Neurons and synapse

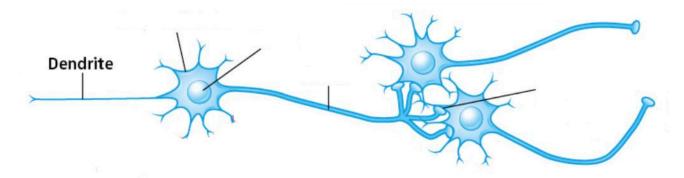
The brain contains around 100 billion neurons. These neurons receive a wealth of information (nerve messages) from numerous sensory organs. They also transmit this information to different regions of the brain. These nerve messages circulate through a network of neurons. The areas of connection between 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

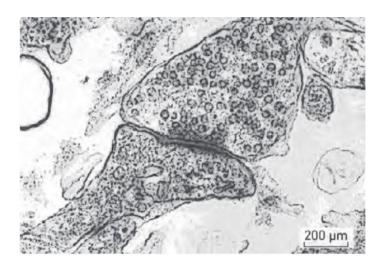
Using the following video https://youtu.be/oK3esXMQxal :

- **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 on https://www.proteinatlas.org/: its function (SUMMARY), its origin (places of synthesis TISSUE), and its location in the cell (SUBCELL)



PROTEINS: Neurexine (NRXN3); Helicase (DNA2); Glucagon (GCG); Histone (H2AC8); SHANK3; Neuroligine (NLGN3); Actine (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?

The genetic code

International amino acid nomenclature with 3 letters and one letter:

Second letter									
U		С	Α	G					
U	UUU } Phe UUC } Leu UUG } Leu	UCU UCC UCA UCG	UAU Tyr UAC Stop UAG Stop	UGU Cys UGC Stop UGG Trp	UCAG				
С	CUU CUC CUA CUG	CCU CCC CCA CCG	CAU His CAA GIn CAG	CGU CGC CGA CGG	UCAG	Third letter			
Α	AUU AUC AUA AUG Met	ACU ACC ACA ACG	AAU Asn AAC Lys AAG Lys	AGU Ser AGC AGA Arg	U C A G	Third			
G	GUU GUC GUA GUG	GCU GCC GCA GCG	GAU Asp GAC GAA GAG Glu	GGU GGC GGA GGG	UCAG				
	C	U UUUU Phe UUUG LEU UUA LEU CUC CUA CUA CUG AUA AUG Met G GUU GUC GUC GUC GUC GUC GUC GUC GUC GU	U C UCU Phe UCC UC	U C A UUUU Phe UCU UCC UCA UAA Stop UAA Stop UAA Stop UAA Stop C CUU CCC CUC CCC CCA Pro CAA Gln CAA Gln A AUU IIIe ACC ACA AUA Met ACG Thr AAA Lys ACG GUU GCC AA GAA AAS Lys GUU GCC AA GCL GCC AAS GAAC AAS GAAC AAS GCL GAAC AAS GAAC AAS AAS CG GUU GCC AAS GAAC AAS AAS CG GUC AAS GAAC AAS GAAC AAS GGU GAAC AAS AAS CG GAAC AAS AAS AAS AAS AAS AAS AAS AAS AAS	U	U			

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	С
Valine	Val	V	Tyrosine	Tyr	Y
Leucine	Leu	L	Asparagine	Asn	N
Isoleucine	lie .	1	Glutamine	Gin	Q
Methionine	Met	M	Aspartic Acid	Asp	D
Proline	Pro	P	Glutamic Acid	Glu	E
Phenyl alanine	Phe	F	Lysine	Lys	к
Tryptophan	Trp	w	Arginine	Arg	R
Serine	Ser	S	Histidine	His	н

Nomonoloturo

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

Ref seq	• • •	CCTC	ATA	AAAG	GTGCTA	CCATCTGT	TTTCAA	• • •
Prot seq								