

Name: \_\_\_\_\_

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Date: \_\_\_\_\_

## Modeling Migration Scale Activity

### Background Information

Neurons born in the brain during development must move (migrate) to locations in the brain where they reside and function in adulthood. The distances they travel can be quite large compared to their own size. They also encounter obstacles along their path including other migrating neurons, glia and fibers. In this activity, you will model the migratory path of neurons born in the middle of the brain (ventricular zone) that must migrate to the supraoptic nucleus (SON, a region of the hypothalamus responsible for blood pressure regulation). Our mathematical models of neuron migration in this region indicate a degree of random walk with a directional drift or pull. Be sure to show all your work.

### Video

For what behaviors is the hypothalamus very important?

What does the release of cortisol do in a stressful situation?

Why do we use mouse brains to do study the movement of neurons?

What brain region are neurons born in the ventricle trying to reach? How far is this to travel in a mouse?

### Activity #1

The size of a neuron is about  $10\ \mu\text{m}$  in diameter and the distance it must travel to get to the SON is 1.4 mm. On a football field, how far would you have to walk to get to the SON if you were the neuron?

- Create a ratio between your diameter (shoulder to shoulder) and the diameter of a neuron.
- Use this ratio to figure out how far from the end zone the SON would be if the end zone were the ventricular zone (where neurons are born).



**Activity #2**

1. Using the provided graph paper to chart the end zone and target (SON) leaving enough room in between to accurately represent the distance of travel. Place the target x meters from the end zone. That is where you will be trying to get!
2. Starting at the goal line, use your game wheel to spin and walk the distance and direction indicated on the game wheel. You may not reenter the end zone or go deeper into the end zone. If directed to do so by the game wheel spin again. Track your progress on the football field chart.
3. To model the drift seen in our model your teacher will blow a whistle periodically. When you hear the whistle, take 5 steps directly toward the target.
4. When you have reached the target, mark your final position on the graph paper.

**Activity #3**

Using the chart you created while walking across the football field, measure your distance from the target for your first 20 spins.

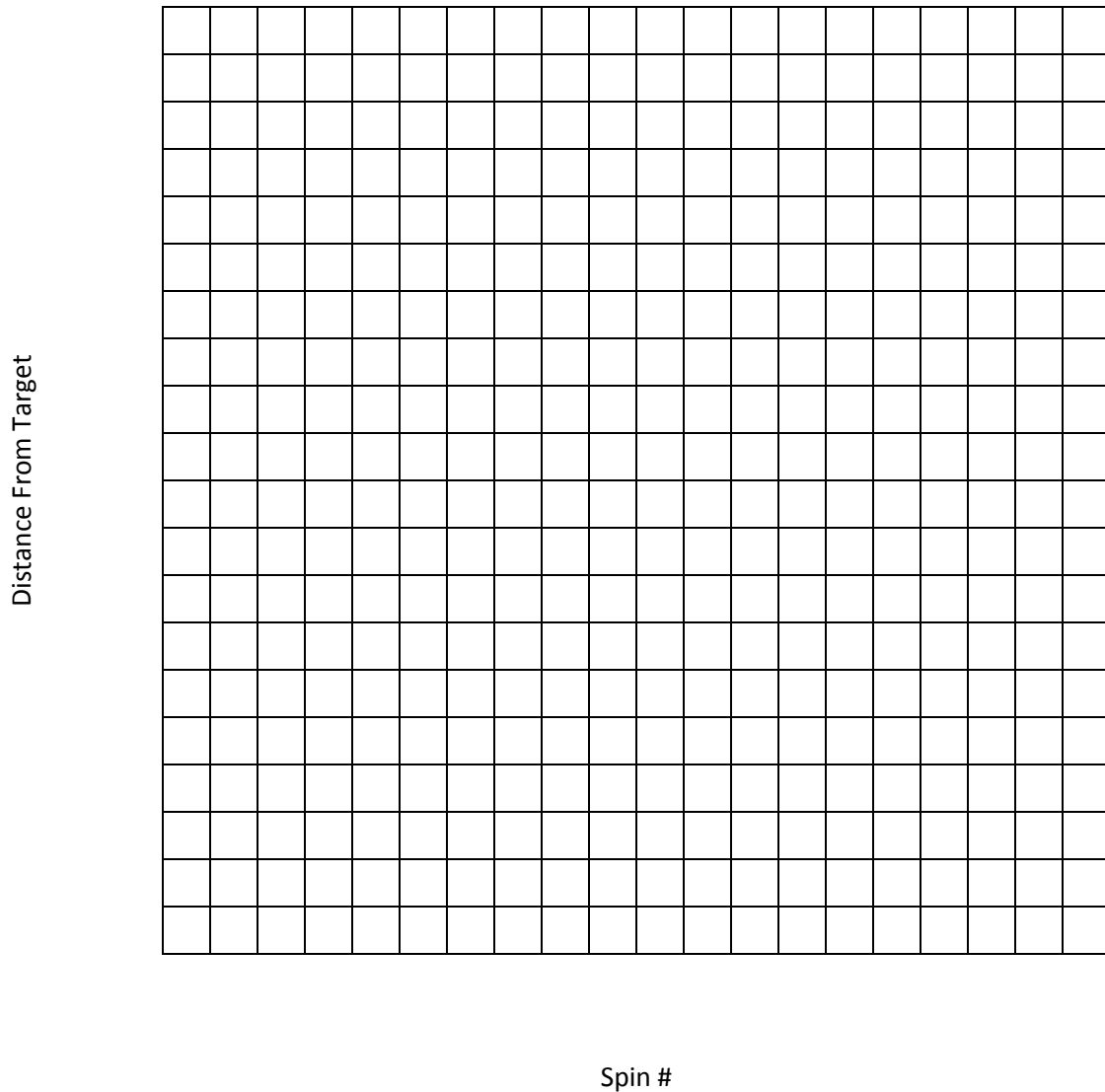
- This distance can be obtained by measuring the distance between the target and your location with any given spin. You can measure it in millimeters or centimeters.

Spin Number	Distance from Target
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Spin Number	Distance from Target
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	



Modeling Migration

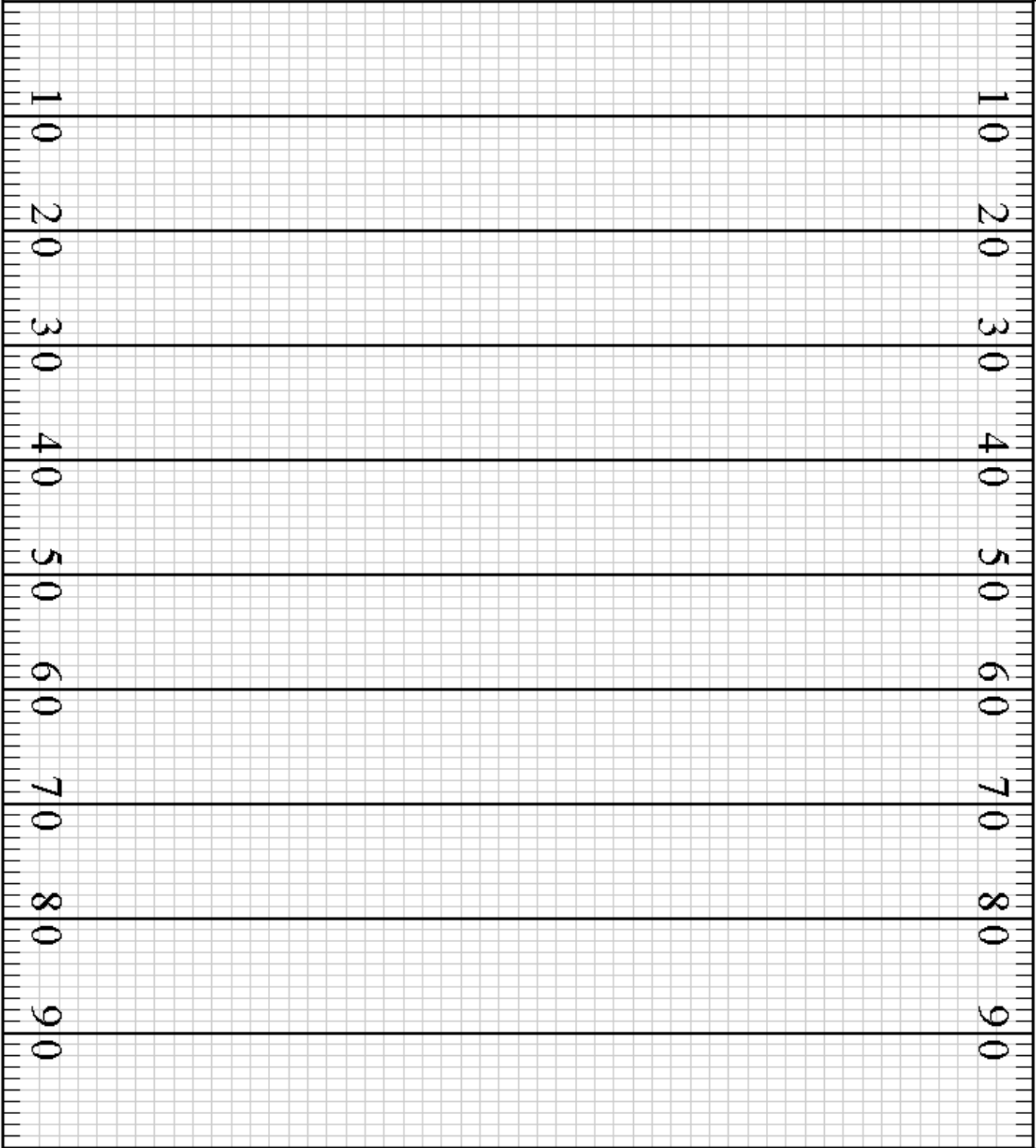


Questions

1. Using the same ratio as Activity #1, calculate how far would you have to walk if you were a neuron that had to travel 20 mm?
2. Given that the brain is mostly a mixture of liquids and solids what physical and chemical properties would you expect our molecule/whistle to have?



# End Zone—Start



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