553/2

BIOLOGY **PROPOSED MARKING GUIDE**

(Practical) **04/02/2024**

PAPER 2

February 2024

2hours

UGANDA LOWER SECONDARY EXAMINATIONS

S.3 TEST 2 2024

BIOLOGY

PRACTICAL

2 HOURS

Instruction:

Attempt the two questions.

The items carry the same marks.

Responses should be written in spaces provided.

1. Bogere bought a piece of land from Njovu property consultants and wanted to do some **crop farming** on his land. After all payments were made, he started to prepare the land but during tilting, his garden had two soil types A and B. He was worried if these different soil types can support growth of maize crops in rainy season. Design and perform an experiment to help Mr.Bogere to know whether the soil types in his garden can support maize growing in rainy season and give reasons for the choice of experiment. Your experiment planning should include the following aspects:

i. Title and Aim of experiment.
ii. Hypothesis.
iii. Variables
iv. List of apparatus and materials used
v. Procedure and experimental set up
vi. Presentation of data.
vii. Conclusion.
(viii) Explain your hypothesis.

Confidential: soil sample A is clay and B is loam soil.

Solution:

Hint of the question:

Maize plants require moderate water for their growth as very little and too much water retards its growth, so the mere fact that mr.Bogere is worried of growing the maize in rainy season, then he needs a soil type that can retain moderate amount of water even when it rains heavily in rainy season. So the main experiment to be conducted here is water retention or water drainage by the soil types A and B.

Title: *An experiment to investigate whether the soil types A and B in Mr.Bogere garden can support maize growing in rainy season.*

Aim: *To investigate which soil type A or B in Mr.Bogere's garden can support maize growing in rainy season by retaining moderate amount of water in it.*

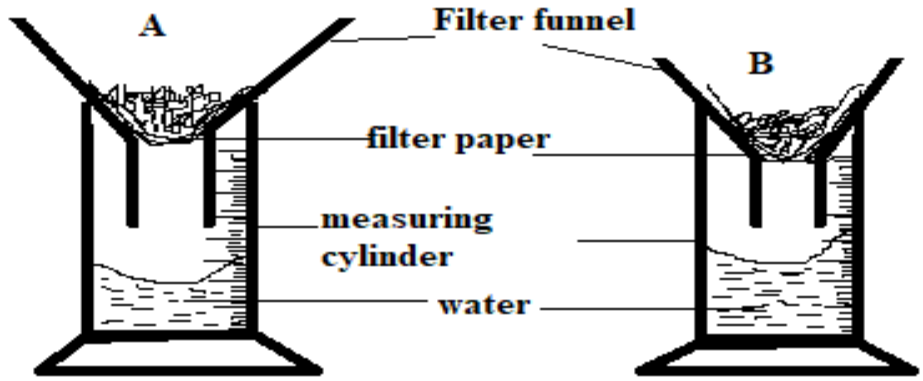
Hypothesis. *If one soil type has moderate water retention capacity, then it can support growth of maize in rainy season. Therefore I expect moderate amount of water to be collected in the measuring cylinder.*

Variables: *soil types, volume of water collected, time taken for water to stop collecting.*

List of apparatus
Two measuring cylinders
Two Filter funnels
Two filter papers/ cotton wool
Two Beakers and a stop clock .

materials used
water
dry soil types A and B

Experimental set-up.



Procedure

i. *Soil samples A and B where collected from Mr. Bogere's garden in separate containers.*
ii. *50cm^3 of each soil sample was separately measured using a measuring cylinder and poured in a two separate beakers.*
iii. *Then the filter papers were properly folded and one was fixed/inserted into each filter funnel. The funnels with filter paper were then put/placed over a measuring cylinder.*
iv. *The measured soil in beakers was then poured on filter papers fixed in each filter funnel separately.*
v. *50cm^3 of water was measured using a beaker and then poured on soil sample A and stop clock immediately started.*
vi. *The volume of water collected in the measuring cylinder is noted every after 10seconds until when water stops to drain and then recorded in a table as shown below.*
vii. *The procedure (v) and (vi) were repeated for soil sample B.*

Presentation of data.
The results obtained are represented in the table below;

Time (s)	*10*	*20*	*30*	*40*	*50*	*60*	*70*	*80*
Volume of water in A collected (cm^3)	***0.0***	***2***	***5***	***7***	***9***	***11***	***12***	***12***
Volume of water in B collected (cm^3)	***0.0***	***5***	***9***	***12***	***15***	***20***	***22***	***22***

To calculate the volume of retained, the final volume of water collected is subtracted from the initial volume of water used, as shown below;
For soil sample A;
Percentage of water retained $=\frac{initial\ volume - final\ volume}{initial\ volume\ of\ water}$ *X 100*

$=\frac{50-12}{50}$ = *76% of water retained in soil A*

Percentage of water retained in soil type B $=\frac{initial\ volume - final\ volume}{initial\ volume\ of\ water}$ *X 100*

$$=\frac{50-22}{50} = \underline{56\% \text{ of water retained in soil B}}$$

Observation: moderate water was collected in a measuring cylinder of soil sample B, hence moderate water is retained in the soil and less water was collected for the case of A, hence much water was retained in the soil sample A.

A graph showing the variation in the volume of water collected with time.

NB: plot a graph

Data analysis.

Little water was collected in measuring cylinder of A and much water was retained in the soil. This is because soil sample A has smaller soil particles, which are closely packed together, hence leaving little air spaces, which offer a high resistance to water that percolates through it hence little water passes through it, hence little water is collected and much water is retained in the soil.

Moderate water was collected in measuring cylinder of B and moderate water was retained in the soil. This is because soil sample B has medium sized soil particles, which are moderately packed together, hence leaving medium air spaces between the soil particles, which allow moderate amount of water to pass through it, hence moderate water is collected and moderate water is retained in the soil.

Conclusion:

Little water was collected in measuring cylinder of A and hence much water was retained in the soil. This shows that it cannot support maize growing in a rainy season, this is because it will retained much water, which may even lead to flooding, which may cause maize root damage and decay, hence rotting and this results into plant destruction. Also much water in soil in maize plants results into oxygen deprivation, affecting root respiration and hence affects nutrient uptake.

Moderate water was collected in measuring cylinder of B hence moderate water was retained in the soil. This shows that soil type B can support maize plant growth in rainy season, which can allow the softening of soil, allowing roots to lengthen and obtain nutrients from different areas of soil.

END