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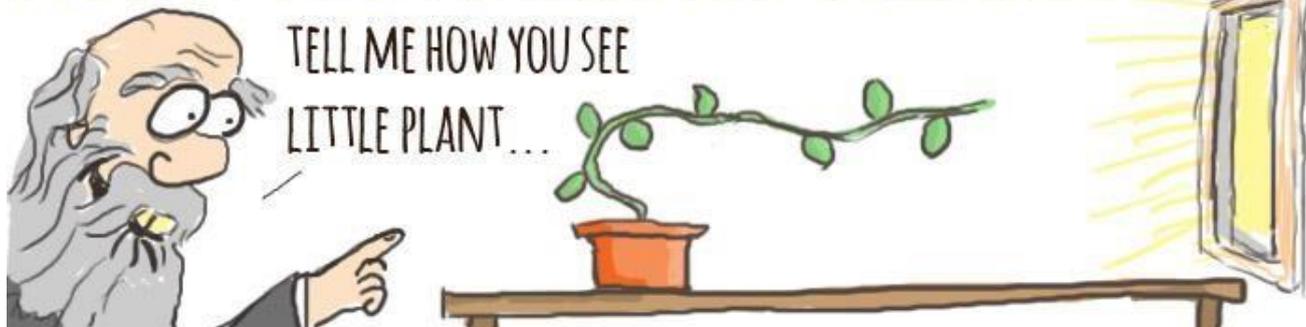
Training and Consultancy

The path to enlightened education

**SUBJECT: LIFE SCIENCES
GRADE 12
SCIENTIFIC INVESTIGATION
(PLANT RESPONSE TO THE ENVIRONMENT)
SPRING CLASSES
2023**

QUESTIONS

PLANT PHOTOTROPISM EXPERIMENT



ACTIVITY 1

A Grade 12 learner performed an investigation to determine the effect of light on the growth of plant shoots. The learner divided the plants that were used into three groups as follows:

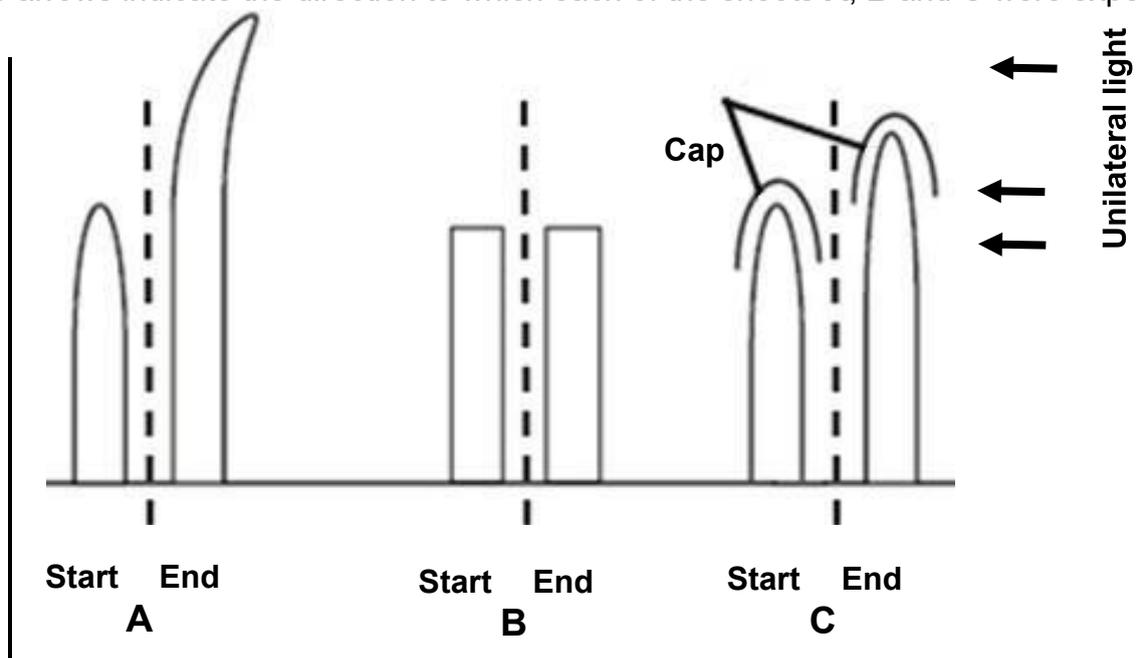
Group **A** The tip of the shoot was intact.

Group **B** The tip of the shoot was removed.

Group **C** The tip of the shoot was covered by a cap that does not allow light to pass through.

The diagram in each group (**A**, **B** and **C**) below shows each shoot at the start of the investigation and next to each, the same shoot at the end of the investigation.

The arrows indicate the direction to which each of the shoots **A**, **B** and **C** were exposed.



- 1.1 Name the dependent variable in this investigation. (1)
- 1.2 Which plant hormone is being investigated in this experiment? (1)
- 1.3 State TWO factors that must be kept constant during this investigation. (2)
- 1.4 Explain the results observed in:
- (a) investigation **A** (3)
- (b) investigation **C** (3)
- 1.5 State TWO ways in which the learner could improve the reliability of this investigation. (2)
- (10)**

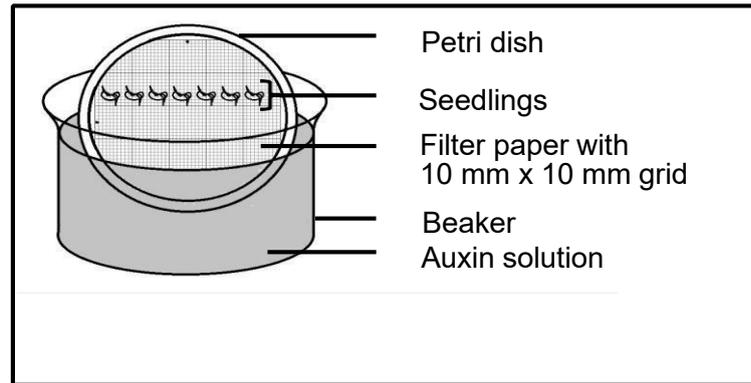
ACTIVITY 2

A group of Grade 12 learners investigated the influence of different concentrations of auxins on plumule growth. A plumule is a young stem that grows from a seed.

The procedure was as follows:

- 35 bean seeds were germinated.
- The seedlings were then divided into five groups of seven seedlings each.
- In each group the seven seedlings were attached with Prestik to filter paper on which a 10 mm x 10 mm grid was drawn.
- The filter paper with seedlings was then glued to the inside of a petri dish.
- Each of these five petri dishes was placed in a beaker containing a different concentration of auxins.

The diagram below shows the set-up of a single beaker.



- All five beakers were placed inside a dark cupboard for three days.
- After three days the increase in the length of each plumule was measured.
- The average increase in length of the plumule in each beaker was calculated and recorded in the table below.

The table below shows the results of the investigation after three days.

BEAKER NUMBER	AUXIN CONCENTRATION IN PARTS PER MILLION (ppm)	AVERAGE INCREASE IN PLUMULE LENGTH (mm)
1	0,1	1,5
2	1	3,2
3	10	4,8
4	50	2,3
5	100	0

- 2.1 For this investigation identify the:
- (a) Independent variable (1)
- (b) Dependent variable (1)
- 2.2 State the purpose of the grid that was placed inside each petri dish. (1)
- 2.3 Explain why the beakers were placed in a dark cupboard. (2)
- 2.4 State ONE way in which the learners ensured the reliability of this investigation. (1)
- 2.5 State THREE factors, not indicated in the procedure, that should be kept constant during this investigation. (3)
- 2.6 State the conclusion that can be made from the results in the table. (2)

(11)

ACTIVITY 3

Grade 12 students conducted investigations in order to establish the role of auxins in plant growth and development.

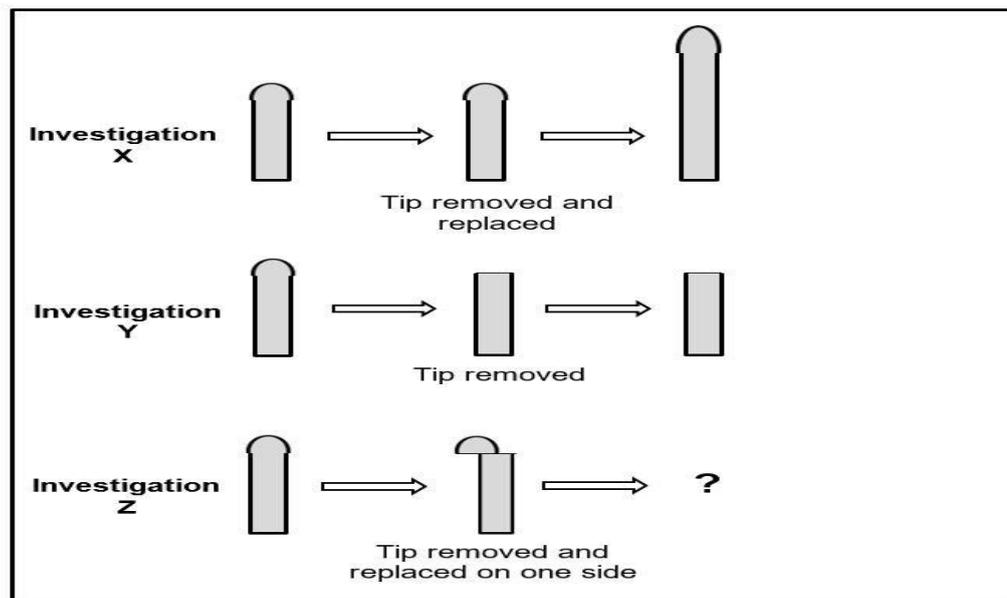
The students:

Treated THREE stem tips (coleoptiles) from the same plant in different ways.

Set up all the investigations in a dark cupboard.

Recorded the results of all the investigations after ten days.

The diagrams below show some of the results.



3.1. State:

- The independent variable for investigation **Z** (1)
- The dependent variable for investigation **X** (1)
- TWO ways in which the students could improve the reliability of the investigations (2)

3.2 Explain why the students conducted the investigation in a dark cupboard. (2)

3.3 Explain the role of auxins in the expected result of investigation **Z**. (4)

(10)

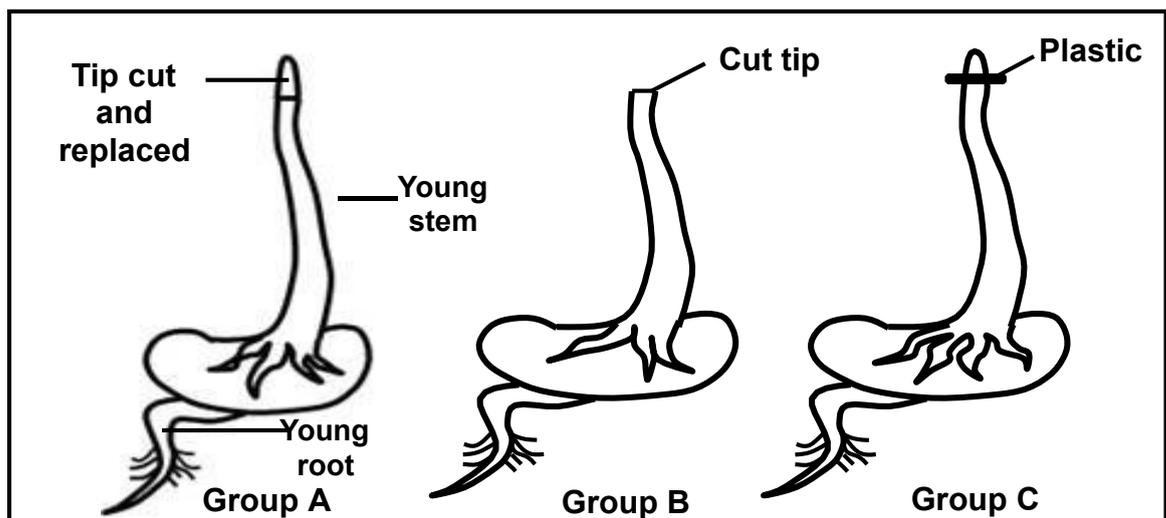
ACTIVITY 4

A group of learners conducted an investigation to determine the effect of auxins on the growth of stems in bean seedlings.

The procedure was as follows:

- 30 bean seeds were allowed to germinate for 5 days to produce seedlings.
- The seedlings were divided into 3 groups (**A**, **B** and **C**) of 10 seedlings each.
- The tips of all the seedlings were cut at the same length.
- In group **A**, the cut tip was placed back on top of the young stem.
- In group **B**, the tip was not placed back.
- In group **C**, a piece of plastic was placed on top of the cut surface and the tip was then placed on top of the plastic.
- The seedlings in all the groups were placed in a dark cupboard for a week.
- The growth of the stem was then observed.

The diagram below shows how the seedlings in each group were treated.



- 4.1 Identify the dependent variable in this investigation. (1)
- 4.2 Why did the learners cut the tips of the young stems? (1)
- 4.3 Give ONE reason why 10 bean seedlings were used in each group. (1)
- 4.4 Write down the LETTER(S) (**A**, **B** or **C**) of the group(s) where there will be no upward growth of the stem. (2)
- 4.5 Describe how auxins cause apical dominance. (3)
- 4.6 Name the plant hormone:
- (a) Other than auxins, that promotes the germination of seeds (1)
- (b) That inhibits the germination of seeds (1)
- (10)**

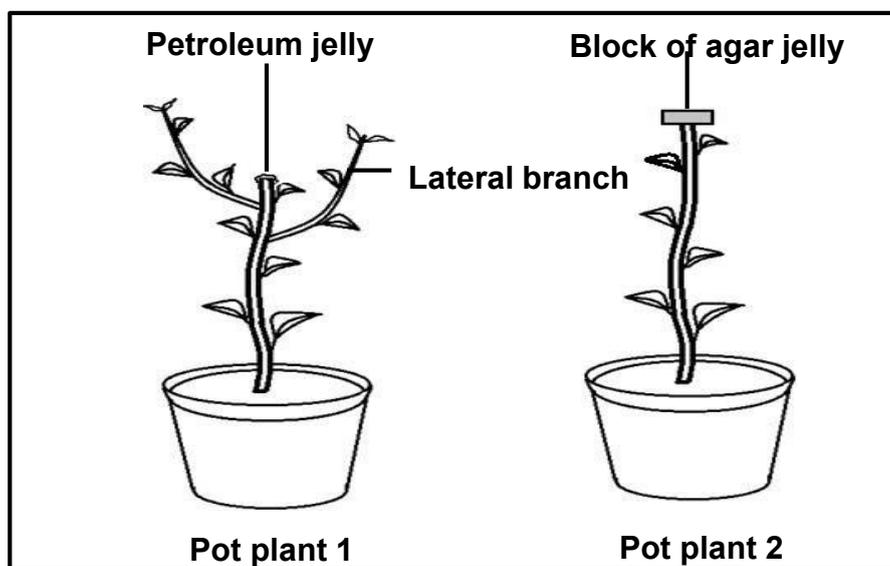
ACTIVITY 5

An investigation was done to determine the effect of a plant hormone on plant growth:

The procedure was as follows:

- Two pot plants (**1** and **2**) of the same species and age were used.
- The apical buds of both plants were cut at the same length along the stem.
- The cut surface of plant **1** was sealed with **petroleum jelly**.
- The cut apical bud of pot plant **2** was placed on a **block of agar jelly** for 2 hours.
- The block of agar jelly was then placed on the cut surface of plant **2**.
- The plants were exposed to the same environmental conditions for 2 weeks.
- The growth of both plants was observed at the end of this period.

The diagrams below show the **results** obtained.



- 5.1 State why the apical bud was placed on a block of agar jelly for 2 hours. (2)
- 5.2 Describe the results obtained for plant 1. (2)
- 5.3 Explain how fruit farmers can use the knowledge from the results in QUESTION 5.2 to their benefit. (2)
- 5.4 Explain why the stem in pot plant 2 grew upwards. (3)
- (09)**

ACTIVITY 6

A grade 12 learner investigated the effect that abscisic acid had on the germination of seed.

The procedure was as follows:

- He placed equal numbers of lettuce seeds in two potting trays (**A** and **B**). Each tray contained the same soil and was subjected to the same environmental conditions throughout the investigation.
- The percentage of seeds that had germinated in tray **A** was calculated every 10 days for 40 days.
- At the same time a sample of seeds was taken from tray **B** and the concentration of hormone in the seeds was determined.

The results of the investigation are provided in the table below:

Time (days)	% seeds germinated in Tray A	Concentration of abscisic acid in seeds in Tray B (in ng/g)
0	0	350
10	10	70
20	65	50
30	80	20
40	95	10

6.1 Formulate a hypothesis for this investigation. (2)

6.2 Identify each of the following in this investigation:

(a) Dependent variable (1)

(b) Independent variable (1)

6.3 State TWO ways in which the Learner ensured the validity of the investigation. (2)

6.4 What would the concentration of abscisic acid be in the seeds in tray A after (1)

50 days? (07)

ACTIVITY 7

Rorisang investigated the effect of auxins on the growth of three plant shoots (A, B and C). The plant shoots were treated as follows:

Shoot **A** – Not treated in any way

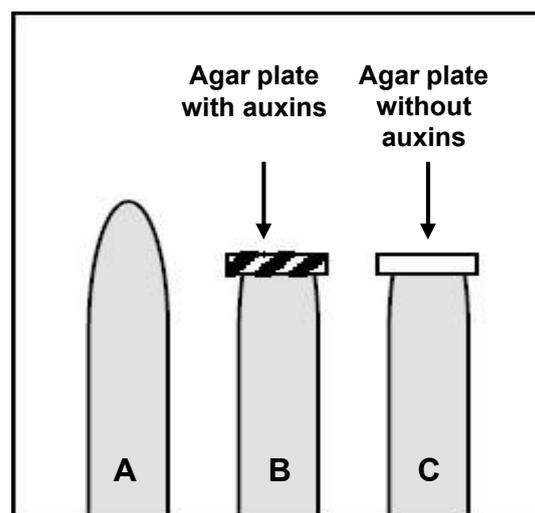
Shoot **B** – Tip removed and agar plate with auxins placed on top

Shoot **C** – Tip removed and agar plate without auxins placed on top

All shoots were exposed to the same light conditions.

NOTE: Agar is a jelly-like substance that allows auxins to diffuse through it.

The diagram below illustrates the set-up at the beginning of the investigation.



7.1 Identify the independent variable in this investigation. (1)

7.2 State TWO factors that must be kept constant in this investigation. (2)

7.3 Explain the results observed in:

(a) Shoot **B** after a few days (3)

(b) Shoot **C** after a few days (2)

7.4 Suggest TWO ways in which Rorisang could have improved the reliability of his

investigation. (2)

(10)