



**LIMPOPO**

**PROVINCIAL GOVERNMENT**  
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF  
**EDUCATION**

**NATIONAL**  
**SENIOR CERTIFICATE**

**GRADE 12**

**LIFE SCIENCES PRACTICAL TASK 1**

**GROUP WORK**

**20 FEBRUARY 2025**

**MARKS: 5**

**TIME: 1½ Hour**

**This question paper consists of 04 pages.**

**PRACTICAL TASK: EXTRACTION OF DNA FROM A RIPE BANANA.**

**NAME OF THE SCHOOL: \_\_\_\_\_**

**NAME OF THE LEARNER: \_\_\_\_\_**

**DATE: \_\_\_\_\_**

## INSTRUCTIONS AND INFORMATION

1. You must use a non-programmable calculator where necessary.
2. Write neatly and legibly.

### Materials needed per group:

- 1 Fresh / over ripe banana (works best) peeled and cut into small pieces
- 1 reseal-able plastic bag
- 5 ml of detergent (Liquid dish soap)
- 2,5ml/ half teaspoon of table salt
- 100 ml water
- 100 ml Rubbing alcohol (e.g. isopropyl) chilled in the freezer or on ice
- Small plastic or glass container
- Coffee filters/ cheesecloth / Strainer
- Funnel
- Test tubes or small clear containers
- Wooden sticks or plastic pipettes for DNA collection



### NOTE:

1. Section A: Group Work
2. Section B: Individual work

## SECTION A (Group work)

### Fresh banana - DNA EXTRACTION

#### METHOD:

NOTE: Put the alcohol in the freezer or in ice to chill for at least 30 minutes

**Step 1:** Put the banana in the reseal-able plastic bag, kneading it for about 2 minutes.

**Step 2:** In a small container combine, 100ml of water, 2,5ml/ half teaspoon of salt and 5ml of detergent. Stir gently until salt is fully dissolved.

**Step 3:** Pour the prepared extraction mixture into the bag with the mashed banana, mix it together in the bag make sure that fruit is as fine as possible.

**Step 4:** Put a strainer OR cheese cloth and funnel on top of a container and pour the mashed fruit solution into the strainer to get rid of the fruit pulp. Push the water out of the pulp with a spoon if you work with a funnel or use your hands to squeeze the water solution out of the pulp in the cheesecloth. Only use the watery solution in the container.

**Step 5:** Add an equal amount of chilled isopropyl alcohol to the solution in the jar by tilting the jar and pouring the alcohol slowly down the side, until you have roughly equal volumes of isopropyl alcohol and fruit mixture in the jar.

**Try to keep the layers from mixing. (DO NOT STIR)**

**Step 6:** Set the jar on a flat surface, don't move it, let it rest for 15-30 minutes.

**Step 7:** Look carefully and you should see white strands of DNA emerging. DNA will appear as white, stringy substances between the layers that will drift to the top of the alcohol

Use a stick to collect the DNA. Make sure you show your group's DNA to your teacher.

**MARKING RUBRIC**

	ASSESSMENT CRITERIA	1 MARKS	0 MARK	0 MARK	MARK OBTAINED
1.	Following procedures	Precisely followed all steps with attention to detail.	Missed significant steps in the procedures/ Did not follow procedures		
2.	Adherence to safety guidelines: 1. Avoid eating, drinking while doing experiments 2. Don't run in class/lab	Strict adherence to safety guidelines.	Mostly followed safety guidelines/ ignored safety guidelines		
3.	Preparation of final step	Very gentle pouring of chilled isopropyl alcohol onto the liquid fruit extract	Some rough pouring of chilled isopropyl alcohol onto the liquid fruit extract/ Careless pouring of chilled isopropyl/ alcohol onto the liquid fruit extract causing mixing of the and extract		
4.	Measurements and mixing of solutions	Accurate measurements and mixing of solutions	Some incorrect measurements and mixing of solutions/ No correct measurements and mixing of solution		
5.	Precipitation and visible formation of DNA	Efficient precipitation and visible of DNA strands	Extraction yielded minimal DNA/ Poor extraction. No results or no DNA obtained		
<b>TOTAL</b>					<hr/> <b>5</b>



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**GRADE 12**

**LIFE SCIENCES PRACTICAL TASK 1**

**Individual Assessment**

**20 FEBRUARY 2025**

**MARKS: 35**

**TIME: 40 Minutes**

**This question paper consists of 06 pages.**

**PRACTICAL TASK: EXTRACTION OF DNA FROM A RIPE BANANA.**

**NAME OF THE SCHOOL: \_\_\_\_\_**

**NAME OF THE LEARNER: \_\_\_\_\_**

**DATE: \_\_\_\_\_**

### INSTRUCTIONS AND INFORMATION

1. You must use a non-programmable calculator where necessary.
2. Write neatly and legibly.

***This activity must be done under strict Exam conditions. Every learner must do own work individually without any assesstance***

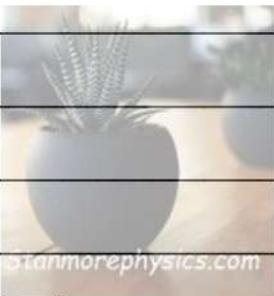
### SECTION B ( Individual Work)

#### DNA EXTRACTION

#### Question 1

1.1

- 1.1.1 How does mashing of banana contribute to the DNA extraction process? (2)



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- 1.1.2 Which components of the banana are commonly used in DNA extraction, and what is the rationale behind selecting these parts? (2)

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- 1.1.3 Describe how salt contribute to the precipitation and stabilization of DNA ? (2)

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- 1.1.4 Which part of the cell does the detergent disrupt during extraction? (1)

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- 1.1.5 Why is it necessary to use ice cold isopropyl alcohol in the DNA extraction process? (3)

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1.1.6 Explain why it is important to pour the alcohol gently to form a distinct layer over the banana extract? (2)

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1.1.7 Explain the purpose of the coffee filter/cheesecloth or strainer in DNA extraction? (2)

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1.1.8 What observable change indicate that DNA is being precipitated? (2)

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1.1.9 What is the advantage of using a clear container/ glass beaker? (2)

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1.10 Explain why it is important to avoid vigorous shaking when mixing the banana with the extraction solution? (2)

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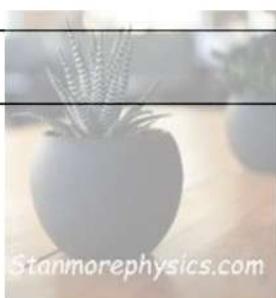
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(20)

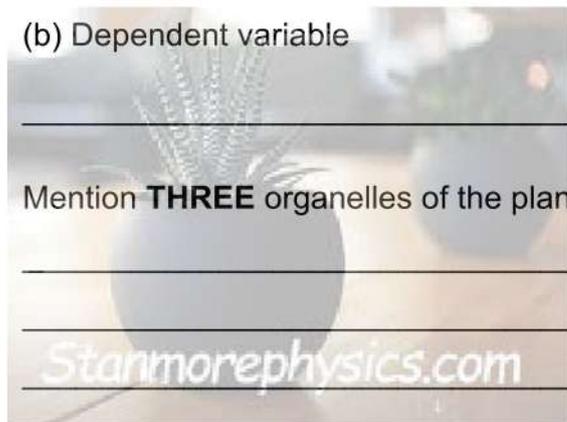
1.2

1.2.1 Identify the following factors:

(a) Independent variable (1)

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(b) Dependent variable (1)



1.2.2 Mention **THREE** organelles of the plant cell that DNA can be extracted from. (3)

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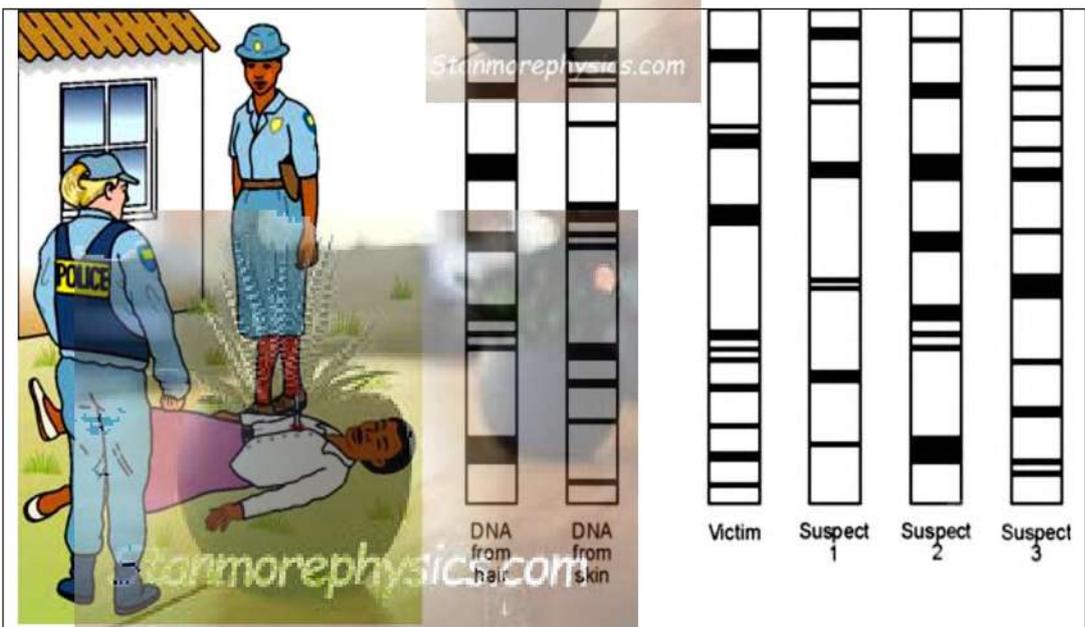
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(5)

**Question 2**

2.1	Read the following case study and use the DNA forensic evidence to solve the crime <b>Using DNA profiling to solve a crime.</b>	
<b><u>CASE STUDY</u></b>		
<p>Inspector Banyini and sergeant Sineli were investigating a scene of a violent crime. The victim was a 70 year old woman who had been stabbed and left to die. They found a few strands of hair in one of her hands, which might have come from the murderer. They also found some skin under the woman`s fingernails, which also come from the murderer if the victim had been able to scratch the murderer when she was attacked.</p> <p>There were three possible suspects in the investigation, one of whom was the boyfriend of the victims daughter. All three suspects were required to take a blood sample. A sample was also taken from the victim. The DNA profiles of the four samples were compared with the DNA profiles obtained from the hair and skin samples taken from the crime scene.</p> <p>The profiles are shown below</p>		
		

2.1.1 What is DNA profiling.

(1)

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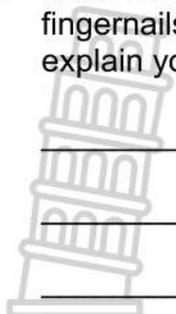
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2.1.2. Does the DNA from the hair found in the victim`s hand and the skin under her fingernails come from the same person? Use evidence from the DNA profiles to explain your answer.

(3)



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2.1.3 Based on the DNA profiles, which of the three suspects could have been present at the crime scene? Use evidence from the profiles to explain your answer.

(3)

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2.1.4 Do you think DNA evidence on its own is enough to convict a criminal? Give reasons for your answer.

(3)

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(10)

**GRAND TOTAL: (40)**



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**GRADE 12**

**LIFE SCIENCES PRACTICAL 1**

**20 FEBRUARY 2025**

**MARKING GUIDELINE**

**TOTAL: 40**

**SECTION A**

	ASSESSMENT CRITERIA	1 MARKS	0 MARK	MARK OBTAINED
1.	Following procedures	Precisely followed all steps with attention to detail.	Missed significant steps in the procedures/ Did not follow procedures	
2.	Adherence to safety guidelines	Strict adherence to safety guidelines	Mostly followed safety guidelines/ Ignored safety guidelines	
3.	Sample preparation	Very gentle with fruits to minimize damage	Some rough handling, leading to noticeable damage/ Careless handling leading to significant damage	
4.	Measurements and mixing of solutions	Accurate measurements and mixing of solutions	Some incorrect measurements and mixing of solutions/ No correct measurements and mixing of solution	
5.	Precipitation and visible formation of DNA	Efficient precipitation and visible of DNA strands	Extraction yielded minimal DNA/ Poor extraction, no results or no DNA Obtained	
				(5)

SECTION B

- 1.1
- 1.1.1 - Breaks open the cells✓, increasing the surface area for releasing DNA✓ into the extraction solution✓ (2)
- 1.1.2 - The banana`s flesh are used because it is easy to break down mechanically, ✓  
- the flesh consists of many plant cells containing a nucleus with DNA (2)
- 1.1.3 - enables DNA strands to stick together✓  
- It causes proteins and carbohydrates to precipitate✓ (2)
- 1.1.4 The detergent disrupt the cell membranes (and the nuclear memberane) (1)
- 1.1.5 - Ice cold isopropyl alcohol encourages precipitation✓ of the DNA  
-ice cold temperatures helps DNA molecule to come out of the solution✓  
- and form visible strands✓ (3)
- 1.1.6 - It ensures that a distinct layer forms over the aqueous extract✓  
- It allows the DNA to precipitate without mixing into the alcohol✓ (2)
- 1.1.7 -they are used to filter the mixture after mashing the fruit✓  
-it removes solid particles✓,  
-leaving a clear liquid that contains the extracted DNA✓ (2)
- 1.1.8 The formation of white✓, cloudy✓, or stingy substance. (2)
- 1.1.9 A clear container allows for easy observation✓ of the separation layers✓ and the formation of the precipitated DNA✓, which is important for analyzing and documenting the results✓ (2)
- 1.1.10 Vigorous shaking can shear✓ the DNA into smaller fragments/✓ damage the DNA, which makes it harder to observe ✓the long strands of DNA and may reduce the quality✓ of the extraction. (2)
- (20)**
- 1.2
- 1.2.1 (a) Banana✓/ Type of fruit (1)  
(b) Amount of DNA✓ (1)
- 1.2.2 Nucleus✓ (3)  
Mitochondria✓  
Chloroplast✓
- (5)**  
**(25)**

Question 2

- 2.1
- 2.1.1 DNA profiling is a technique used to identify an individual or species by analyzing the unique patterns of their DNA. ✓ (1)
- 2.1.2 No ✓, the patterns/bars/bands are different ✓, there could be more than one person ✓ involved in the murder (3)
- 2.1.3 Suspect 2 ✓, the DNA profile of the hair found in the victim`s hand matches ✓ with the DNA profile of suspect 2 ✓ (3)
- 2.1.4 No ✓,  
- the hair, skin could have been planted ✓  
- the tissue under the victim`s fingernails could have been from an earlier interaction ✓  
- the samples taken may be mixed with others in the laboratory ✓ (10)
- GRAND TOTAL: 40**