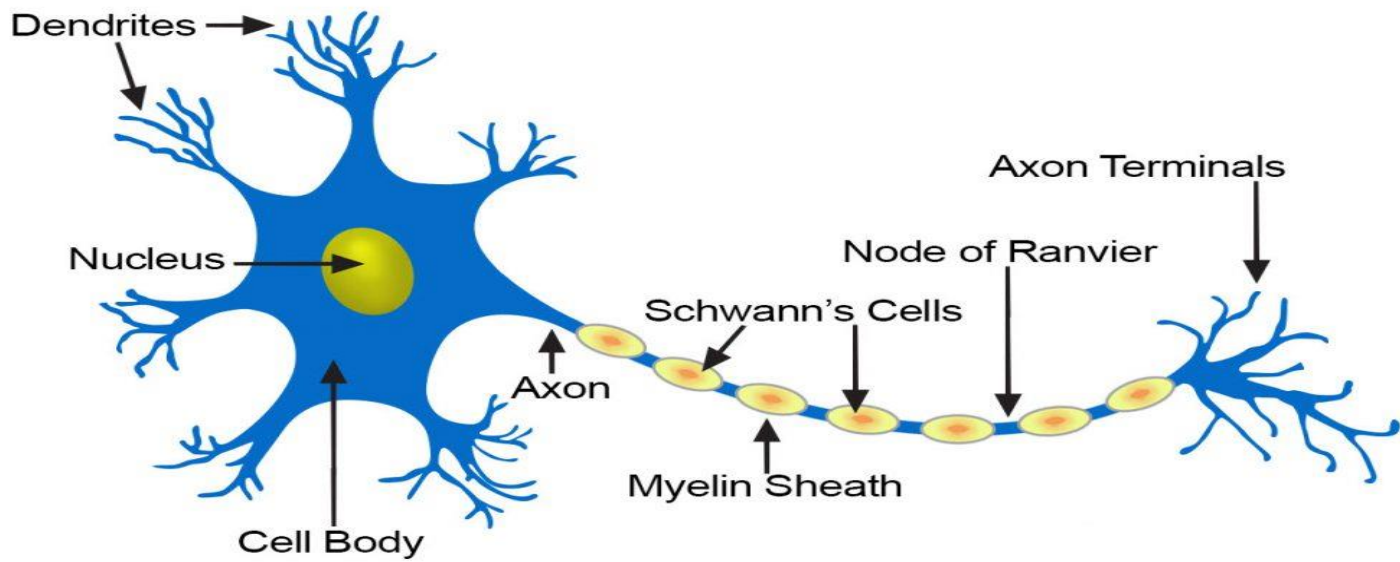
Is there a difference in how sugar and food taste if your nose is blocked? If so, why might this be happening? Read and talk about possible explanations for these kinds of differences. Do you come across a similar situation when you have a cold?



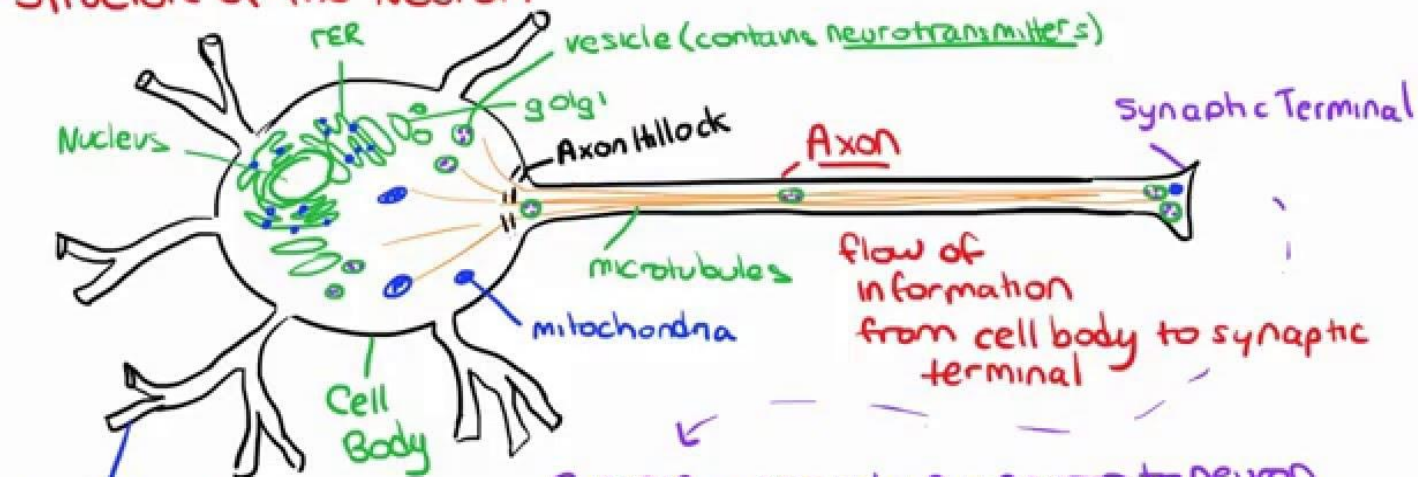




Structure of a Typical Neuron



Structure of the Neuron



Dendrites

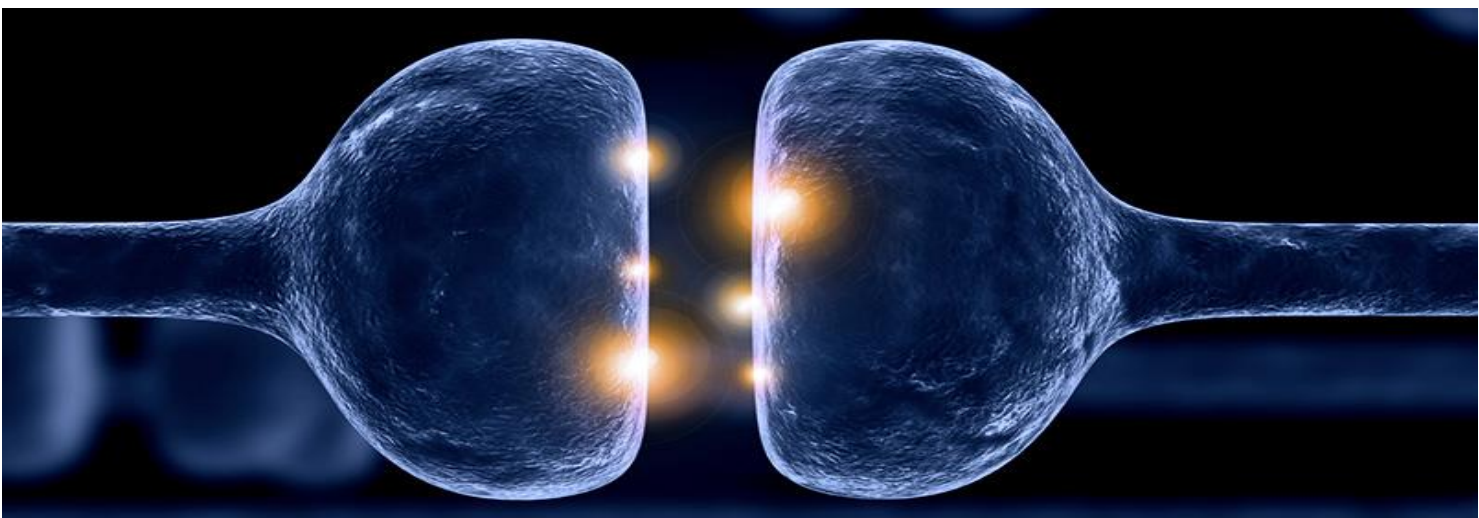
receive info from other neurons

Synapse ~ connection ~ neuron to neuron
~ neuron to effector

Chemical

Electrical

(neuroeffector junction)
→ neuromuscular or neuroglandular junction



Handwritten signature

