

## Lesson #3A Neurons & Synapses: Web Quest

(Adapted from "The Teenage Brain in Search of Itself..." Webquest by RoseMary McClain of Londonderry High School, NH)

Subject area / course / grade level: Science Grade 7-10

**Summary:** This is a 3 part lesson. The "Explanation" & "Elaboration" will be completed in later lessons. Students will collect information from pre-set resources to develop understanding of the nervous system, neurons, synapses, and neurotransmitters. Information gather from this lesson will help them build models and participate in neuron related activities of future lessons.

**Time Needed:** 1+ Period(s)

### Materials:

- Teacher Created PPT to coordinate with instructions included (Copy & Paste) to be used with student journals/notebooks
- OR Copies of work sheets 1 set/student
- OPTIONAL "This is Your Brain" Curriculum worksheets by NSTA [Purchase it here](#)
- OPTIONAL "This is Your Brain" Curriculum PPT Transparencies H & I [Download it here](#)

### WASS: (Middle School):

6-8 LS1-C Multicellular organisms have specialized cells that perform different functions. These cells join together to form tissues that give organs their structure and enable organs to perform specialized functions within organ systems.

6-8 SYSA Any system may be thought of as containing subsystems and as being a subsystem of a larger system.

### WASS: (High School):

9-12 INQA Scientists generate and evaluate questions to investigate the natural world.

9-12 SYSB Systems thinking can be especially useful in analyzing complex situations. To be useful, a system needs to be specified as clearly as possible.

### NGSS(Middle School):

MS-LS1-d Design and conduct an investigation to gather evidence to support explanations that the body is a system of interacting subsystems composed of groups of cells working to form tissues and organs specialized for particular body functions, and that scientific advances in understanding of those systems have led to improvements in nutrition, health, and medicine.

### NGSS (High School):

HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.

### CCSS:

WHST.6-8.9 Draw evidence from informational texts to support analysis, reflection, and research.

### What? Conducting a Web Quest

**How?** Individually with computers

**Why?** To gather information needed to build models in future lessons.

### Differentiation:

Provide different Web Quests based on the needs of learners/ Amount of questions can be reduced if needed.

### ENGAGEMENT (10 min) NEURON TALK

Use student pre-write to engage future lesson concepts.

### Instruct:

INITIAL THOUGHTS: (In your journal)

- How do different parts of the brain communicate?
- What are neurons?



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- How big is the human brain?  
Turn & talk to discuss answers.

### EXPLORATION (40+ min)

### NEURONS & SYNAPSES WEB QUEST

#### **SLIDE 1**

##### **PART I: "The Brain & Its Parts"**

Click on the link & read "The Central Nervous System": [Eric Chudler Link](#)

Answer the following questions in your notebook:

- How many parts make-up the central nervous system?
- How many nerve cells are in the brain?
- Are there any other special cells in the brain?
- List them.

#### **SLIDE 2**

##### **Next... "Draw a Brain"**

Click on the link: ["Structures & Areas of the Human Brain"](#)

In your notebook:

- Make a drawing of the brain with the spinal cord.
- Label all the parts.
- Write a description to list what each part does.

#### **SLIDE 3**

##### **PART II: "Picturing Neurons"**

Click on the link & observe the images of neuron diagrams by Cajal:

[Cajal Neuron Images](#)

Click on the link & observe other images of neurons: [Neuron Images](#)

Answer the following questions in your notebook:

- Do all neurons look the same?
- What are some differences mentioned in Cajal's images?

#### **SLIDE 4**

##### **Next... "Understanding Neurons"**

Click on the link & read about neurons. ["Eric Chudler Neurons"](#)

Answer the following questions in your notebook:

- What is a neuron?
- What does it do?
- How many neurons are in the human brain?

#### **SLIDE 5**

##### **Next... "Neuron Model"**

Click on the link & observe the images of neuron diagrams: ["Neuron Diagram"](#)

In your notebook:



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- Draw a typical neuron.
- Label the parts.
- Write a description to list what each part does.

\*ALTERNATIVE: "[This is Your Brain](#)" by NSTA curriculum worksheets

[Click Link to Purchase Here](#)

### SLIDE 6

#### Let's Play... "Building a Neuron"

Click on the link & play the game: "[Mad Neuron Game](#)"

Screen shot with snipping tool your score & email to your table partner for credit.

### SLIDE 7

#### PART III... "How Neurons Communicate"

Click on the link & read about synapses: "[Neurons Communicate Via the...](#)"

Click on the link & watch the video: "[Molecular Mechanism of Synaptic Function](#)"

Answer the following question in your notebook:

- What type of signal is transmitted in the synapse?
- Do neurons actually touch other neurons?

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### SLIDE 8

#### Next... "Neurotransmitters"

Click on the link & watch the video: "[Crossing the Divide](#)"

Click on the link & read: "[Types of Neurotransmitters](#)"

In your notebook:

- Write a description for how neurotransmitters work as though you were explaining it to a 6<sup>th</sup> grader.
- Explain the importance of "Dopamine."
- Write an open ended question about neurotransmitters?

### EXPLANATION (To be completed in tomorrow's lesson)

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### ELABORATION (To be completed in tomorrow's lesson)

- 

### EVALUATION

- The student journals or worksheet packet will be the assessment.



A Web Quest for 7<sup>th</sup>-12<sup>th</sup> Grade Students

By Shannon Hernandez & Mike Shaw of CSNE

# NEURONS & SYNAPSES

(ADAPTED FROM "THE TEENAGE BRAIN IN SEARCH OF ITSELF..." WEBQUEST BY ROSEMARY MCCLAIN OF LONDONDERRY HIGH SCHOOL, NH)

# PART I: “THE BRAIN & ITS PARTS”

Click on the link & read “The Central Nervous System”:

[Eric Chudler Link](#)

Answer the following questions in your notebook:

1. How many parts make-up the central nervous system?
2. How many nerve cells are in the brain?
3. Are there any other special cells in the brain?
4. List them.



# NEXT... “DRAW A BRAIN”

Click on the link: [“Structures & Areas of the Human Brain”](#)

**In your notebook:**

1. **Make a drawing of the brain with the spinal cord.**
2. **Label all the parts.**
3. **Write a description to list what each part does.**
4. **Show your partner & have them sign-off you did this.**

# PART II: “PICTURING NEURONS”

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Click on the link & observe the images of neuron diagrams by Cajal.

[Cajal Neuron Images](#)

Click on the link & observe other images of neurons:

[Neuron images](#)

Answer the following questions in your notebook:

1. Do all neurons look the same?
2. What are some differences mentioned in Cajal’s images?

# NEXT...“UNDERSTANDING THE NEURON”

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Click on the link & read about neurons. [“Neuroscience for Kids”](#)  
**Answer the following questions in your notebook:**

1. What is a neuron?
2. What does it do?
3. How many neurons are in the human brain?

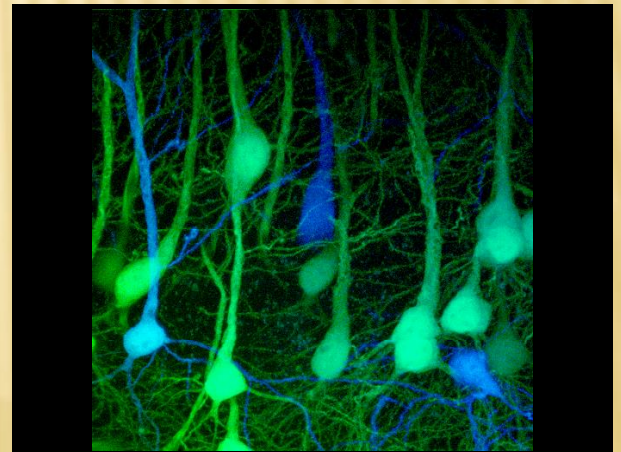


# NEXT... “NEURON MODEL”

Click on the link: [“Neuron Diagram”](#)  
In your notebook:

1. Draw a typical neuron.
2. Label the parts.
3. Write a description to list what each part does.

*Image Source: J Sans HHMI, Harvard*



# LET'S PLAY... "BUILDING A NEURON"

Click on the link & play the game:

<http://learn.genetics.utah.edu/content/addiction/reward/madneuron.html>

**Screen shot with snipping tool your score & email to your table partner for credit.**

# PART III: "HOW NEURONS COMMUNICATE"

Click on the link & read about synapses: ["Neurons Communicate Via the..."](#)

Click on the link & watch the video: ["Molecular mechanism of Synaptic Function"](#)

**Answer the following question in your notebook:**

1. What type of signal is transmitted in the synapse?
2. Do neurons actually touch other neurons?



# NEXT... “NEUROTRANSMITTERS”

Click on the link & watch the video: ["Crossing The Divide"](#)

Click on the link & read: ["Types of Neurotransmitters"](#)

**In your notebook:**

1. Write a description for how neurotransmitters work as though you were explaining it to a 6<sup>th</sup> grader.
2. Explain the importance of “Dopamine.”
3. Write an open ended question about neurotransmitters?



# CHECK YOUR PARTNER'S WORK

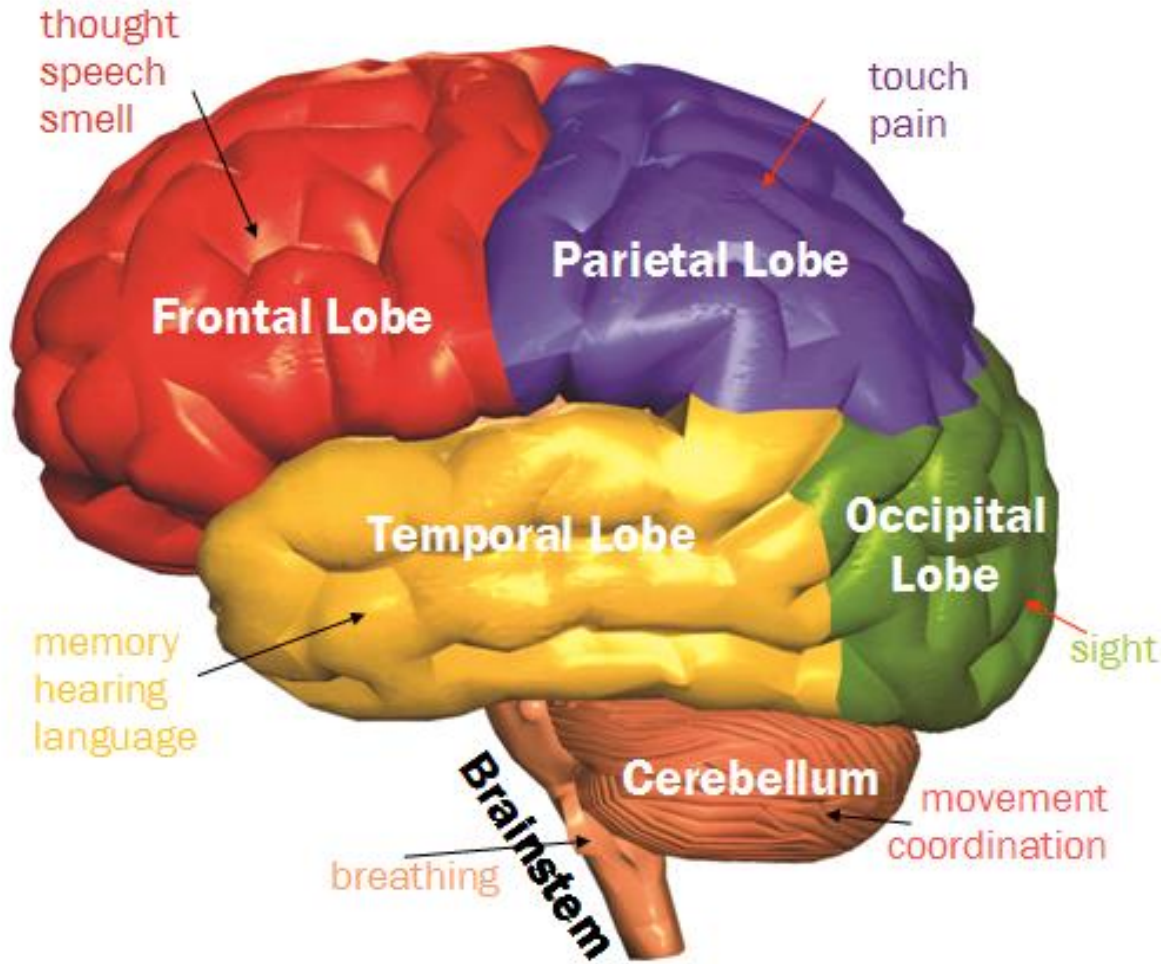
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Use the next slides to check your partner's journal drawings of the brain, neurons & synapses.

- Did they label the parts?
- Did they list the functions of the brain?

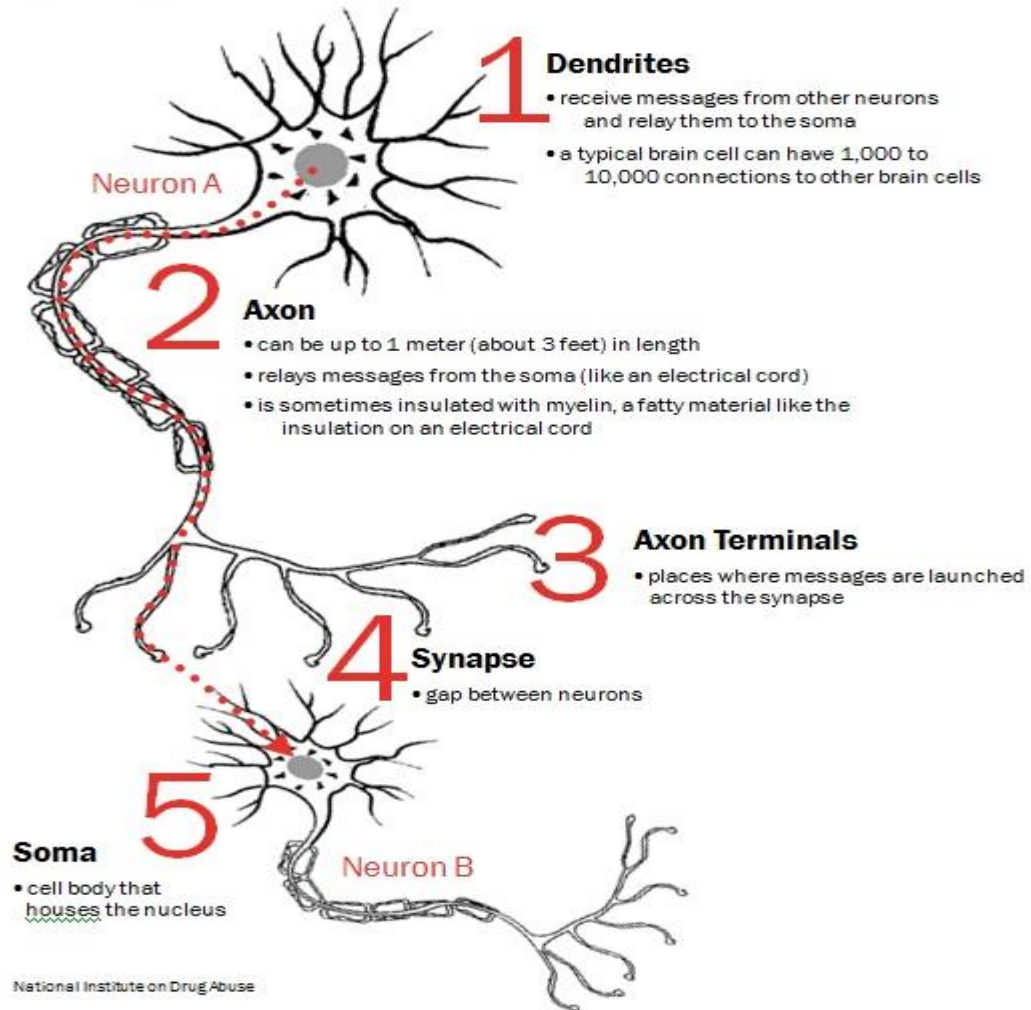
# Functions of the Brain

Transparency G



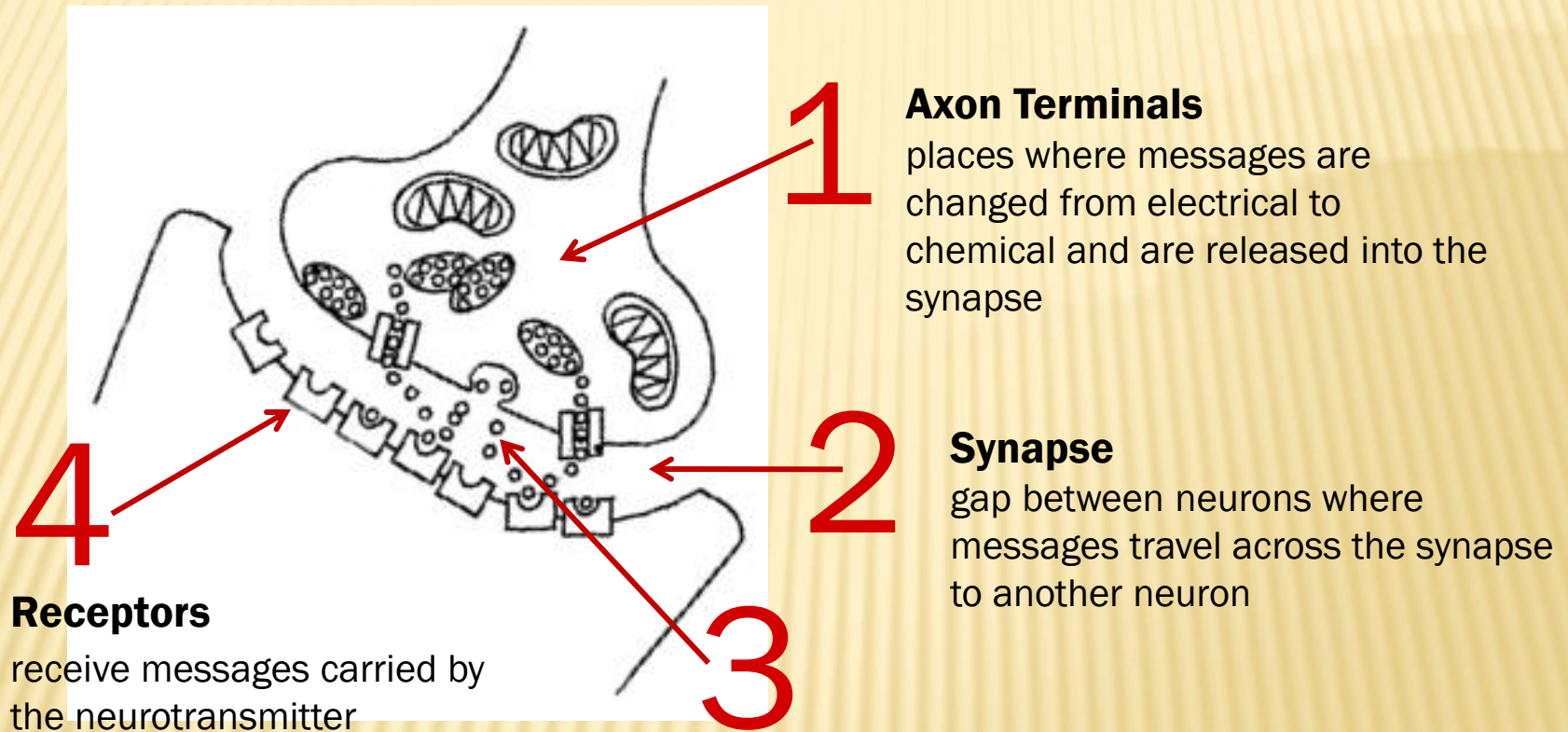
## How the Neuron Sends a Message

Transparency H





## Sending the Message across the Synapse



1

### **Axon Terminals**

places where messages are changed from electrical to chemical and are released into the synapse

2

### **Synapse**

gap between neurons where messages travel across the synapse to another neuron

3

### **Neurotransmitters**

carry messages from one neuron across the synapse to another neuron.

Dopamine is a common neurotransmitter in humans.

4

### **Receptors**

receive messages carried by the neurotransmitter



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# **NEURONS & SYNAPSES ANSWER KEY**

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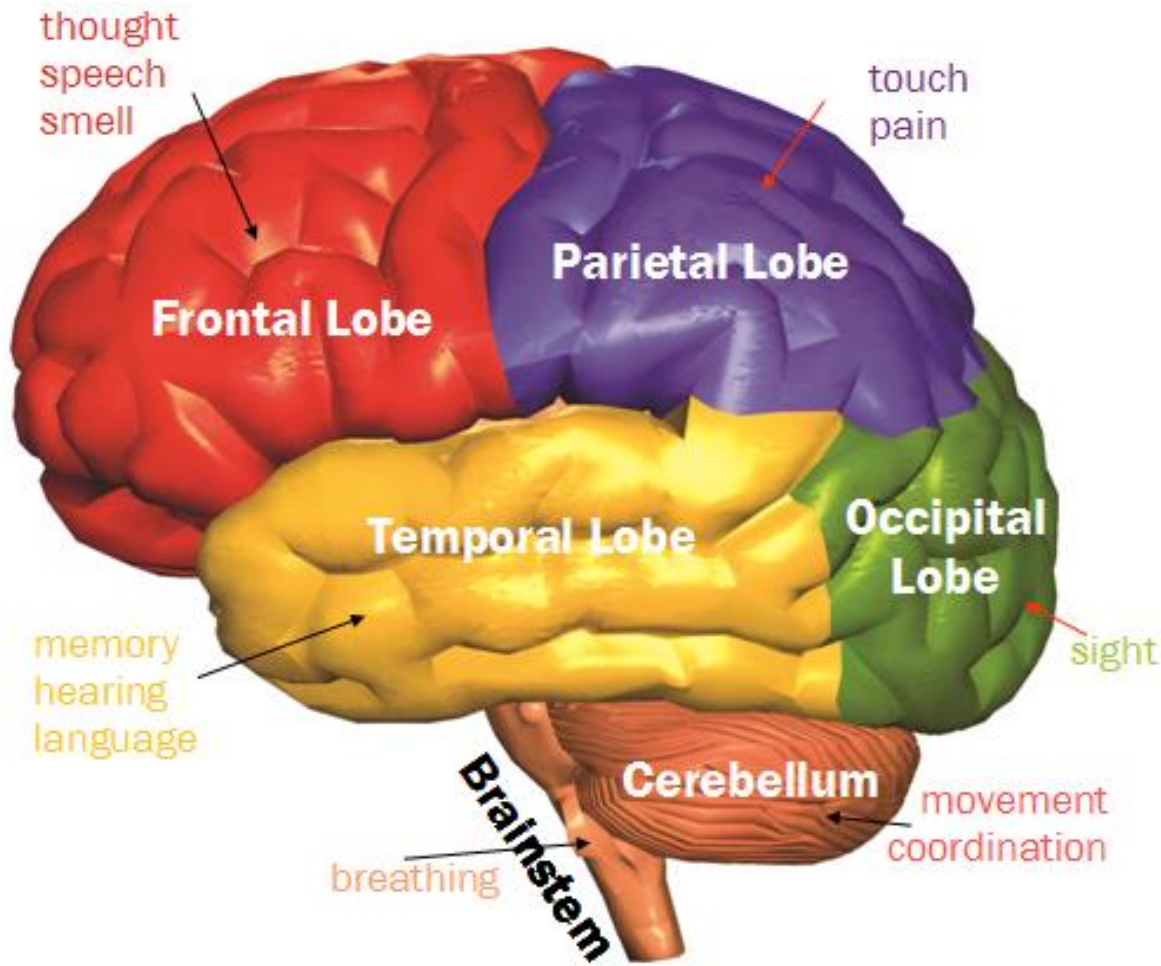
[Eric Chudler Link](#)

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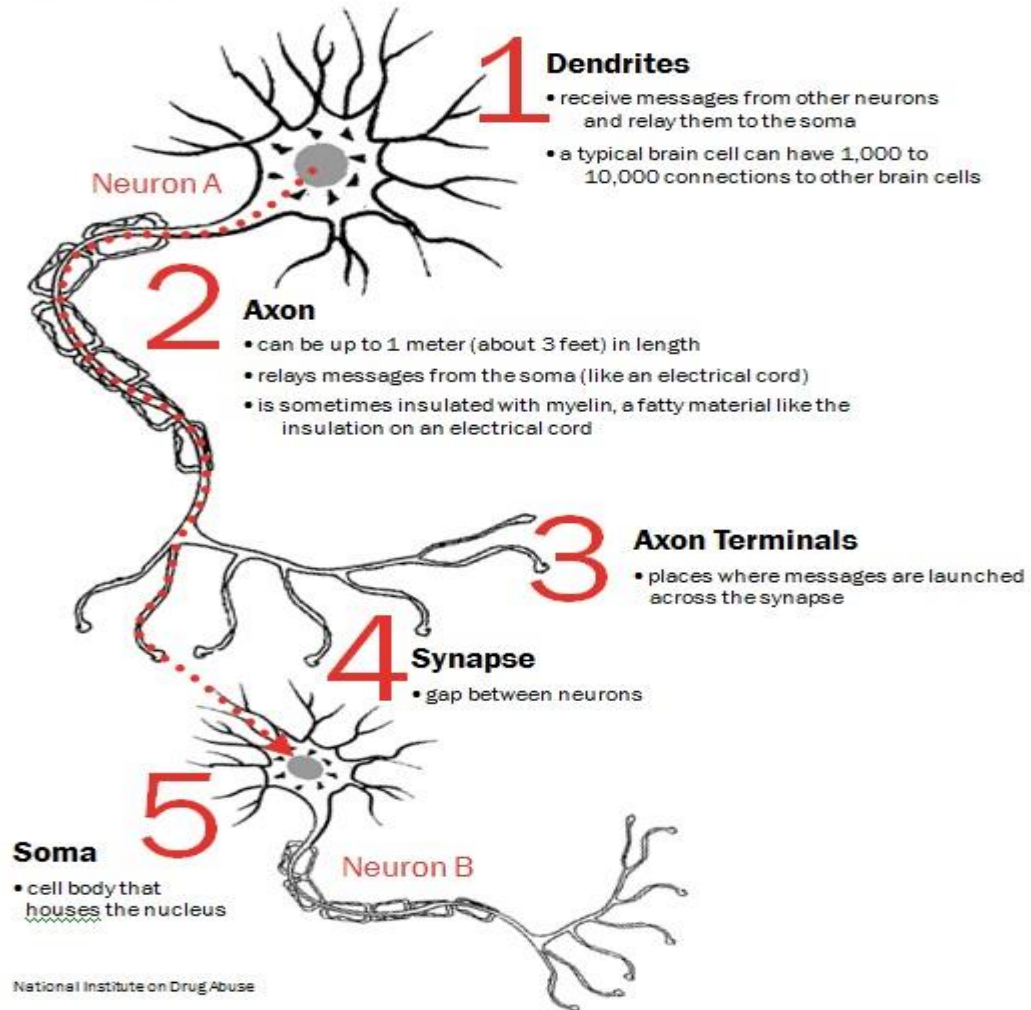
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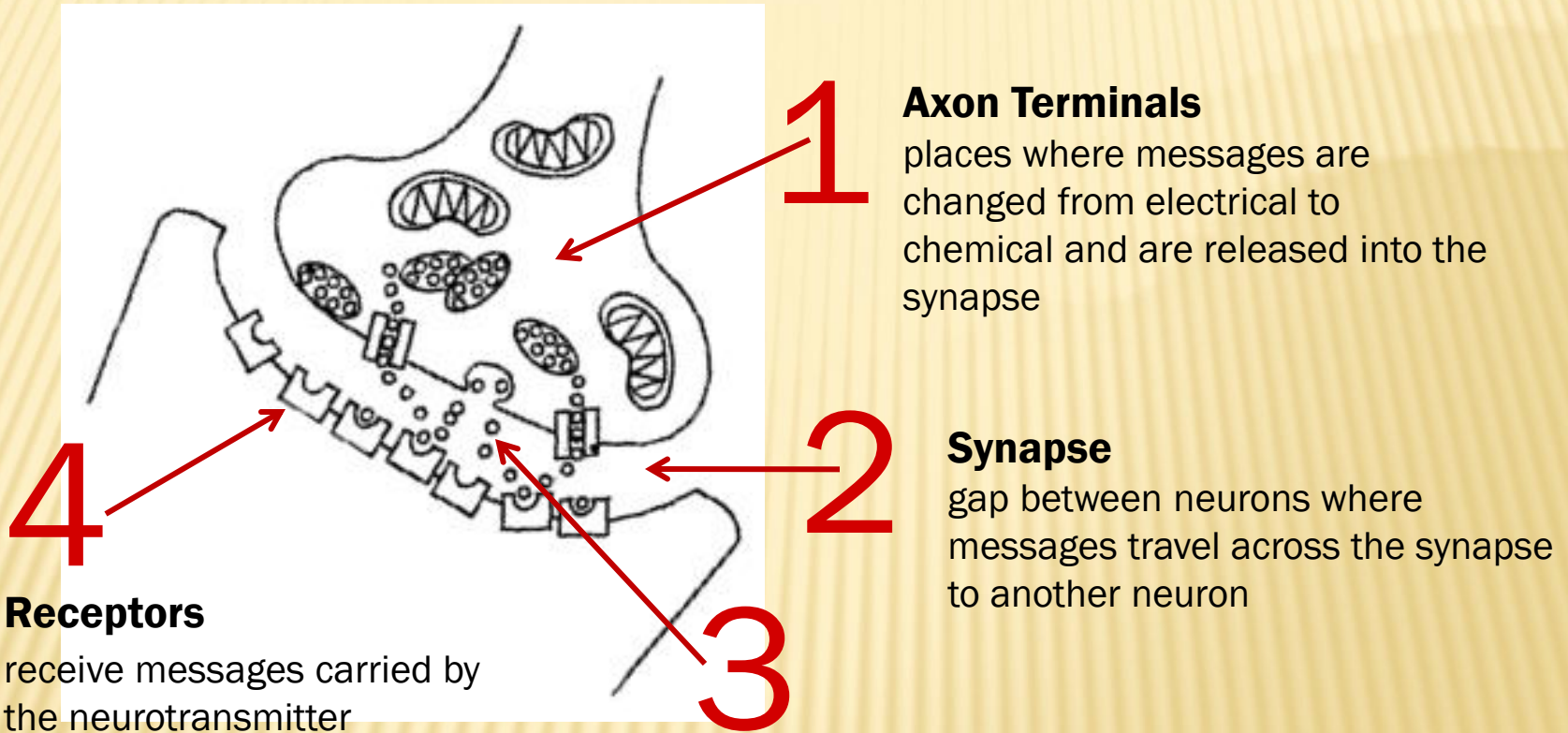
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