

Fundamentals of Biology II (551-0104-01)

Day 2 - C4 experiments

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Before we start: Your reports

- Seize your chance!
- Use of the word “significant”
 - If “a difference is significant” in a scientific paper, it means “statistically significant”
 - t-test, ANOVA, etc (null-hypothesis rejected)

General comments on style:

- Label figures

Figure 1. Activity assays of ...
and refer to them in the text

.... (Figure 1).

less common: As shown in Figure 1, ...

- Introduce abbreviations first, then consistently use them ...

... glucose-6 phosphate dehydrogenase (G6PDH)

... but don't abbreviate everything (for readability).

- Write latin species names in italics

Agrobacterium tumefaciens

Check nomenclature

DPE1 → protein

DPE1 → gene

dpe1 → dysfunctional gene

Scientific papers require formal language...

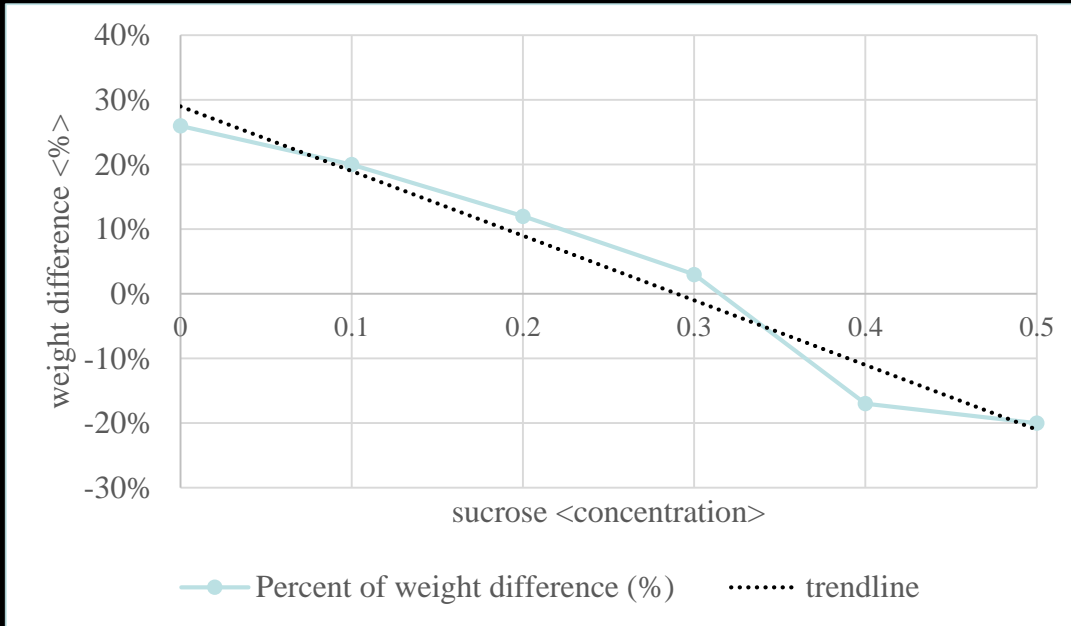
- 1) Never use “don’t”, “can’t” etc → do not, cannot
- 2) Do not begin sentences with numbers → need to be spelled out.
- 3) Use formal expressions
 - The epidermis gives the plant stability
→ provides with
 - This experiment looks into how the presence of the epidermis
 - In this experiment we try to find out if side- and adventitious roots
→ investigate, analyse, study, ...
 - ... symporters are playing a big role.
→ a great/important role; also: a greater increase etc ...
 - Sadly, this lies all in the realm of speculation.
→ Unfortunately, ...
 - Interesting fact: This step also occurs in the human body, more specific, it is the first step of the pentose-phosphate pathway.
→ Interestingly, ...

Scientific papers require formal language...

- A lot of different breeds exist.
→ a number/plethora of varieties
- The unpeeled samples on the other hand completely contradict the hypothesis; in fact, its reduction (!) in size goes against all logic.
→ Do not become too passionate ...

Water potential experiment

Example from your reports:



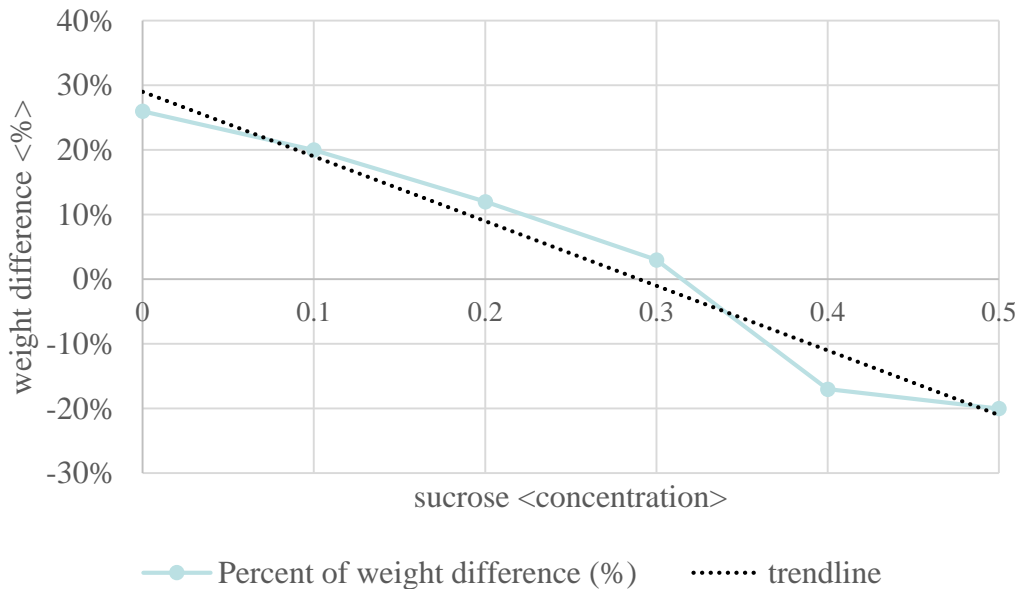
“The x-axis intercept of the linear fit represents the concentration at which no weight is gained or lost.”

What does this concentration mean?

a) This specific concentration should therefore be **the concentration of sucrose inside the parenchyma** cells.

b) This value represents the point, where the **water potential of the solution and the potato are the same**. This solution is called **isotonic**.

Water potential experiment



$$\Psi_w^{\text{saccharose solution}} = \Psi_w^{\text{intracellular space of cells}}$$

$$\Psi_w = \Psi_s + \Psi_p + \Psi_g$$

Water Potential Osmotic Potential Pressure Potential Gravitational Potential

$$\Psi_w^{\text{saccharose solution}} = \Psi_s^{\text{Osmotic Potential}} + \cancel{\Psi_p^{\text{Pressure Potential}}} + \cancel{\Psi_g^{\text{Gravitational Potential}}}$$

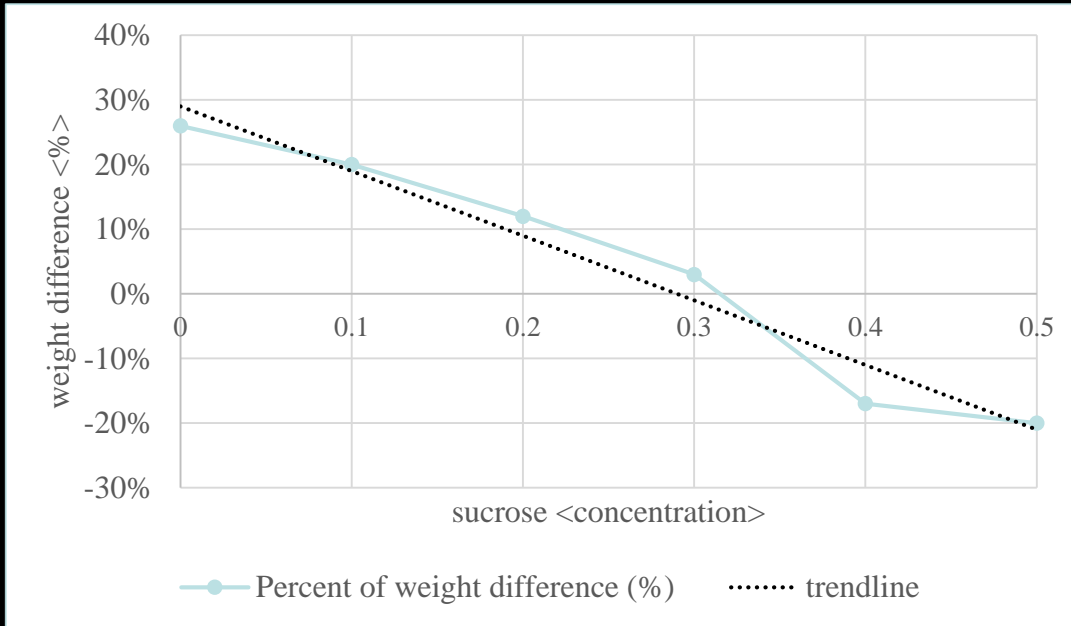
$$\Psi_w^{\text{Potato parenchyma}} = \Psi_s^{\text{Osmotic Potential}} + \Psi_p^{\text{Pressure Potential}} + \cancel{\Psi_g^{\text{Gravitational Potential}}}$$

In cells with cell walls:
Turgor pressure (≥ 0 MPa)

Value is unknown in the experiment
but is > 0 (cells are turgescient).

Water potential experiment

Example from your reports:



“The x-axis intercept of the linear fit represents the concentration at which no weight is gained or lost.”

What does this concentration mean?

a) This specific concentration should therefore be ~~the concentration of sucrose inside the~~ **parenchyma** cells.

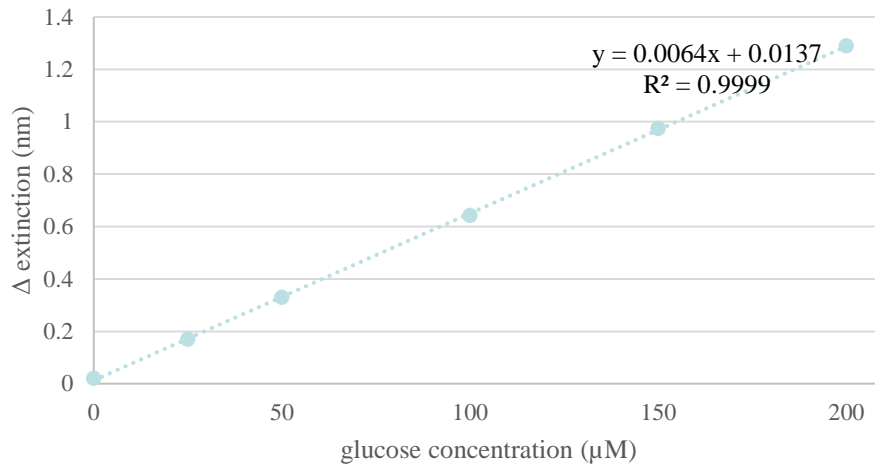
b) This value represents the point, where the **water potential of the solution and the potato are the same**. This solution is called ~~isotonic~~.

Maltotriose metabolism

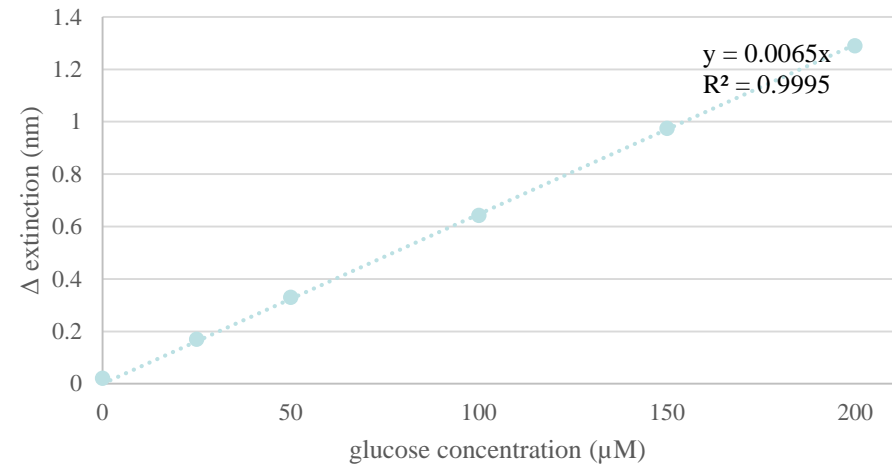
The calculation ...

An example of a calibration curve:

calibration curve

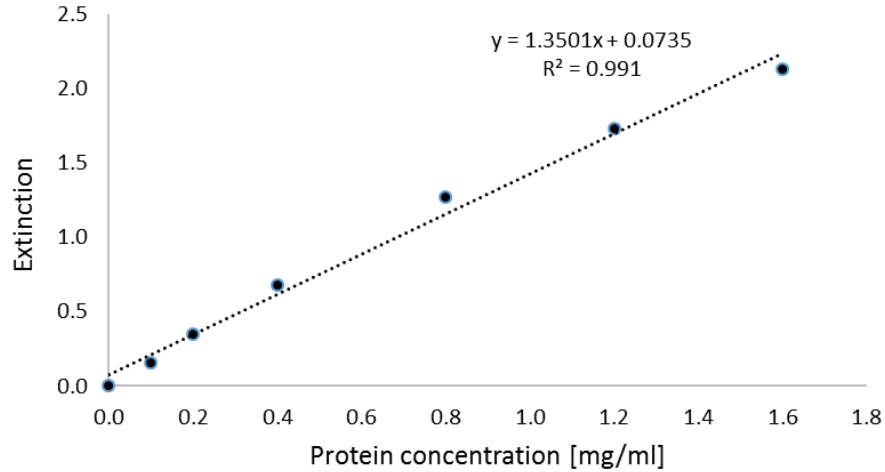


calibration curve

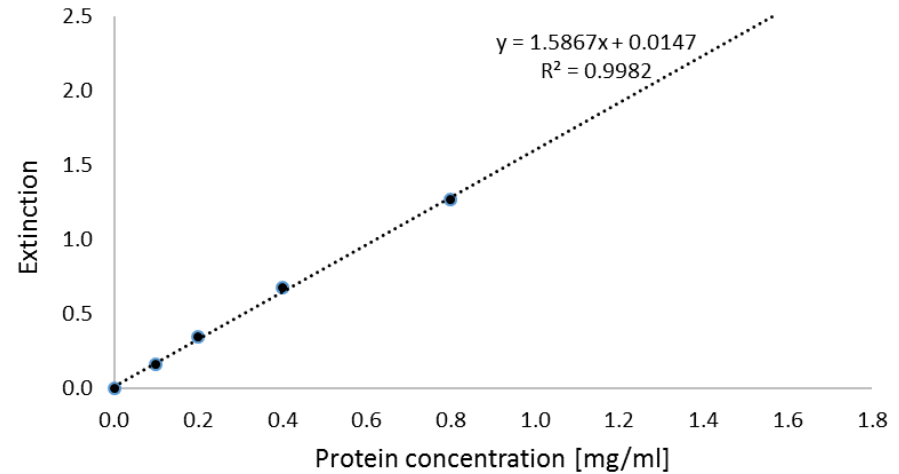
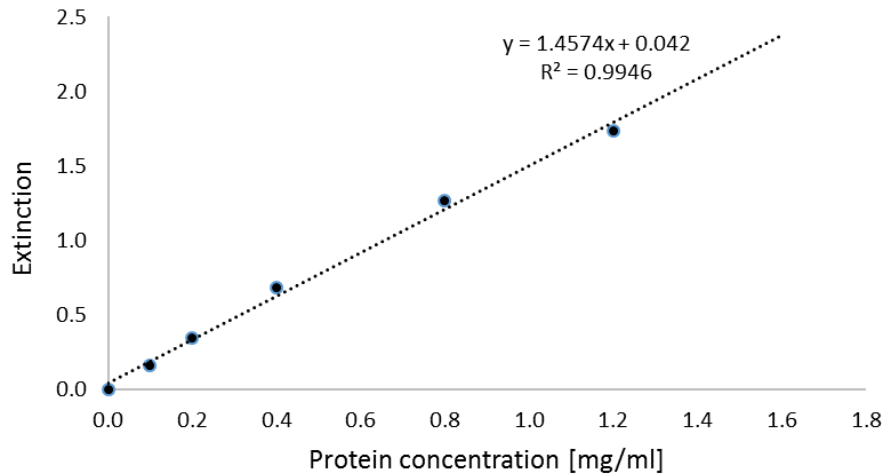


What is the extinction coefficient here?

How about the y-intercept?



An example from the lab



What does this mean for my measurement?

The calculation ...

WT	Zero point
start extinction	0.073
end extinction	0.175
Δ extinction	0.102
glucose concentration (μ M)	
nmol glucose/ cuvette	
μ mol glucose / g FW	

Why is the Δ extinction at time 0 not 0?

Activities in C4

1. Polar regeneration of auxin induced adventitious roots
2. Comparison of internodal growth
3. Comparison of development in light and dark
4. Light dependent action of norflurazon

Activities in C4

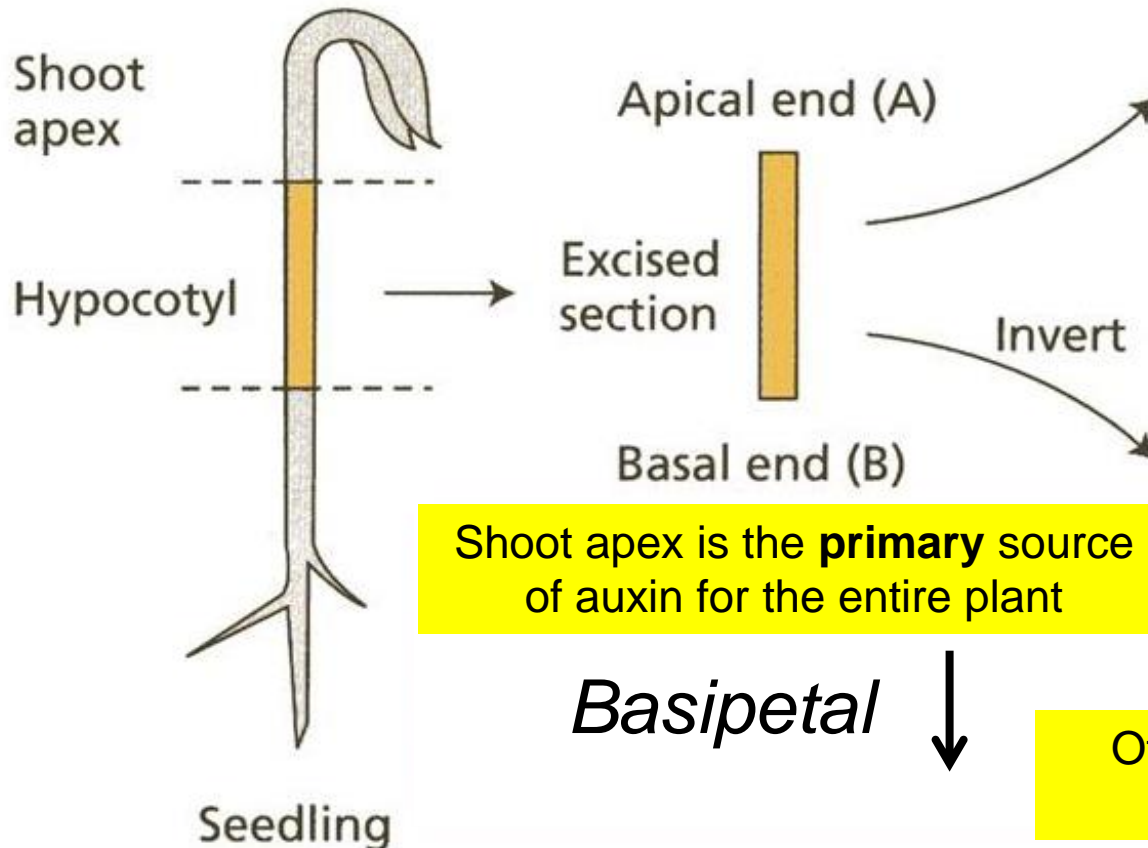
1. Polar regeneration of auxin-induced adventitious roots
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Auxin transport in the shoot:

↓ *Basipetal*
↑ *acropetal*

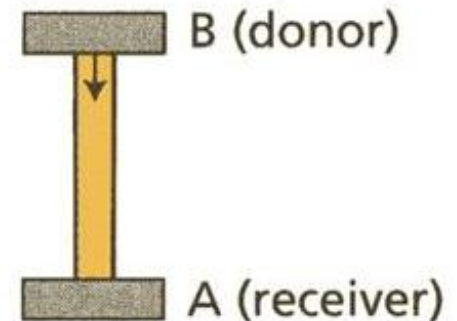
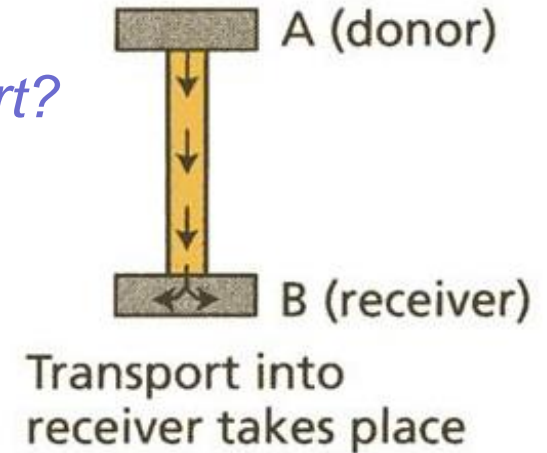
In the root, auxin is transported both acropetally (in the phloem) and basipetally (from root tip to elongation zone).

transport?



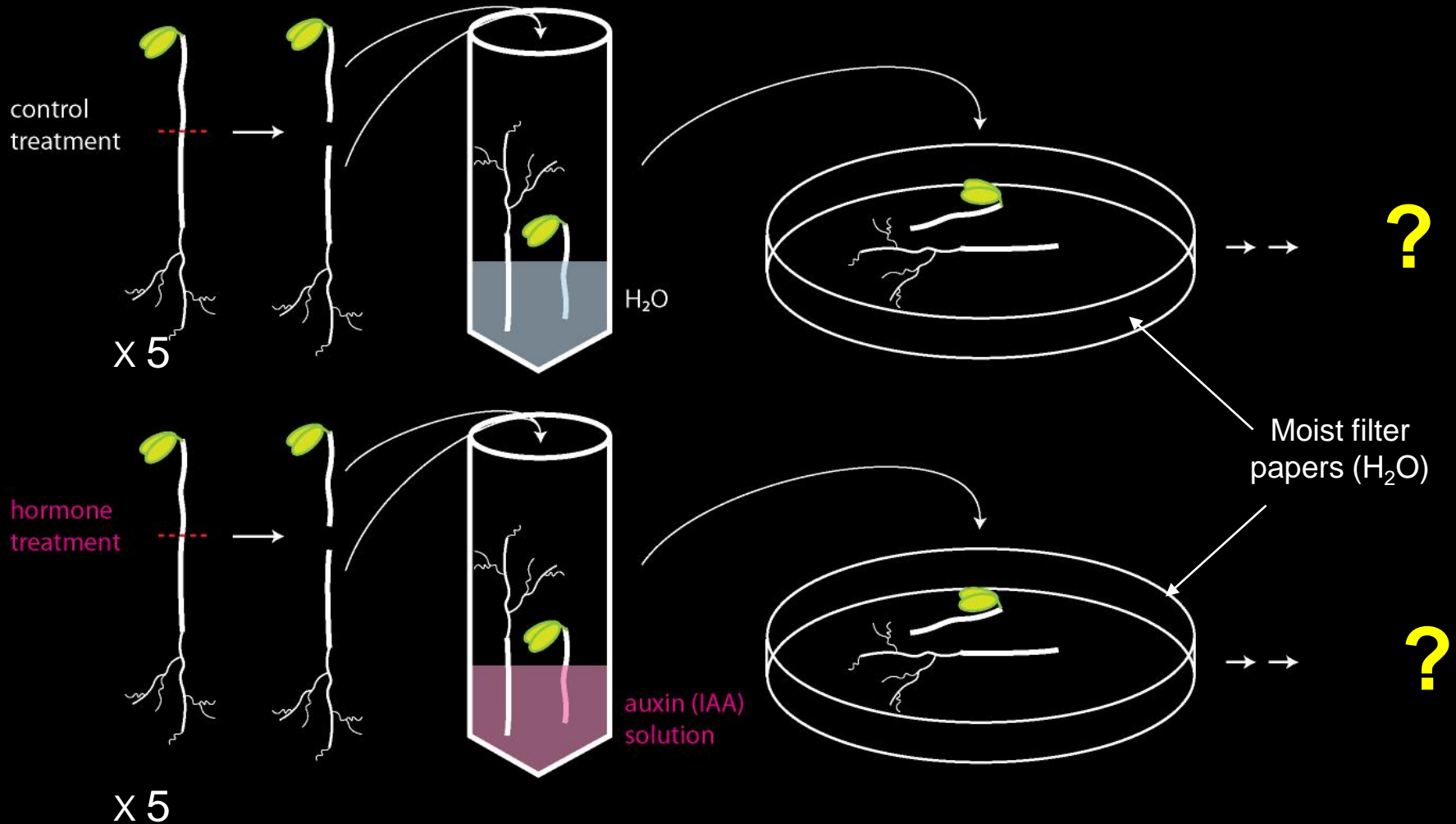
Shoot apex is the **primary** source of auxin for the entire plant

radiolabeled auxin



Other sources: root tip, young leaves ...

Auxin experiment (1)

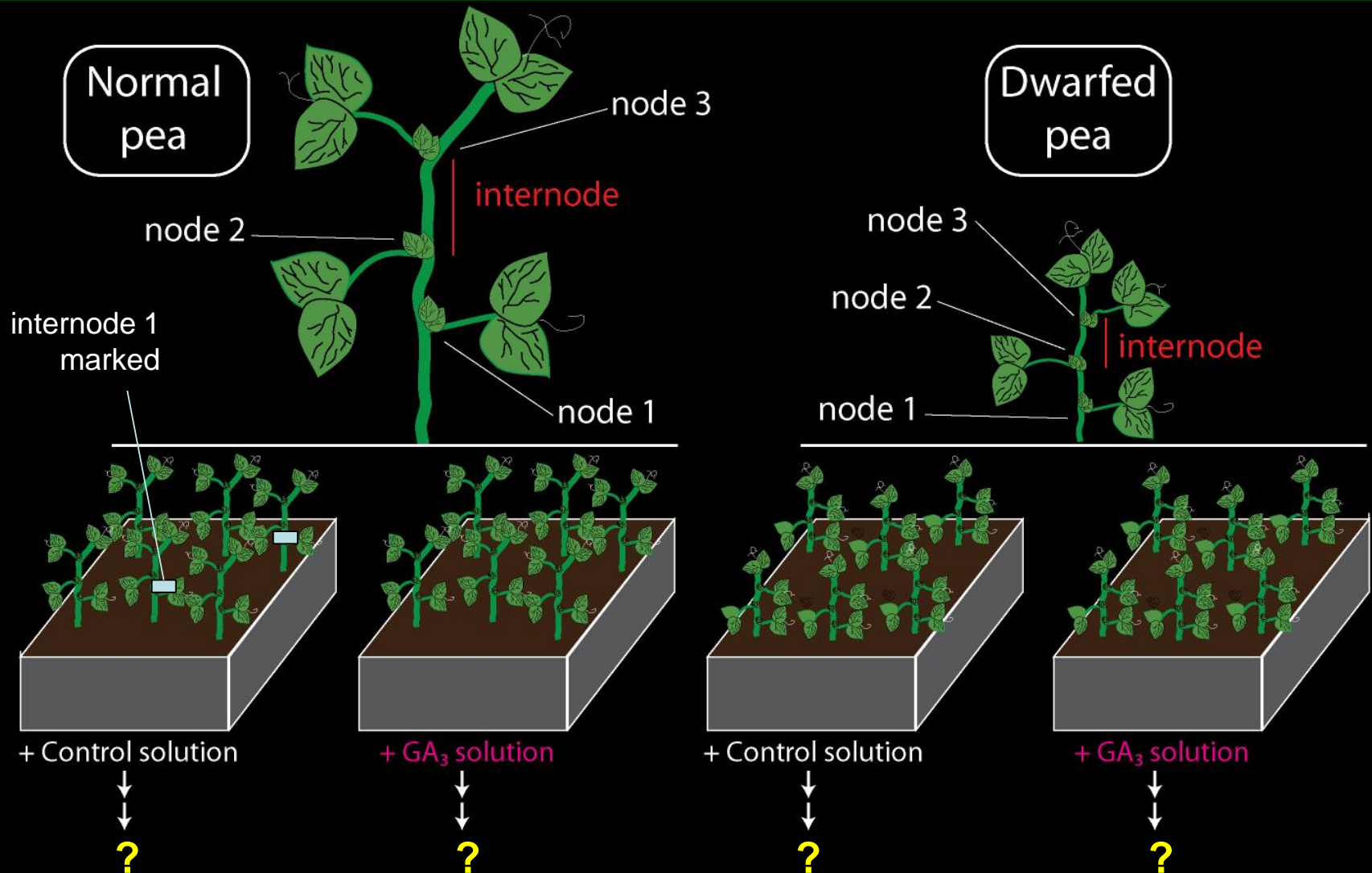


Today: Quantify and describe the formation of adventitious roots.
Relate your data to auxin transport.

Activities in C4

- 1. Polar regeneration of auxin-induced adventitious roots**
- 2. Comparison of internodal growth**
- 3. Comparison of development in light and dark**
- 4. Light dependent action of norflurazon**

Gibberellin experiment

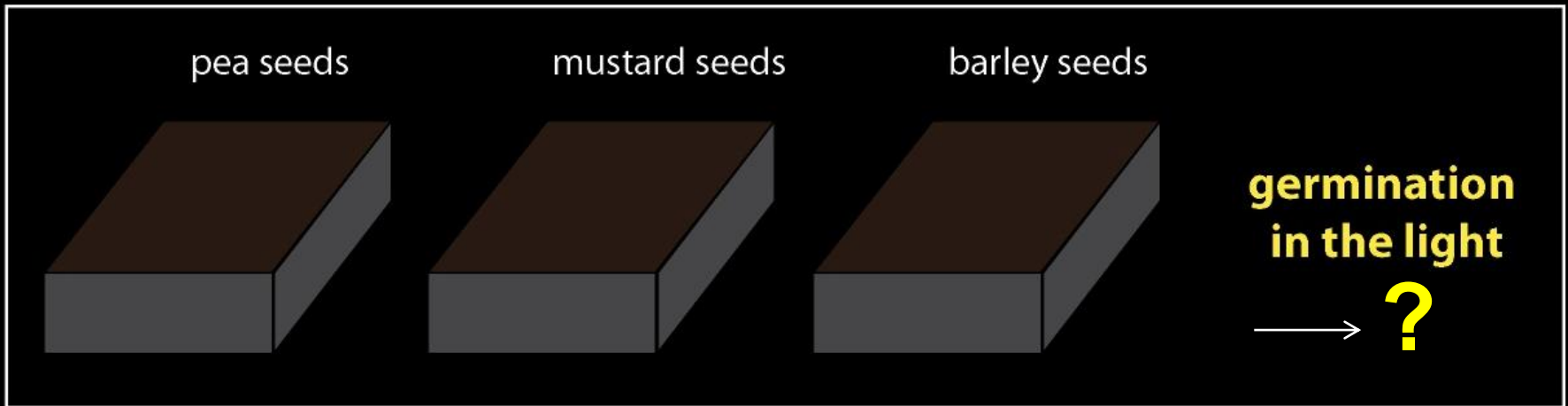
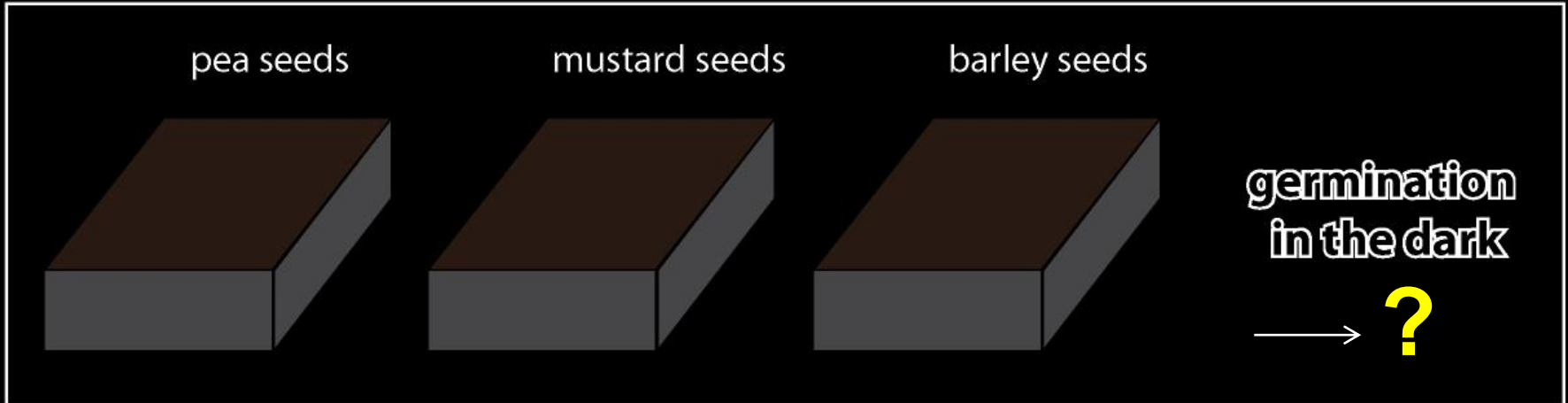


- Quantify the internodal growth with and without GA treatment
- What may be the defect in the dwarfed pea?

Activities in C4

1. Polar regeneration of auxin-induced adventitious roots
2. Comparison of internodal growth
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4. Light dependent action of norflurazon

Germination experiment

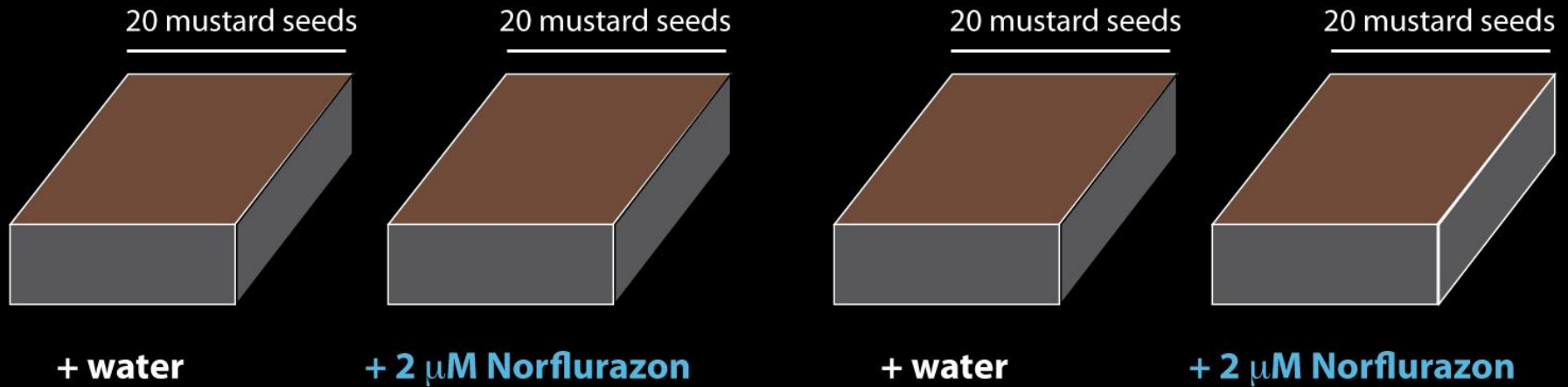


Describe skoto- and photomorphogenesis (see script)

Activities in C4

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Herbicide experiment



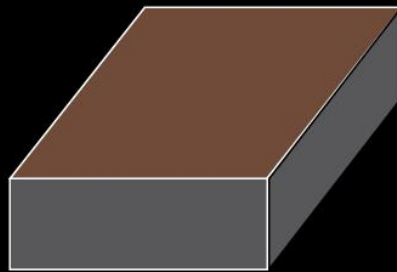
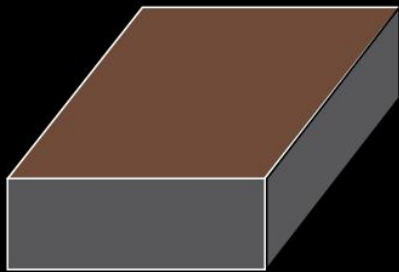
Herbicide experiment

Growth under low light



20 mustard seeds

20 mustard seeds



+ water

+ 2 μ M Norflurazon

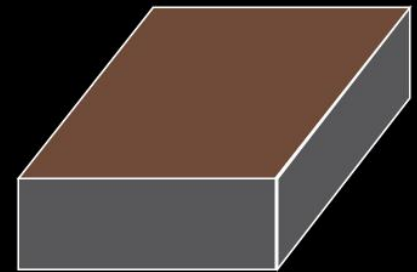
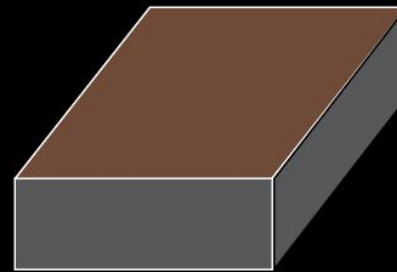


Growth under STRONG light



20 mustard seeds

20 mustard seeds



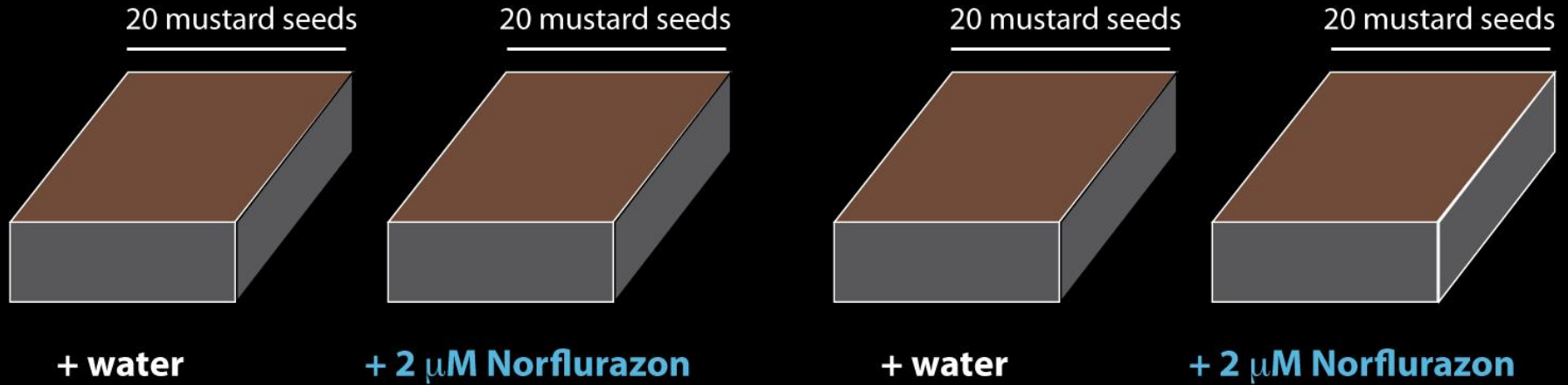
+ water

+ 2 μ M Norflurazon



Norflurazon inhibits phytoene desaturase (PDS) (the same enzyme as in the tobacco silencing experiment) → Effect?

Herbicide experiment



Caution: Norflurazon is toxic!

Reports of Day 2:

- Again due Tuesday noon (including DPE1 updates of groups 9 and 10)
- Compile everything in **one** report
 - 1) all experiments that start today
 - 2) all experiments that finish today
 - implement my suggestions and send me the whole sections (from introduction to discussion)