

UNIT 2

Research Ready

Intern at a Development and Aging Research Center. Investigate how the nervous and endocrine systems communicate and keep the body in balance, and design experiments with the model organism *C. elegans*.

CORNELL NOTEBOOK · fillable · John Hay Hornets

Essential questions for this unit

- How does a neuron carry and pass along a signal?
- How do the nervous and endocrine systems work together to maintain homeostasis through feedback?
- How do scientists design controlled experiments using a model organism?

Vocabulary bank (define each in your own words as you go)

■ neuron	■ stimulus	■ homeostasis
■ dendrite	■ response	■ model organism
■ axon	■ myelin	■ <i>C. elegans</i>
■ synapse	■ receptor	■ assay
■ neurotransmitter	■ effector	■ variable
■ CNS	■ hormone	■ control
■ PNS	■ endocrine gland	■ sample size
■ cerebrum	■ feedback loop	■ hypothesis
■ reflex	■ insulin	■ toxicology
■ reaction time	■ glucagon	■ conclusion

How to use this Cornell notebook

1. NOTES (right column): take notes during class, video, reading, or lab.
 2. CUES (left column): afterward, write questions and key terms that the notes answer. Some are seeded for you.
 3. SUMMARY (gold box): in your own words, answer the essential question in 2-3 sentences.
 4. Review by covering the notes and answering the cues from memory.
- Tip: vetted readings, videos, and interactives for every lesson are on the class site under "Resources & readings."

Contents & notebook check

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Number your pages and log each one as you finish. Use the date and self-rating columns for periodic notebook checks (rate 1-4 how complete the page is).

PAGE	LESSON	DATE DONE	1-4
4	2.1a Getting Nervous: neurons & brain (lab p. 5)		
6	2.1b Reflexes & reaction time (lab p. 7)		
8	2.2a Everything Endocrine: hormones & feedback (lab p. 9)		
10	2.2b Research & model organisms (lab p. 11)		
12	2.3 Challenge Accepted: open investigation (lab p. 13)		
14	Unit wrap-up & self-check		

Notebook rubric

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How your notebook is scored. Aim for level 4 on every row. 4 Exemplary · 3 Proficient · 2 Developing · 1 Beginning.

Completeness & organization

MY SCORE

Every assigned page is present, in order, dated, and numbered.

Cue questions

MY SCORE

The left column has thoughtful questions and key terms that the notes answer.

Notes

MY SCORE

Notes are accurate and in your own words, with labeled diagrams where useful.

Summaries

MY SCORE

Each summary answers the essential question in 2-3 clear sentences.

Lab records

MY SCORE

Objective, data, and a claim-evidence-reasoning analysis are complete and dated.

MY GOAL FOR THIS UNIT'S NOTEBOOK

2.1a Getting Nervous: neurons & brain

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ESSENTIAL QUESTION**How is the nervous system built to carry signals?****CUE · QUESTIONS · KEY TERMS****NOTES**

- Label a neuron: dendrite, axon, synapse.
- CNS vs. PNS?
- What does each major brain region do?
- How does a signal cross a synapse?

KEY TERMS

- neuron
- dendrite
- axon
- synapse
- neurotransmitter
- CNS
- PNS
- cerebrum

SUMMARY : in your own words, answer the essential question (2-3 sentences)

2.1a Lab record: Sheep-brain dissection (or validated virtual lab)

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*Dated lab record. This page is a gradeable artifact: complete every section.***OBJECTIVE** (what question are you answering today?)**MATERIALS / SAFETY** (equipment, PPE, SDS hazards noted)**DATA / OBSERVATIONS** (record measurements; sketch or table as needed)**ANALYSIS** (what does the data show? claim, evidence, reasoning)**REFLECTION** (sources of error, next question, real-world link)

2.1b Reflexes & reaction time

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ESSENTIAL QUESTION**How does the body respond automatically to a stimulus?****CUE · QUESTIONS · KEY TERMS****NOTES**

- Trace a reflex arc.
- Stimulus vs. response?
- How do drugs change neuron signaling?
- Why is myelin important to speed?

KEY TERMS

- reflex
- reaction time
- stimulus
- response
- myelin
- receptor
- effector

SUMMARY : in your own words, answer the essential question (2-3 sentences)

2.1b Lab record: Reflex & reaction-time lab

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Dated lab record. This page is a gradeable artifact: complete every section.

OBJECTIVE (what question are you answering today?)

MATERIALS / SAFETY (equipment, PPE, SDS hazards noted)

DATA / OBSERVATIONS (record measurements; sketch or table as needed)

ANALYSIS (what does the data show? claim, evidence, reasoning)

REFLECTION (sources of error, next question, real-world link)

2.2a Everything Endocrine: hormones & feedback

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ESSENTIAL QUESTION**How does the endocrine system keep the body in balance?****CUE · QUESTIONS · KEY TERMS****NOTES**

- What is a negative feedback loop?
- Insulin vs. glucagon roles?
- How do hormones reach their targets?
- How do nervous & endocrine systems differ in speed?

KEY TERMS

- hormone
- endocrine gland
- feedback loop
- insulin
- glucagon
- homeostasis

SUMMARY : in your own words, answer the essential question (2-3 sentences)

2.2a Lab record: Blood-sugar / hormone feedback model

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*Dated lab record. This page is a gradeable artifact: complete every section.***OBJECTIVE** (what question are you answering today?)**MATERIALS / SAFETY** (equipment, PPE, SDS hazards noted)**DATA / OBSERVATIONS** (record measurements; sketch or table as needed)**ANALYSIS** (what does the data show? claim, evidence, reasoning)**REFLECTION** (sources of error, next question, real-world link)

2.2b Research & model organisms

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ESSENTIAL QUESTION**Why do scientists use model organisms like *C. elegans*?****CUE · QUESTIONS · KEY TERMS****NOTES**

- What makes a good model organism?
- Identify the variables and control.
- How do you read scientific literature?
- What makes a sample size adequate?

KEY TERMS

- model organism
- *C. elegans*
- assay
- literature
- variable
- control
- sample size

SUMMARY : in your own words, answer the essential question (2-3 sentences)

2.2b Lab record: Research design & model-organism planning

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*Dated lab record. This page is a gradeable artifact: complete every section.***OBJECTIVE** (what question are you answering today?)**MATERIALS / SAFETY** (equipment, PPE, SDS hazards noted)**DATA / OBSERVATIONS** (record measurements; sketch or table as needed)**ANALYSIS** (what does the data show? claim, evidence, reasoning)**REFLECTION** (sources of error, next question, real-world link)

2.3 Challenge Accepted: open investigation

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ESSENTIAL QUESTION**How do I design and defend my own experiment?****CUE · QUESTIONS · KEY TERMS****NOTES**

- State a testable hypothesis.
- How will heavy metals affect the system?
- What are the limitations of your design?
- What does your data let you conclude?

KEY TERMS

- heavy metal
- toxicology
- hypothesis
- data table
- graph
- limitation
- conclusion

SUMMARY : in your own words, answer the essential question (2-3 sentences)

2.3 Lab record: Model-organism investigation

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Dated lab record. This page is a gradeable artifact: complete every section.

OBJECTIVE (what question are you answering today?)

MATERIALS / SAFETY (equipment, PPE, SDS hazards noted)

DATA / OBSERVATIONS (record measurements; sketch or table as needed)

ANALYSIS (what does the data show? claim, evidence, reasoning)

REFLECTION (sources of error, next question, real-world link)

Unit wrap-up & self-check

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“I can...” :check each skill, then rate your confidence (1-4)

- 2.1 label a neuron and explain how a signal travels and crosses a synapse.
- 2.1 trace a reflex arc and measure reaction time.
- 2.2 explain how negative feedback (e.g., insulin/glucagon) maintains homeostasis.
- 2.2 justify using a model organism and identify variables and controls.
- 2.3 design, run, and defend an open-ended investigation with valid conclusions.

What was the most important idea in this unit?**What is still confusing, and what is your plan to fix it?****How does this unit connect to a real biomedical career or case?**