

LIFE SCIENCES WORKSHOP

**SCIENTIFIC
SKILLS/INVESTIGATIONS
25 FEBRUARY 2025
MASTEC**

DIGNOSTIC REPORT

- Misinterpretation of instructional verbs by candidates: they failed to understand the instructional verbs, **state**, **describe**, **explain**, **calculate** (% increase, % decrease, average)
- Poor performance in **scientific investigations** whereby **generic responses** were given to questions that required specific information on the investigation provided (reliability, validity)
- When using previous question papers, bear in mind that scenarios may change depending on the demand of the question.

INVESTIGATIONS

- If they do not know menstrual cycle, hormones, plant hormones and endocrine systems (aim 1), it is unlikely for them to answer questions on the investigation.
- Homeostasis (scientific investigation)
- Plant response to the environment (scientific investigation).
- Insulin and blood glucose, auxins and length, carbon dioxide and heartbeat and breathing rate
- Not effects of as independent variable

INVESTIGATION TERMINOLOGY

- Reliability AND Validity
- Control: only one variable tested and eliminate other variables
- Experiment: independent variable manipulated to cause an effect on dependent variable
- Remains high NOT remains constant
- Increasing versus high
- Decreasing versus low
- General trend not the functions, e.g. axon diameter and speed of impulse
- Use data to explain your answer above, mention time and measurements, thus use data as evidence
- Application of knowledge to new scenarios
- If groups are treated differently, then it is not reliability
- PLANNING STEPS VERSUS PROCEDURE
- Conclusion = aim of the investigation linked to the results

INVESTIGATIONS

- Investigation aim: determine whether blind people hear better than non-blind people
- Experiment: most involved and accurate, predict the outcome by making a hypothesis
- Control: element that remains unchanged or unaffected by other variables. It is a benchmark or point of comparison against which test results are measured.

Example

- Hearing task the same for blind and non-blind groups
- Experimental group: performance of the blind group in an experiment compared to that of non-blind group
- Control group: performance of the non-blind group compared to that of blind group

INVESTIGATIONS

- Scientific investigations are a pivotal assessment tool for higher-order questions and are present in both Papers 1 and 2.
- Learners who are able to master the typical questions based on a scientific investigation will definitely perform well in Life Sciences.
- The questions that are asked generally require candidates to:
- Identify the independent variable;
- Identify the dependent variable;
- Identify the controlled variables;
- Define a control;
- Express the need for a control;
- State the aim of the investigation;
- List the planning steps for the investigation;
- Suggest how to improve the validity of the investigation;
- Suggest how the reliability of the results can be improved;
- State a conclusion;
- Evaluate the procedure.

INVESTIGATIONS

- Learners must ensure that they do not give generic responses but respond to the specific procedure and data provided.
- Candidates may be asked, for example, how to improve the reliability, or what should have been done to ensure reliability or why use 1200 girls

INVESTIGATIONS

- It is clear that learners do not understand how to interpret a graph, or the data given in a tabular form.
- They are proficient at reading off values but are unable to identify and explain trends.
- When describing the trend in a graph, learners must begin with the independent variable and see how its values affect the dependent variable.

% INCREASE/DECREASE

- **Formula**
- Percentage increase = $\frac{\text{Difference} \times 100}{\text{First}}$
- Percentage decrease = $\frac{\text{Difference} \times 100}{\text{First}}$

% INCREASE/DECREASE

- **Formula**
- Percentage increase = $\frac{\text{Old} - \text{New}}{\text{Old}} \times 100$
- Percentage decrease = $\frac{\text{Old} - \text{New}}{\text{Old}} \times 100$

INVESTIGATION

The data below represents the results of an investigation used to determine how the thickness of the lens changed as a pencil was moved away from the eye.

DISTANCE FROM EYE (cm)	THICKNESS OF LENS (mm)
10	4,0
20	3,6
30	3,2
50	2,9
100	2,6
150	2,6
200	2,6

INVESTIGATION

The general conclusion that can be made from the data is that ...

- A. as the distance from the eye decreased, the thickness of the lens remained constant.**
- B. as the distance from the eye increased up to 100 cm, the thickness of the lens decreased, after which it remained constant.**
- C the thickness of the lens increased with an increase in distance from the eye.**
- D as the distance from the eye increased up to 100 cm, the thickness of the lens increased, after which it remained constant.**

TABLE

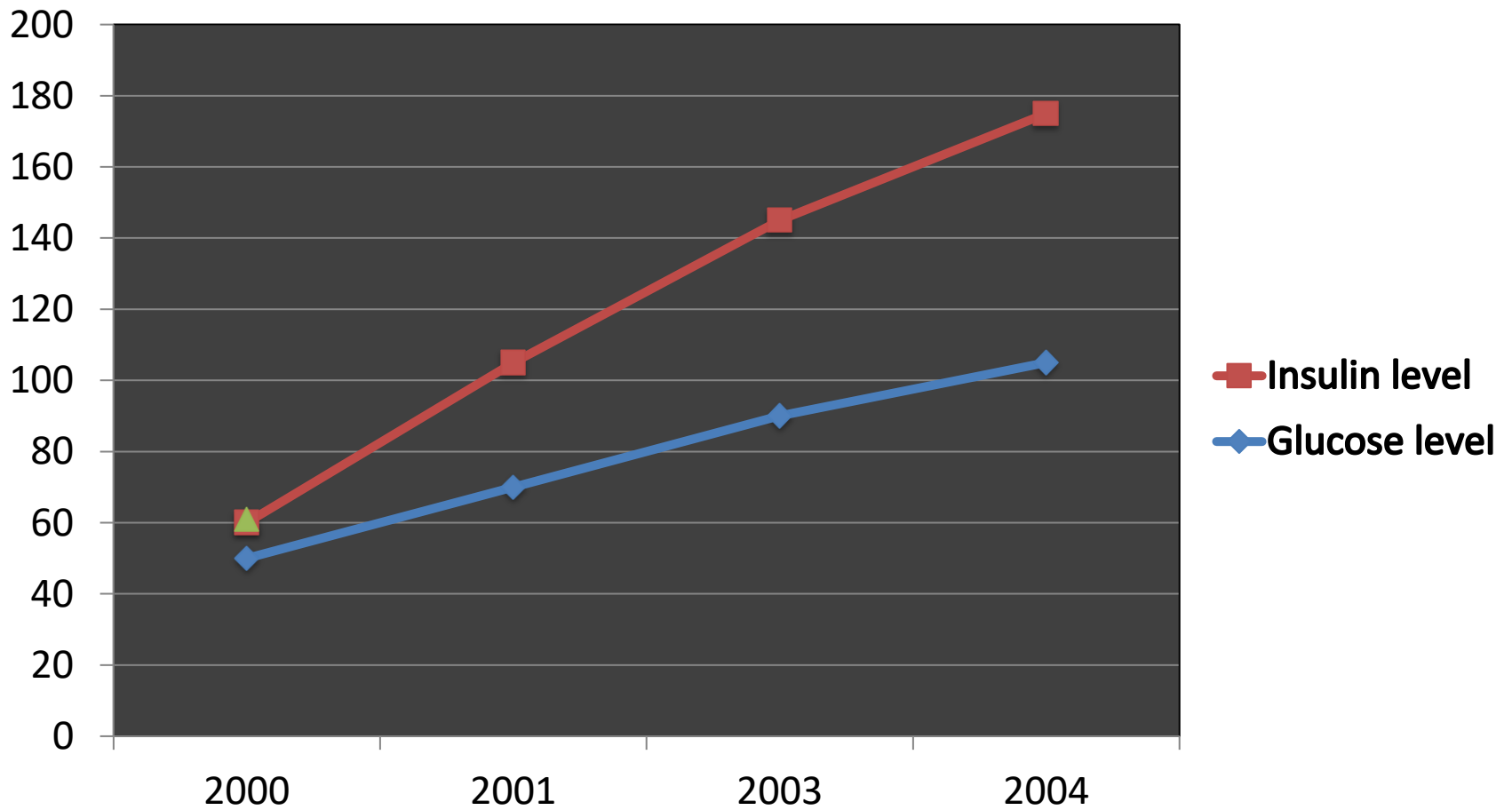
YEAR	Total amount of solid waste (millions of tons)	Amount of recyclable material in solid waste(millions of tons)
2000	10	80
2001	30	50
2002	45	40
2003	55	20
2004	60	5

INVESTIGATIONS

Graphs

- Always have a heading with both the variables.
- ***Dependent variable -variable that can be measured.***
- ***Independent variable -variable that you control.***
- Have a 0 at the origin.
- The scale must be accurate and points on the scale must be clear.
- Plotting points must be clear as well.
- Bar graphs must have a space at the y-axis while histograms do not have the space.
- Width of the bars in bar graph and histogram must be same size.
- Spaces between the bars in a bar graph must be the same size as well.
- For a bar graph, histogram and pie chart a **KEY** is essential.

GRAPH



INTERPRETING GRAPHS

Trends

- May mention words like increase, decrease, becomes constant or stable.
- Describe the increase or decrease by using the words: steady, slow or drastic.
- Both ✓ glucose and insulin increased ✓ between 30 minutes and 60 minutes. ✓
- Both ✓ the total amount of solid waste produced and the amount of recyclable material increased ✓ from 2003 to 2006. ✓

RELATIONSHIPS

- **Relationships**
- **As the one variable increases or decreases so too does the other variable increase or decrease.**
- As the axon diameter increases so does the speed of an impulse✓✓
- NOT directly proportional relationship

SCIENTIFIC METHOD

- **Construct a hypothesis:**
- A hypothesis is an educated guess about how things work:
- If _____ (I do this)
_____, then _____(this) _____will happen.
- You must state your hypothesis in a way that you can easily measure or test.
- Include both the **dependent and independent variable** in the hypothesis.

VARIABLES

- Independent variable : a factor that you choose to control in the experiment.
- Dependent variable: a factor that you measure in an experiment.
- Fixed variables: factors that stay the same throughout the experiment. **Begin with the word same....**

AIM OF THE INVESTIGATION

- To determine / To investigate
- The aim must include the **2 variables**.

INVESTIGATIONS

- The blood bank wants to carry out an investigation to determine the distribution of blood groups of 1 200 learners in a high school. They decide to use a sample to do their investigation in order to save costs and time. They also want to get a reliable result.
- **State any FOUR planning steps that the blood bank should put in place to do this investigation, before they draw blood from the learners, using a syringe.**

PLANNING STEPS

- Determine sample size
- Determine the venue
- Take random samples
- Arrange necessary equipment
- Arrange trained personnel
- Inform school of day and time research will take place
- Draw up a table to record information

PRECAUTIONS

State THREE precautions that the blood bank should take when drawing blood from the learners.

- Personnel should wear gloves
- Sterilise the learners arms
- Use new sterile syringes for every learner that is tested
- Apply pressure to stop the bleeding
- Monitor the learners after drawing the blood
- Avoid injury to learner
- Safe disposal of waste

INVESTIGATIONS

RELIABILITY

- Repeat the investigation.
- Increase the sample size.

VALIDITY

- Validity questions how the investigation or experiment (method) was carried out. It is important to be sure that all the factors or variables have been controlled except the one variable that is being tested.
- *To ensure validity the samples must be chosen randomly.*

MARKING

- Put ticks ✓ on the correct answer
- Put marks in the margin on the far right of the answer book
- Train learners not to write in the margins, as that space is meant for marks obtained
- Put marks as per sub-questions, 1.1, 1.2, 2.1, 2.2 (It helps when doing analysis)
- Carry over of marks to the next page (one cannot do wrong additions)
- Transfer the total mark for each question to the front page, add and write the grand total