AP Biology **Name:**

The Neuron Game
Data Table
(activity adapted from Dr. Irene Yun, CSU Chico)

Complete the table below as you work through the game. Use the data to determine whether the cell fires and to answer the questions that follow.

Exercise 1: Excitatory Neuron **Firing Percentage (#fires/total x100) = _____**

Rules	Round	# of excitatory transmitters released	# of excitatory receptors activated	# of inhibitory transmitters released	# of inhibitory receptors activated	Does the cell fire?
Practice						
Excitatory ONLY	1					
Excitatory ONLY	2					
Excitatory ONLY	3					
Excitatory ONLY	4					
Excitatory ONLY	5					
Excitatory ONLY	6					
Excitatory ONLY	7					

Exercise 2: Excitatory AND INHIBITORY!!! **Firing Percentage (#fires/total x100) = _____**

Rules	Round	# of excitatory transmitters released	# of excitatory receptors activated	# of inhibitory transmitters released	# of inhibitory receptors activated	Does the cell fire?
Excitatory & Inhibitory	1					
Excitatory & Inhibitory	2					
Excitatory & Inhibitory	3					
Excitatory & Inhibitory	4					
Excitatory & Inhibitory	5					
Excitatory & Inhibitory	6					
Excitatory & Inhibitory	7					

Exercise 3: Variation (Letter:____):_____ Firing Percentage (#fires/total x100) = _____

Rules	Round	# of excitatory transmitters released	# of excitatory receptors activated	# of inhibitory transmitters released	# of inhibitory receptors activated	Does the cell fire?
Variation (__)	1					
Variation (__)	2					
Variation (__)	3					
Variation (__)	4					
Variation (__)	5					
Variation (__)	6					
Variation (__)	7					

Exercise 4: Variation (Letter:____):_____ Firing Percentage (#fires/total x100) = _____

Rules	Round	# of excitatory transmitters released	# of excitatory receptors activated	# of inhibitory transmitters released	# of inhibitory receptors activated	Does the cell fire?
Variation (__)	1					
Variation (__)	2					
Variation (__)	3					
Variation (__)	4					
Variation (__)	5					
Variation (__)	6					
Variation (__)	7					

Analysis and Conclusion Questions.

1. **Compare the firing percentage of the "excitatory" with the "excitatory & inhibitory" percentage. What was the effect of adding inhibitory neurons to the "game"?**
    a. **Define "summation." Explain how exercise 1 and 2 relate to summation (be sure to mention what type of summation this might be).**

2. **Compare the firing percentage of the "excitatory" neuron to BOTH of the variations you tried. What was the effect of EACH variation?**

3. **What effect did the drug(s) have at the synapse? How did they affect neurotransmitter release, binding, reuptake?**
    a. **How were the "methods" and "effects" of the drugs similar? How were they different?**

4. **For the drugs (cocaine, amphetamines, Ritalin etc… and Opiates), are these classified as stimulants or depressants? Explain what that means in relation to the neurons, neurotransmitters, synapse etc…**

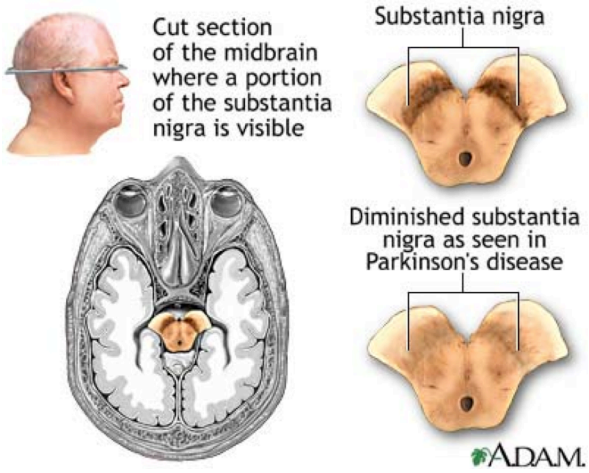
5. **Alcohol is a depressant (NOT a stimulant). Explain what that might mean at the neuron/synapse level. DRAW A PICTURE THAT MIGHT MODEL WHAT HAPPENS AT THE SYNAPSE IF ALCOHOL IS PRESENT. What is possible???**

6. **What was the effect of "learning" at the synapse? How did this affect the firing percentage?**

7. **Given that action potentials are ALWAYS the same regardless of stimulus and magnitude of stimulus, the "lowered threshold" model we used in this simulation is incorrect. Suggest and describe at least two "OTHER" ways that learning might affect neurons that would lead to increased firing. DRAW picture to illustrate your answer**

8. **What was the effect of Parkinson's at the synapse? How did this affect the firing percentage?**

9. **Parkinson's disease affects neurons in a part of the brain called the Substania Nigra that controls balance and motor coordination and movement. The neurons in this area are damaged and clusters of a protein (α-synuclein), called Lewy Bodies, build up in the cell bodies of the neurons and disrupt their ability to make dopamine.**
    a. **Given this little bit of information, what would the symptoms of Parkinson's be?**



    b. **Given this little bit of information and the information in the diagram at right, what are some possible treatments for Parkinson's? Give at least 2, and for each one describe how it might improve the patient's condition (how would it lessen symptoms?**