FINAL

# KZN CLUSTERED DISTRICTS

GRADE 12

## LIFE SCIENCES

## PRACTICAL: TASK 3

### GENETICS AND RESPONDING TO ENVIRONMENT IN ANIMALS

### MAY 2025

**MARKS: 30**

**TIME: 60 MINUTES**

**N.B. This question paper consists of 6 pages including this page.**

## INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. Answer ALL the questions.
2. Write ALL the answers in the ANSWER BOOK.
3. Start the answers to EACH question at the top of a NEW page.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Present your answers according to the instructions of each question.
6. Make ALL drawings in pencil and label them in blue or black ink.
7. Draw diagrams, tables or flow charts only when asked to do so.
8. The diagrams in this question paper are NOT necessarily drawn to scale.
9. Do NOT use graph paper.
10. You must use a non-programmable calculator, protractor and a compass, where necessary.
11. Write neatly and legibly.

**QUESTION 1**

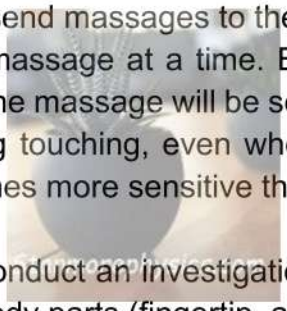
1. **Responding to the environment: Animals**

**Group work:** 20 minutes

**Background**

The ability to feel things depends on how many "receptors" present in the body part. Touch receptors sense when there is something touching the skin and send messages up through the neurons to the brain.

Neurons are also known as nerve cells. They send messages all over the body. Neurons (**sensory**) send massages to the brain for interpretation. Each of the neuron can only send one massage at a time. Even if TWO points of something touch the same neuron, only one massage will be sent to the brain. This means, the brain would only sense one thing touching, even when there are TWO. Some parts have more receptors and becomes more sensitive than others



Grade 12 learners conduct an investigation to determine the distribution of receptors (touch) in different body parts (fingertip, arm and back) using the paperclip.

**Teacher:**

- Selects 6 learners to be part of the investigation
- Forms 3 pairs (each pair must be formed by learners of same gender)
- The 3 pairs are given label **A**, **B** and **C**
- Provides them with the materials
- Instructs ALL learners to copy the table of the results 3 times
- Facilitates and ensures that participants are not harmed
- Introduce the background of the investigation a day before

**Materials**

- 3 rulers with centimetres
- 3 paperclips of the same types and medium/large size

**Procedures**

- Learners in the sample work in pairs and follow the **four steps** below. One learner in each pair will be the **investigator** and the other one will be the **participant**.

- The **investigator** will touch the **participant** with the paperclip as per steps below

- The **participants** will have to close their eyes during the investigation so that their reactions/responses are due to what they feel not what they see.

**Step 1**

- Open the paper clip and spread the ends as illustrated in the diagram below.
- Use the ruler to measure the distance between two ends and adjust them until they are exactly 4cm apart.

**Step 2**

- Apply a gentle touch of both ends of paper clip to the fingertip of the index finger as demonstrated in the picture below. Record:
  - If you feel **both** ends, write **2** in the table
  - If you feel only **one** end, write **1** in the table

**Step 3**

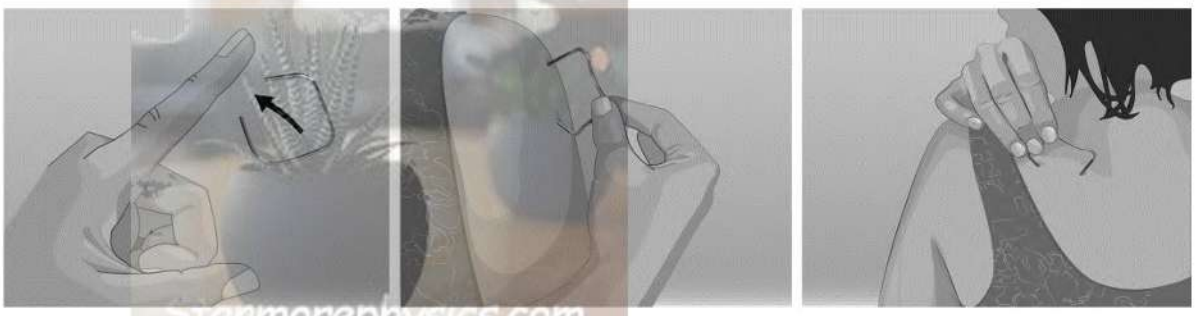
- Repeat **step 2** on the upper arm and back as demonstrated in the picture below and record your results in table.

**Step 4**

- Using your ruler, push the paper clip ends 1cm closer together and record the results. Pushing it for 3cm, 2cm, 1cm and touching ends for different readings as indicated in the table.
- Repeat **step 2** and **3** bringing the paper clip ends closer each time until they are touching.



**Note:** ALL learners will record the same results of the THREE participants



http://askabiologist.asu.edu/experiments/nerves



1.1 Copy the table below **3** times in the ANSWER BOOK/SHEET and use them to record the results of the THREE participants.

| **Distance between paperclip ends** | **Fingertip** | **Upper arm** | **Back** |
|---|---|---|---|
| 4cm | | | |
| 3cm | | | |
| 2cm | | | |
| 1cm | | | |
| Ends touching | | | |

(5)

**Individual work:** 40 Minutes

1.2 Identify:

(a) Independent variable (1)

(b) Dependent variable (1)

1.3 Describe the trend displayed by the upper arm as the distance of the paperclip ends move from 4cm to touching ends. (2)

1.4 State which part of the body is the least sensitive. (1)

1.5 State which part of the body is the most sensitive. (1)

1.6 Give a reason to the answer in QUESTION 1.5 (1)

1.7 State TWO planning steps to be considered at the beginning of this investigation. (2)



1.8 State the conclusion of this investigation. (2)

1.9 State TWO ways in which validity was ensured in this investigation. (2)

**(18)**

**QUESTION 2**

2. The scientists in United State conducted an investigation to determine which race has more prevalent cases of colour blindness. 2000 participants were used in the investigation.

The results are recorded in the table below.

| Race | The percentage of prevalent cases of colour blindness |
|---|---|
| White | 82 |
| Black | 12 |
| Hispanic | 3 |
| Other | 3 |

2.1 State the aim of the investigation. (2)

2.2 State ONE way in which reliability of this investigation was ensured. (1)

2.3 Calculate the number of black participants. Show ALL workings. (3)

2.4 Use the information above to draw a pie-chart. Show ALL workings. (6)
**(12)**

**GRAND TOTAL: 30**

FINAL

# KZN CLUSTERED DISTRICTS

GRADE 12

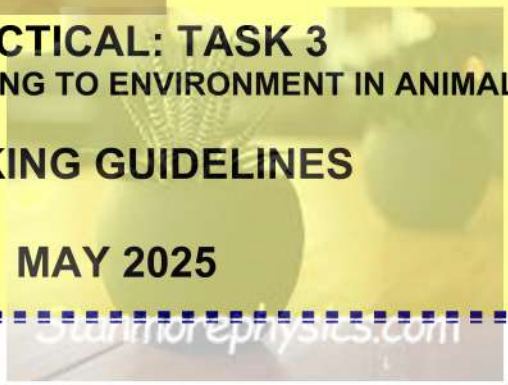
## LIFE SCIENCES

## PRACTICAL: TASK 3

### GENETICS AND RESPONDING TO ENVIRONMENT IN ANIMALS

## MARKING GUIDELINES

## MAY 2025



**MARKS: 30**

**TIME: 60 MINUTES**

**N.B. This question paper consists of 6 pages including this page.**

## PRINCIPLES RELATED TO MARKING LIFE SCIENCES

1. **If more information than marks allocated is given**
   Stop marking when maximum marks is reached and put a wavy line and 'max' in the right-hand margin.

2. **If, for example, three reasons are required and five are given**
   Mark the first three irrespective of whether all or some are correct/incorrect.

3. **If whole process is given when only a part of it is required**
   Read all and credit the relevant part.

4. **If comparisons are asked for, but descriptions are given**
   Accept if the differences/similarities are clear.

5. **If tabulation is required, but paragraphs are given**
   Candidates will lose marks for not tabulating.

6. **If diagrams are given with annotations when descriptions are required**
   Candidates will lose marks.

7. **If flow charts are given instead of descriptions**
   Candidates will lose marks.

8. **If sequence is muddled and links do not make sense**
   Where sequence and links are correct, credit. Where sequence and links are incorrect, do not credit. If sequence and links become correct again, resume credit.

9. **Non-recognised abbreviations**
   Accept if first defined in answer. If not defined, do not credit the unrecognised abbreviation, but credit the rest of the answer if correct.

10. **Wrong numbering**
    If answer fits into the correct sequence of questions, but the wrong number is given, it is acceptable.

11. **If language used changes the intended meaning**
    Do not accept.

12. **Spelling errors**
    If recognisable, accept the answer, provided it does not mean something else in Life Sciences or if it is out of context.

13. **If common names are given in terminology**
    Accept, provided it was accepted at the national memo discussion meeting.

14. **If only the letter is asked for, but only the name is given (and vice versa)**
    Do not credit.

15. **If units are not given in measurements**
    Candidates will lose marks. Memorandum will allocate marks for units separately.

16. **Be sensitive to the sense of an answer, which may be stated in a different way.**

17. **Caption**
    All illustrations (diagrams, graphs, tables, etc.) must have a caption.

**QUESTION 1**

1.1 Expected results:

- The finger will record **more 2/less 1** in the table at most/all distances between the paper clips ends than the back and the arm.

**OR**

- The back will record **less 2/more 1** in the table at most distances between the paper clips ends than the finger and the arm.

**OR**

- Finger will feel more of **both ends** (more receptors) as distance between the paper clips ends decreases than the back and the arm.

**OR**

- Back will feel the least of **both ends** (less receptors) as the distance between the paper clips ends decreases than the finger and arm

**Marking Rubric**

| Criteria | Mark allocation | | |
|---|---|---|---|
| | 0 | 1 | 2 |
| Follow instructions **(F)** | none | some | All |
| Measurement and recording **(RM)** | Incorrect measurements and recording for all 3 participants | Correct and accurate measurements and recording for 1-2 participants | Correct and accurate measurements and recording for all 3 participants |
| Tables of results **(T)** | 0-2 tables drawn | 3 tables drawn | |

(5)

**Note**: Most people cannot distinguish between 1 and 2 points on their arms or back.
: Most people will feel both ends of the paper clip when they are 4cm apart almost everywhere on the body but once those paper clip ends get closer together, that starts to change.

1.2

(a) Distance between the paperclip ends✓/paperclip (1)

(b) Distribution of receptors✓ (in different body parts/finger, arm and back) (1)

1.3 The upper arm will feel lesser and lesser of both/TWO/2 points✓✓as the distance of the paperclip ends move from 4cm to touching ends (2)

1.4 Back✓ (1)

1.5 Finger✓ (1)

1.6
- It will feel most of TWO/2 ends of paperclip at different distances✓
- which is an indication that it has (touch) receptors that are more closely arranged✓
- It has many receptors ✓ Any (1)

1.7
- Get permission from the participants✓
- Decide on the sample size✓
- Decide on the materials✓/method to use
- Decide on the recording method✓ Any (2)

**Mark the first TWO only**

1.8 A decrease in the distance between paperclip ends stimulate lesser distribution of receptors in the back than in the arm and the finger.✓✓ (2)

1.9
- Same paperclips✓/size/medium/large/type
- Same distance between the paperclips ends✓ per each attempt for various body parts
- Same body parts✓/finger, arm and back were investigated in the 3 participants
- All participants closed their eyes✓
- Each pair was of the same gender✓ Any (2)

**Mark the first TWO only**

**(18)**

**QUESTION 2**

2.1
- To determine which race has more prevalent cases of colour blindness✓✓ in United State.

**OR**

- To investigate the percentage/number of prevalent cases of colour blindness among different races✓✓ in United State. (2)

Any

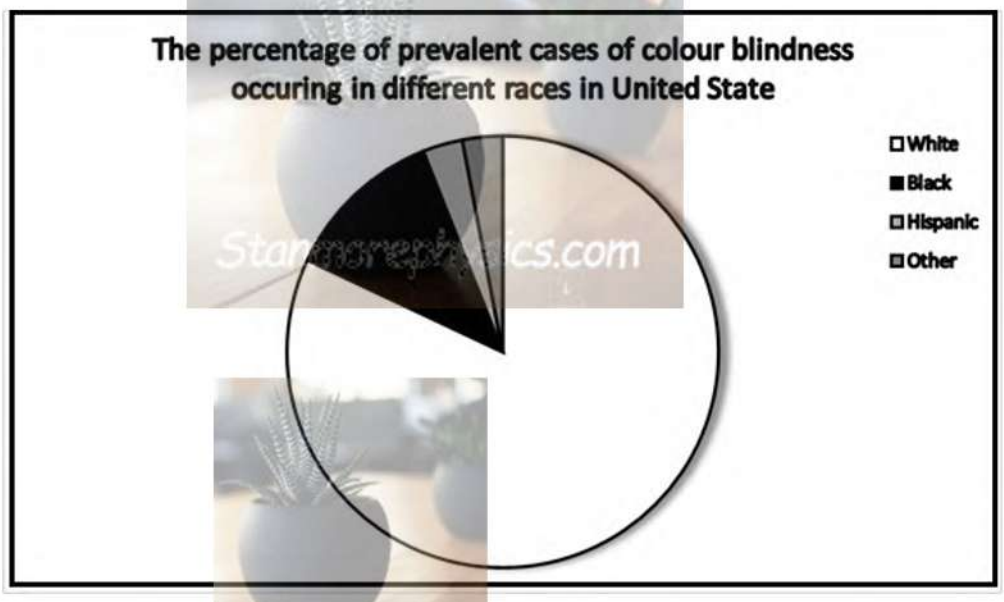
2.2 2000 participants✓ were used (1)

**Mark the first ONE only**

2.3 $\frac{12}{100}$ ✓ x 2000✓

= 240✓ (3)

2.4




**Calculations**:

White = $\frac{82}{100}$ x 360°

= 295,2°/295°

Black = $\frac{12}{100}$ x 360°

= 43,2°/43°

Hispanic = $\frac{3}{100}$ x 360°

= 10.8°/11°

Other = $\frac{3}{100}$ x 360°

= 10.8/11

Marking Criteria:

| **Criteria** | **Mark allocation** |
|---|---|
| Correct type of the graph drawn (**T**) | 1 |
| Title of the graph shows the relation between the two variables (**H**) | 1 |
| Correct calculations to determine the proportions (**C**) | 2: All correct<br>1: 1-3 correct |
| Correct proportions and labelled sectors/key (**P**): | 2: All 4 sectors correct<br>1: 1-3 sectors correct |

(6)

**(12)**

**GRAND TOTAL: (30)**