

Lesson #4 Action Potential Lab
(Adapted from various labs designed to measure reaction time)

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

Summary: Students will conduct a lab using reaction times to better understand action potentials.

Time Needed: 1 Period

Materials:

For Reaction Time Lab:

- Meter Stick
- Lab Worksheet 1/student (See Attached)

For Previous day's reading:

- Electronic or paper copies of National Safety Council Article ["Understanding the Distracted Brain"](#)
- **Cut and paste the following for your students:**
Pg 1 summary paragraph 1
Pg 9 Paragraph 2 "*Distracted drivers...*" (Ignore figure)
Pg 6 section titled "*Brain researchers have identified...*"
Pg 10 section titled "*Slower response time...*" through "...*Talking on hands free & handheld phones.*"

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.9-12.9 Draw evidence from informational texts to support analysis, reflection and research.

What? Testing action potentials/ reaction time

How? With our lab team

Why? To see how messages are sent through the nervous system

Differentiation:

Eliminate the "Distraction" portion of the lab for lower level learners.

ENGAGEMENT (10 min) DISTRACTED BRAIN VIDEO

- Have class observe video ["The Distracted Brain & Driving"](#)
- Discuss the article read previously about the brain, attention, & reaction time
- Connect conversation to action potentials



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EXPLORATION (30 min) REACTION TIME LAB

- Working in pairs, have students complete the lab.

EXPLANATION (On Going)

Students will use lab worksheets and lab conclusions to explain learning.
Educators will rove the room to check for understanding.

ELABORATION (5 min)

Time permitting, conduct a wrap-up conversation to discuss what student's learned.

EVALUATION

- Students' lab conclusion will be the assessment.



Reaction Time

Question: Does the brain allow humans to function with equal efficiency when comparing reaction time between tasks performed with and without distractions?

Hypothesis: _____

Experiment:

Variables:

Controlled: _____

Manipulated: _____

Responding: _____

Materials:

Meter Stick Time Scale

Procedures: **“Focused Reaction Time”**

1. Person #1 holds the top of the ruler.
2. Person #2 holds the finger & thumb close to, (but not touching), the zero centimeter bottom end of the ruler.
3. EVERYONE must remain quiet for this part of the procedure (Think Controls).
4. As person #1 releases the ruler, person #2 must try and catch it as quickly as possible.
5. Using the time scale, record the time in seconds which correlates to the distance on the data table.
6. Repeat trials 5 more times.
7. Calculate the average.

Procedures: **“Distracted Reaction Time”**

8. Repeat steps 1 & 2 above
9. Have person #2 be distracted by a phone, text or talking to someone else.
10. As person #1 releases the ruler, person #2 must try and catch it as quickly as possible.
11. Using the time scale, record the time in seconds which correlates to the distance on the data table.
12. Repeat trials 5 more times.
13. Calculate the average.
14. Switch roles & repeat experiment with your partner.



Results:

Data Table: TITLE _____

Name of Test Subject: _____ Type of Distraction: _____

Focused Reaction Time			Distracted Reaction Time	
Trail Number	Cm the ruler fell	Time in seconds	Cm the ruler fell	Times in seconds
1				
2				
3				
4				
5				
6				
Average				

Name of Test Subject: _____ Type of Distraction: _____

Focused Reaction Time			Distracted Reaction Time	
Trail Number	Cm the ruler fell	Time in seconds	Cm the ruler fell	Times in seconds
1				
2				
3				
4				
5				
6				

TIME SCALE

Distance Ruler Fell (cm)	Time in Seconds
2	.06
3	.075
4	.09
5	.10
6	.11
7	.12
8	.13
9	.135
10	.14
11	.15
12	.16
14	.17
16	.18
18	.19
20	.20
22	.21
24	.22
26 and up	.23
Misses	.25



Graph:



Observations:

1. What did you use to sense the ruler falling?
2. How is your brain connected to your eyes?
3. What organ did you use to **process** the message that the ruler was falling?
4. What did you do to catch the ruler?
5. How did the message get from your eyes, to your brain and back to your hand so that you were able to catch the ruler? (don't just say it passed through neurons, give me specifics)
6. How was your distracted reaction time compared to your focused reaction time?



This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slight shadow on the right side, suggesting it's resting on a surface.

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