Neurons and synapse

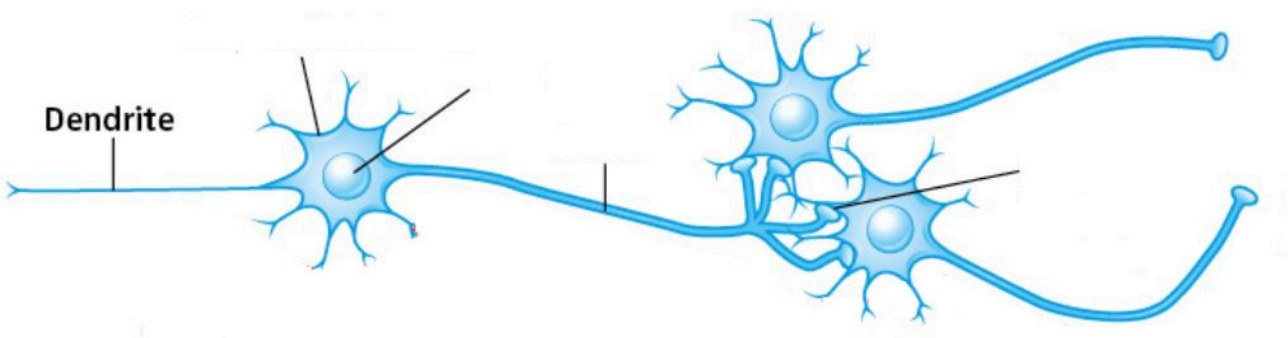
The brain contains around 100 billion neurons. These neurons receive a wealth of information (nerve messages) from numerous sensory organs. They also transmit this information to different regions of the brain. These nerve messages circulate through a network of neurons. The areas of connection between neurons are called synapses. A single neuron can establish up to 10,000 connections.

- ***How does the organization of a synapse enable the transmission of a nerve message from one neuron to another?***

1. The nerve message and synaptic transmission

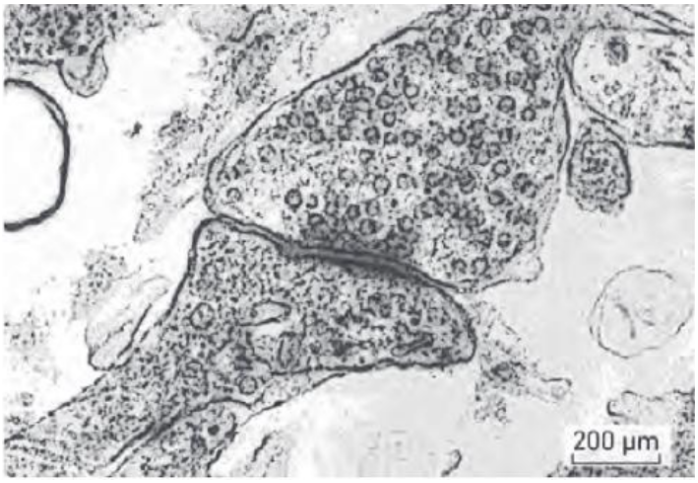
Using the following video https://youtu.be/oK3esXMQxaI :

- **Complete the legends** in the diagram below, and indicate the direction of the nerve message with a red arrow.



- **Place the following labels** on the photograph below and give it a title:

Post synaptic neuron; Pre synaptic neuron; Synaptic cleft; Neurotransmitter vesicles



- **Propose an estimate** for the height of the synaptic cleft

2. The role of proteins in synapse architecture

a) Fonction et localisation de quelques protéines

For each protein listed below, search onhttps://www.proteinatlas.org/ :
its function (SUMMARY), its origin (places of synthesis TISSUE), and its location in the cell (SUBCELL)

PROTEINS : **Neurexin**e (NRXN3) ; **Helicase** (DNA2) ; **Glucagon** (GCG) ; **Histon**e (H2AC8) ; **SHANK3 ; Neuroligin**e (NLGN3) ; **Actin**e (ACTG1) ;

- Draw a table showing the results of your research, considering only the proteins involved in synaptic transmission.

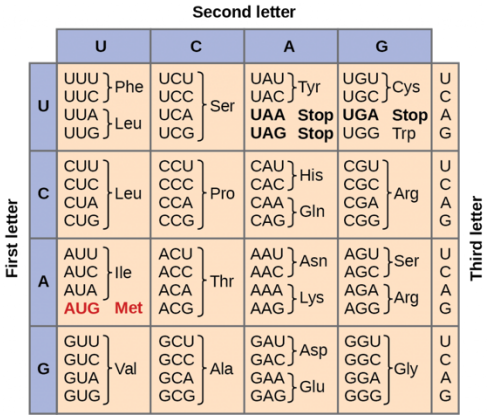
b) Protein manufacturing plans

DNA and proteins contain specific sequences of monomers. In the case of DNA, the carrier of genetic information, the four types of nucleotide make up the monomers in question: they differ by their nitrogenous base. Genes generally consist of hundreds or thousands of nucleotides, and each gene has its own specific nucleotide sequence.

In proteins, too, each polypeptide has monomers (amino acids) aligned in a precise order (the primary structure of proteins). Nucleic acids and proteins therefore contain information written in two different chemical languages. How do we move from one language to the other, from DNA to protein?

<u>The genetic code</u>

<u>International amino acid nomenclature with 3 letters and one letter:</u>



Nomenclature

Amino Acid	3 letter code	1 letter code	Amino Acid	3 letter code	1 letter code
Glycine	Gly	G	Threonine	Thr	T
Alanine	Ala	A	Cysteine	Cys	C
Valine	Val	V	Tyrosine	Tyr	Y
Leucine	Leu	L	Asparagine	Asn	N
Isoleucine	Ile	I	Glutamine	Gln	Q
Methionine	Met	M	Aspartic Acid	Asp	D
Proline	Pro	P	Glutamic Acid	Glu	E
Phenyl alanine	Phe	F	Lysine	Lys	K
Tryptophan	Trp	W	Arginine	Arg	R
Serine	Ser	S	Histidine	His	H

- Using the genetic code, **translate** the proposed nucleotide sequence into an amino acid sequence, using 3-letter nomenclature.

Ref seq ... C C T C A T A A A A G T G C T A C C A T C T G T T T T C A A ...

Prot seq _____