CONTENTS

INTRODUCTION

The purpose of this program is to support Life Sciences candidates who are preparing for the *National Senior Certificate Exams* at the end of the year. You will be guided on

- How to prepare
- What to study
- Frequently asked questions
- Avoiding mistakes often made by candidates
- The way to answer different types of questions
- Acceptable style of writing

This information booklet has been designed to optimize your results, for you to achieve the best marks possible. Many learners work hard but are not aware of the pitfalls in different topics as well as the reasons why candidates loose marks year after year. Carefully pay attention to the “pitfalls” section for each unit.

How to Prepare

1. Use the ***Examination Guidelines for Grade 12 Life Sciences – 2021***. This is a scope examiners use to set papers. Study each point as outlined in the ***Examination Guidelines – 2021***
2. After studying the material indicated in the Exam Guidelines – 2021, test yourself by doing past paper questions. Papers for ALL subjects can be downloaded without cost from www.monyetlaproject.co.za
3. Now download the *Marking Guidelines* for the paper from www.monyetlaproject.co.za
4. If you do well, you will grow in confidence. If you are not satisfied with your progress, notice where you went wrong. We all learn from our mistakes.

Carefully note how marks are allocated in the *Marking Guidelines.* Marks are indicated for specific concepts, look where the ticks (√) are allocated. You may revise the topic again and test yourself a second time by doing more questions on the topic, until you do well.

5. Once you have followed Steps 1 – 4 above, tick the box next to each topic in this document.

Avoid Mistakes Often Made

Candidates should learn from mistakes made by learners from previous years. Learners often loose marks while they actually have a good understanding of the content. This can be the difference between you obtaining **a Level 5** or **Level 7** result. Examine the observations of Life Sciences Examiners over a number of years. Also carefully note the errors candidates make per topic in the different UNITS of this booklet.

General pitfalls to avoid

- When you are required to **list or state** 2 factors, don't write a list of factors. Markers will mark the first TWO only, even if correct answers appear later in your list.
- When you are required to **describe** a certain concept, discuss it in paragraph form, NO diagrams or flow charts are allowed when you are asked to **describe** a topic. Always look at the mark allocation, if a question counts 6 marks, try to write at least 6 facts. Candidates are encouraged NOT to use bulletin format, rather paragraphs.
- When you are required to **explain** a certain concept, it is expected of candidates to make a statement and provide a reason for the statement. Eg, if you are asked to explain the impact of the fusion of the ossicles of the ear, *"Hearing will be impaired because the ossicles will not be able to vibrate freely to transmit vibrations to the inner ear."* Always state the ***effect*** and the ***cause*** of the problem.
- When asked to **tabulate** differences, draw a table by separating the topics in 2 columns. Then stick to a topic on each side of the column eg DNA vs RNA, compare the sugar in DNA to the sugar in RNA.
- You may be required to **draw diagrams.** Do so in pencil and label in ink. Remember to provide a **caption** for each diagram, table and graph.
- Bring all **equipment** to draw graphs and to do calculations. Candidates often loose marks for graphs and pie charts.
- In Question 1.2 where candidates are required to provide the correct **Biological Terminology**, provide the terminology (usually one word) but do NOT provide examples. Eg the monomers of proteins are AMINO ACIDS, don't write names of different amino acids as examples.
- In Question 1.3 where you are instructed to **Choose** A ONLY / B ONLY / BOTH A & B / None; do NOT write A or B or Both, you must pertinently write A ONLY or B ONLY or BOTH A & B or none.

- Carefully read questions to discern **what is asked**, candidates often make a correct statement but do not answer the question. Ask yourself, did I answer the specific question? Is my answer relevant to the questions asked. Isolate KEY WORDS in the question to help you understand what is required. Be sure to write all information required, it is no good if you have knowledge on a topic but not convert it to ink on paper. Make everything clear to the marker, there should be no room for ambiguity in your answer script, no confusion between you and the marker.
- Candidates often express themselves in vague terms and loose marks. Always refer to a concept by name, stay away from expressions such as “they”, “them”, “it” eg when you describe m-RNA that is formed based on the DNA-triplets, do not refer to “… the process for …” refer to the process by NAME, “ … m-RNA is formed during TRANSCRIPTION ….” Practice this style of writing when you prepare for exams.
- Practice to do simple calculations such as % Increase and % Decrease, Ave, Difference, How many times is one bigger than other.
- When information is given in text in the question paper, refer to stats and information in the text to **link it to your answer statement**. Eg *Describe why this investigation may be viewed as reliable?* Answer that a great number of participants were used and then refer to the number in the text to qualify your answer, eg 500 participants.
- **Scientific Investigation Skills** form an integral part of assessment in Life Sciences, DON’T neglect to practice these skills before every exam.
- Remember diagrams in the paper may differ from what you have in your textbook, especially in perspective, angle or scale. Practice from past papers to develop the skill to adapt to a diagram that is slightly different from what you are familiar with.
- When you revise **functions** of different structures, always be ready to explain what the outcome will be if a certain part is **damaged**. Eg, a function of the medulla oblongata is that it controls breathing. If damaged, the obvious effect will be that breathing will be irregular / person will stop breathing. The effect of damage to certain structures is often asked.

Final Reminders

1. Never move on to a next statement in your book/notes without **clarifying a concept** you are not sure of.
2. Form **Study Groups** – support your peers and explain work to one another. *“Expression deepens Impression”*
3. Write down the reason **why** you work towards good results in Life Sciences.

UNIT 1: SCIENTIFIC INVESTIGATION SKILLS

View the Saturday School Video lesson on monyetlaproject.co.za (16/3/24)

WHAT TO STUDY

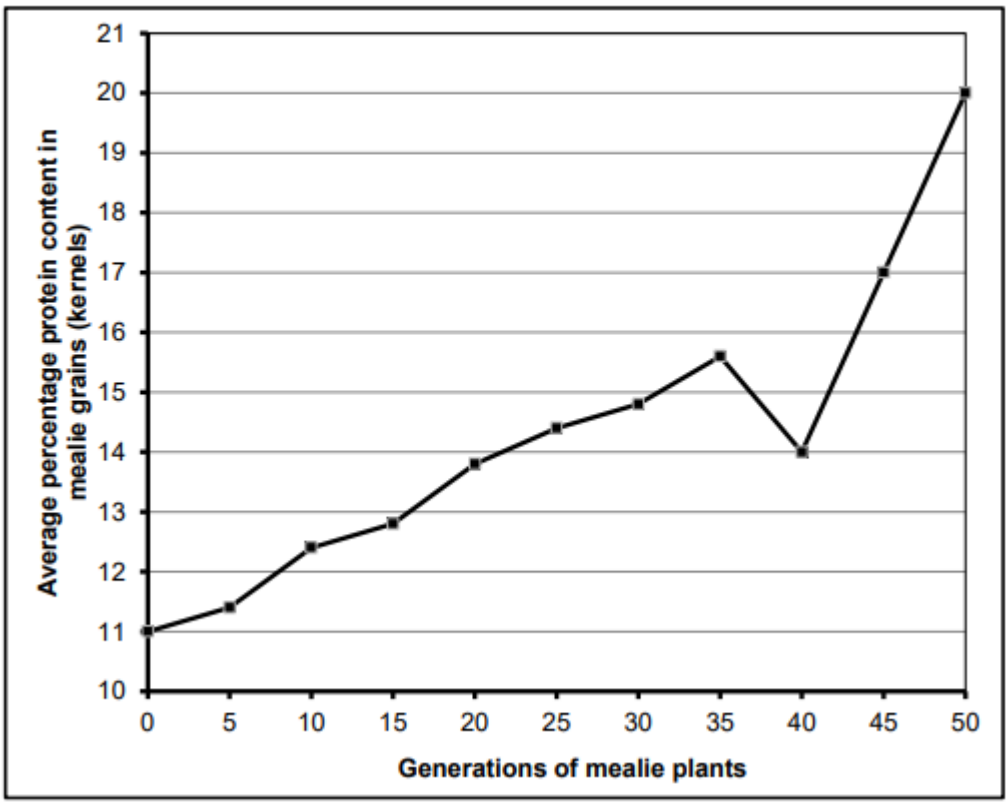
TICK THE BOX ONCE COMPLETED ☑

- ☐ How to **identify** Dependent Variables, Independent Variables & Controlled Variables
- ☐ **Validity** and **Reliability** of an Investigation. What's the difference?
- ☐ How to spot **trends** in a set of data as well as the interpretation of graphs.
- ☐ Drawing of **Graphs**
- ☐ What is included in the **Planning** of an Investigation?
- ☐ Formulate an **Investigative Question**.
- ☐ Write a **Hypothesis**.
- ☐ Provide a **Conclusion** at the end of the Investigation.
- ☐ Simple **Calculations** such as Ave, Difference, Percentage, How many times bigger, % Increase, % Decrease, Degrees for Pie Chart.

QUESTIONS FROM PAST PAPERS

November 2023 – P2

3.1 The graph below shows the results of artificial selection for protein content in mealie plants over 50 generations.



3.1.1 Describe how this farmer did artificial selection of the mealie plant. (3)

3.1.2 What was the average percentage of the protein content in the mealie grains (kernels) at the 15th generation? (1)

3.1.3 By how many times did the average percentage of the protein content in the mealie grains (kernels) increase between the 40th and 50th generation? Show ALL working. (2)

3.1.4 Describe ONE way in which the process of artificial selection is different from genetic engineering. (2)
(8)

November 2020 (2) P2

3.3 Male long-tailed widowbirds have extremely long tail feathers that they use in mating displays to attract females.

Scientists conducted an investigation to determine the relationship between the length of the male long-tailed widowbird's tail and its mating success.

The procedure was as follows:

- A total of 27 male long-tailed widowbirds was sampled and divided into 3 equal groups.
- The tail feathers of the birds in each group were treated in the following way:
  - Group **1** – Cut short
  - Group **2** – Made longer by adding artificial feathers
  - Group **3** – Left unchanged
- The 3 groups of male long-tailed widowbirds, along with female long-tailed widowbirds, were released into an environment suitable for mating.
- Each time a pair mated successfully they produced a nest and all the nests were counted.
- The average number of nests produced by each group was calculated and used as an indication of mating success.

The results are shown in the table below.

GROUP	AVERAGE NUMBER OF NESTS PRODUCED
1	0,5
2	2,5
3	1

3.3.1 Name the:

(a) Reproductive isolating mechanism that occurs in long-tailed widowbirds (1)

(b) Independent variable in this investigation (1)

3.3.2 Explain why 27 long-tailed widowbirds were used in the investigation instead of only 3. (2)

3.3.3 Explain why Group **3** was included in the investigation. (2)

3.3.4 Draw a bar graph to represent the results of this investigation. (6)

3.3.5 State a conclusion for this investigation. (2)
(14)

PITFALLS TO AVOID ⚠

- An **experiment** is always compared to THE CONTROL. **The Control** is a repetition of the experiment, but without the cause. Eg, if an investigation is done to determine the effect of different concentrations of a certain drug on the volume of urine produced per day, the CONTROL will be an experiment done according to the same procedure as the investigation but WITHOUT the drug. THE CONTROL should not be confused with *Controlled Variables*. Controlled Variables are factors that are kept constant while you investigate the impact of a specific factor that you change (manipulate).
- The **Independent Variable** is the cause described in the investigation. The **Dependent Variable** refers to the RESULTS.
- The Independent Variable is always plotted on the **X-axis** of a graph. The Dependent Variable is on the **Y-axis.**
- Before you draw a graph, give it a Caption that contains Cause and Effect, eg. *The Effect of Vasopressin on the Volume of Urine in men above 65 years of Age.*
- Provide Units to the labels for X and Y-axes in Graphs, eg Growth Rate **(cm/day).**
- A Hypothesis is a short prediction. Not an explanation, Not a Question. Always include cause and effect in your statement, eg *The more time spent by a matric learner, the better his Life Sciences results will be*. A Hypothesis is always written before the investigation is conducted.
- Don't confuse Precautions with Safety Measures.

MARKING GUIDELINES ✓

November 2023 – P2

3.1	3.1.1	- The farmer interbred✓ - mealie plants with a high protein content✓ - over 50/many generations✓	(3)
	3.1.2	12,8✓ % (Accept 12,7 - 12,9%)	(1)
	3.1.3	$\frac{20}{14}$✓ = 1,43✓ times	(2)
	3.1.4	- Artificial selection: organisms with a desired characteristic are interbred✓ - Genetic engineering: genes coding for the desired characteristic are inserted into an organism✓ **(Mark first ONE only)**	(2) **(8)**

November 2020 (2) P2

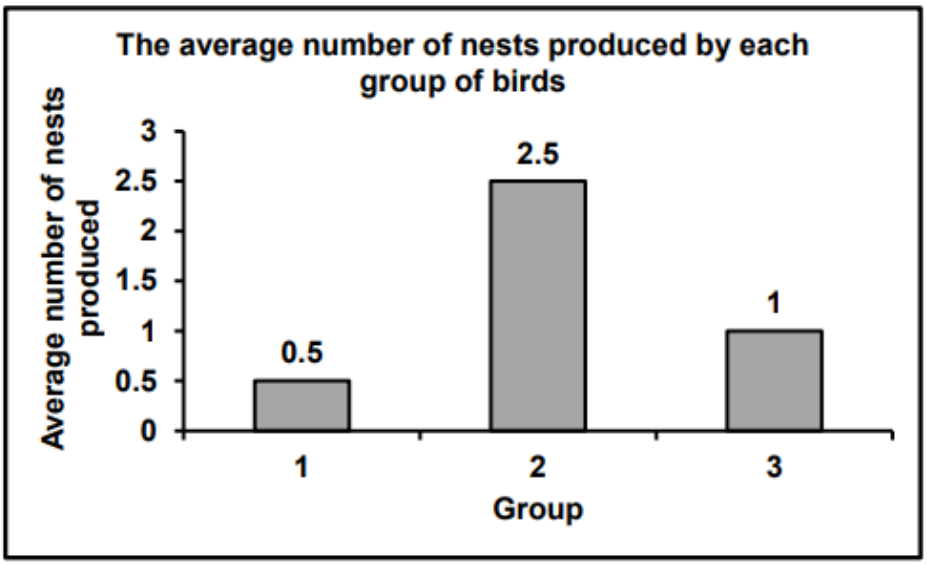
3.3.1 (a) (Species-specific) courtship behaviour✓ (1)

(b) Length of the (male long-tailed widowbird's) tails✓ (1)

3.3.2
- A larger sample size✓
- increases the reliability✓ of the investigation (2)

3.3.3
- To serve as a control✓
- so that it can be compared✓with the other groups
- and show that the tail length is the only factor that affects the results✓/improves the validity of the investigation Any (2)

3.3.4



(6)

Guideline for assessing the graph

CRITERIA	ELABORATION	MARK
Correct type of graph **(T)**	Bar graph drawn	1
Caption of graph **(C)**	Both variables included	1
Axes labels **(L)**	X- and Y-axis correctly labelled	1
Scale for X- and Y-axis**(S)**	- Equal space between bars and width of bars for X-axis and - Correct scale for Y-axis	1
Plotting of bars **(P)**	1 to 2 bars plotted correctly All 3 bars plotted correctly	1 2

3.3.5 The longer the (male long-tailed widowbird's) tail, the higher the mating success✓✓

OR

The shorter the (male long-tailed widowbird's) tail, the lower the mating success✓✓ (2)

(14)

UNIT 2: NUCLEIC ACIDS & PROTEIN SYNTHESIS (27 Marks)

View the Saturday School Video lesson on monyetlaproject.co.za (01/2/2025)

WHAT TO STUDY

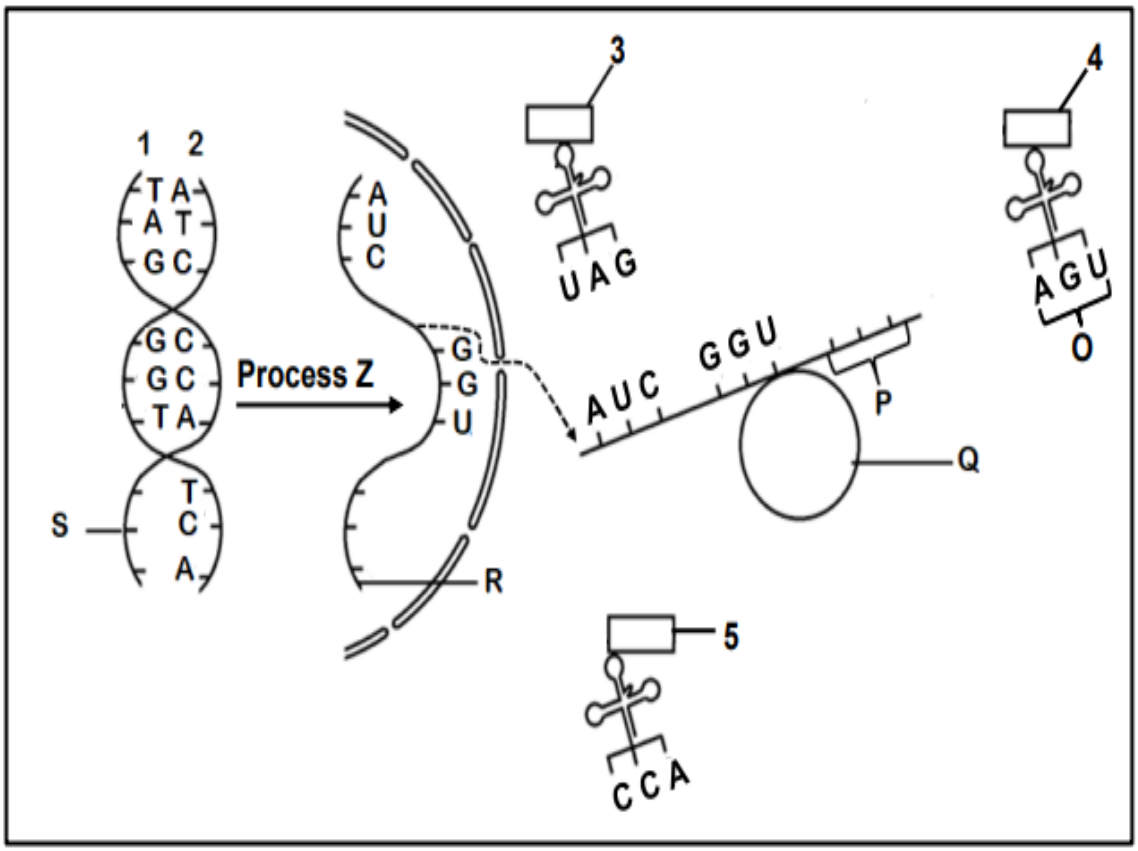
TICK THE BOX ONCE COMPLETED ☑

- ☐ **Location of DNA** in Plant and Animal Cells
- ☐ Structure of the **Nucleus** and **Chromosomes**
- ☐ Structure of Nucleic Acids and Differences - **DNA vs RNA**
- ☐ **Discovery** of DNA
- ☐ **Functions** of DNA & RNA
- ☐ **DNA Replication** – Why; Where; When and How?.
- ☐ Interpretation of **DNA Profiles** & Uses.
- ☐ Protein Synthesis – **What are Proteins?**
- ☐ Protein Synthesis – Describe the Process of **Transcription**
- ☐ Protein Synthesis - Describe the Process of **Translation**
- ☐ Protein Synthesis – Interpret **Diagrams** that illustrate Transcription & Translation
- ☐ Protein Synthesis – Place Amino Acids in **Correct Order** (See Past Papers)

QUESTIONS FROM PAST PAPERS

November 2023 – P2

1.5 The diagram below is a schematic representation of protein synthesis.



1.5.1 Identify:

(a) Process **Z** (1)

(b) Molecule **R** (1)

(c) Organelle **Q** (1)

1.5.2 Give the collective name of nitrogenous bases **O**. (1)

1.5.3 Determine the sequence of the nitrogenous bases at area **S**. (1)

1.5.4 Which strand (**1** or **2**) was used as a template for the formation of molecule **R**? (1)

1.5.5 Which amino acid (**3**, **4** or **5**) will be brought to area **P**? (1)

1.5.6 Name the type of sugar that forms part of the structure of molecule **R**. (1)
(8)

November 2022 – P2

2.2 A mutation has occurred on a section of an mRNA molecule as shown below.

Original sequence	AUG GAA AUA CCG CCA GGA
Mutated sequence	AUG GAA AUA CUG CCA GGA

2.2.1 Name the type of mutation that has occurred. (1)

2.2.2 Give a reason for your answer to QUESTION 2.2.1. (1)

2.2.3 The table below shows some mRNA codons and the amino acids that they code for.

mRNA codon	Amino acid
AUA	Isoleucine
AUG	Methionine
CCA	Proline
CCG	Proline
CUG	Leucine
GAA	Glutamic acid
GGA	Glycine

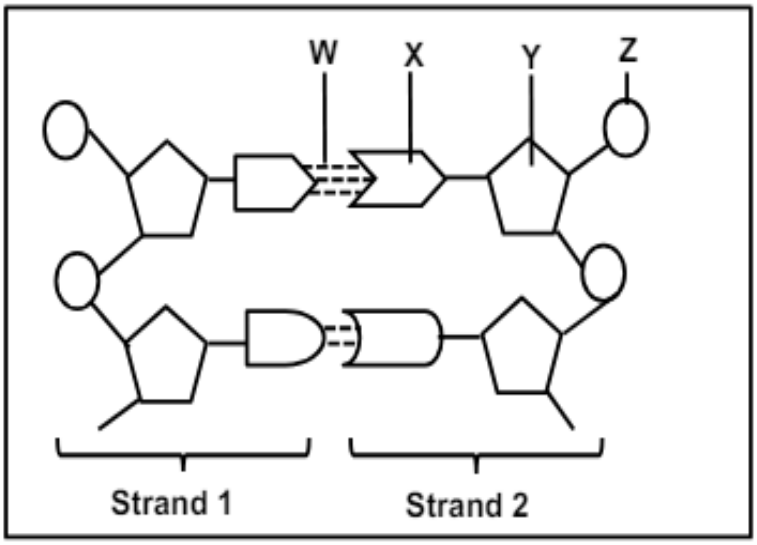
(a) State the number of different amino acids coded for by the original sequence of the mRNA molecule given above. (1)

(b) Give the anticodon on the tRNA molecule that carries the amino acid isoleucine. (1)

(c) Use information in the table to describe the effect of the mutation on the protein formed. (4)

November 2021 – P2

1.4 The diagram below represents part of a DNA molecule.



1.4.1 Identify the:

(a) Molecule **X** (1)

(b) Sugar at **Y** (1)

(c) Bond **W** (1)

1.4.2 Give the collective name of parts **X**, **Y** and **Z**. (1)

1.4.3 State the natural shape of the DNA molecule. (1)

1.4.4 Name the process whereby DNA makes a copy of itself. (1)

1.4.5 Name TWO places in an animal cell where DNA is located. (2)
(8)

PITFALLS TO AVOID

- Many candidates don't understand the difference between **nucleotides** and **nitrogenous bases**.
- Be able to **count** the number of nucleotides, N-bases and Base Triplets in a portion of a DNA / RNA molecule.

- Remember **one DNA Base Triplet** consists of **three N-Bases** (eg GCA). One Triplet in DNA, One m-RNA Codon and One t-RNA Anti-Codon represents ONE **amino acid.**
- In Translation of m-RNA and t-RNA, **T** is replaced by **U**. That means A – U
- A long chain of amino acids is a polypeptide chain. The bonds between amino acids are called a "**Peptide Bonds**" NOT a Polypeptide Bond.
- Do **NOT** confuse DNA Replication with Transcription. Some learners describe Transcription when DNA Replication is asked. This is a mistake.
- Candidates neglect to state that the end result of DNA Replication is **two identical DNA molecules**. Many write *"two DNA strands",* this is not correct.
- Some candidates cannot identify **Transcription** and **Translation** in a diagrammatic form.

MARKING GUIDELINES

November 2023 – P2

1.5	1.5.1	(a)	Transcription✓	(1)
		(b)	mRNA✓/messenger RNA	(1)
		(c)	Ribosome✓	(1)
	1.5.2		Anticodon✓	(1)
	1.5.3		AGT✓	(1)
	1.5.4		1✓	(1)
	1.5.5		4✓	(1)
	1.5.6		Ribose✓	(1)
				(8)

November 2022 – P2

2.2	2.2.1	Gene✓ mutation		(1)
	2.2.2	- There is a change in the sequence (of nitrogenous bases) from CCG to CUG✓		(1)
	2.2.3	(a) 5✓/Five		(1)
		(b) UAU✓		(1)
		(c) - The codon CCG changed to CUG✓/ 4th codon has changed - The anticodon/tRNA sequence changed✓ - The amino acid proline✓ - was replaced by leucine✓ - This resulted in a different protein✓/no protein being formed	Any	(4) **(8)**

November 2021 – P2

1.4	1.4.1	(a) Nitrogenous base✓/Guanine/Cytosine		(1)
		(b) Deoxyribose✓sugar		(1)
		(c) Hydrogen✓ bond		(1)
	1.4.2	Nucleotide✓		(1)
	1.4.3	Double helix✓		(1)
	1.4.4	(DNA) Replication✓		(1)
	1.4.5	- Nucleus✓ /Chromosome/Chromatid/ Chromatin/ Nucleoplasm - Mitochondria✓ **(Mark first TWO only)**		(2) **(8)**

UNIT 3: HUMAN REPRODUCTION (41 Marks)

View the Saturday School Video lessons on monyetlaproject.co.za (01/3/2025 & 15/3/2025)

WHAT TO STUDY

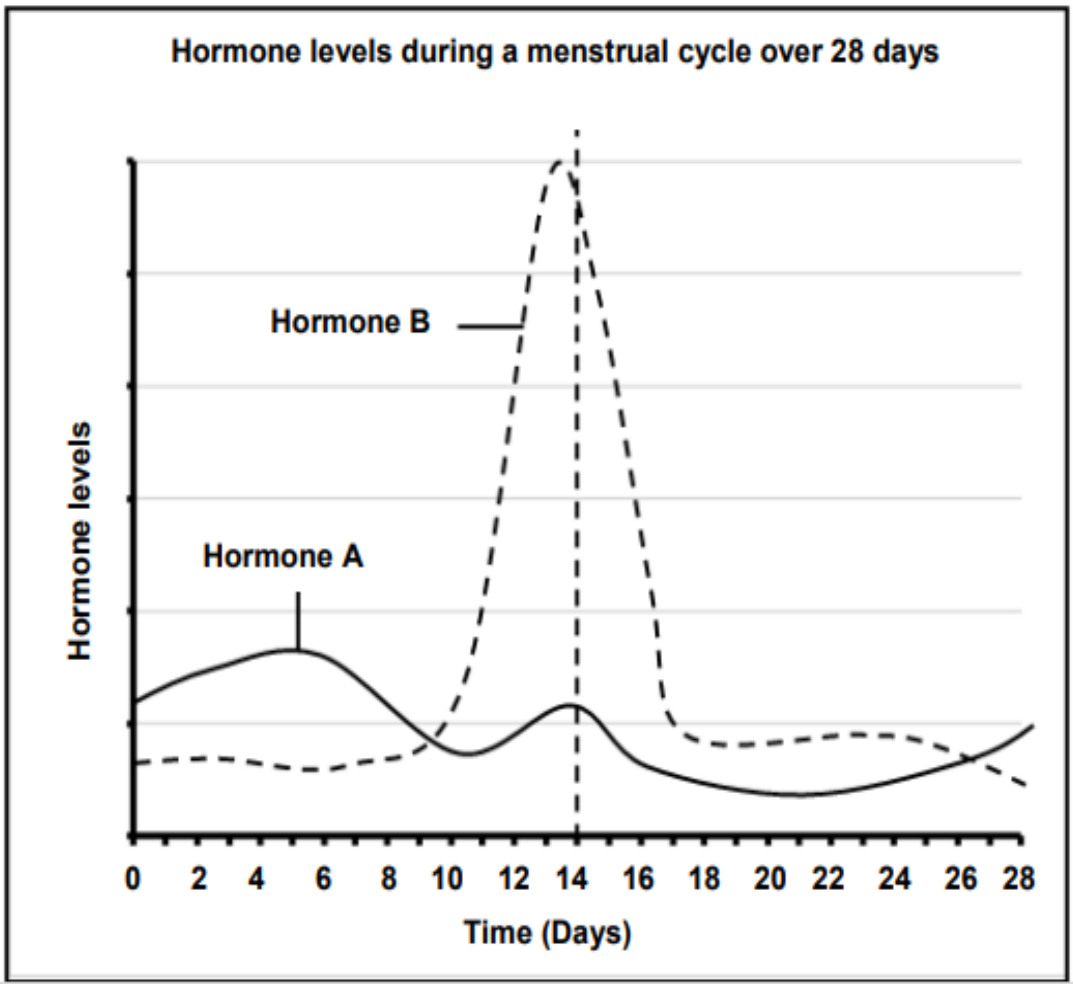
TICK THE BOX ONCE COMPLETED ☑

- ☐ Structure of the **Male** Reproductive System & **Functions** of different Parts
- ☐ Structure of the **Female** Reproductive System & **Functions** of different Parts
- ☐ Structure of an **Ovary** showing the Primary Follicles, Graafian Follicle and Corpus Luteum
- ☐ Changes during **Puberty** and the role of Testosterone (m) & Oestrogen (f)
- ☐ Describe **Gametogenesis** in Males (Spermatogenesis) & Female (Oogenesis)
- ☐ Draw and Label **Diagrams** of Sperm & Ovum
- ☐ Events of The **Menstrual Cycle**: (1) Ovarian and (2) Uterine Cycle
- ☐ Hormonal Control (4) of the **Menstrual Cycle**, incl Graphs.
- ☐ **Negative Feedback** involving Progesterone and FSH
- ☐ **After Fertilisation**: Zygote – Morula – Blastula (Implantation) – Embryo - Foetus
- ☐ The role of **Progesterone** and **Oestrogen** in the development & maintenance of the **Endometrium** and **Pregnancy**
- ☐ Diagram and functions of different structures of the developing foetus, **Amniotic Fluid** and **Placenta**, incl the **Chorion** & **Chorionic Villi**
- ☐ The Importance of the **Umbilical Cord**

QUESTIONS FROM PAST PAPERS

NOVEMBER 2022 – P1

2.3 The graph below shows the levels of two hormones that are secreted by the pituitary gland during the menstrual cycle.



2.3.1 State TWO functions of hormone **B**. (2)

2.3.2 Explain why a female who is struggling to get pregnant:

(a) May be given pills containing hormone **A** as a treatment (3)

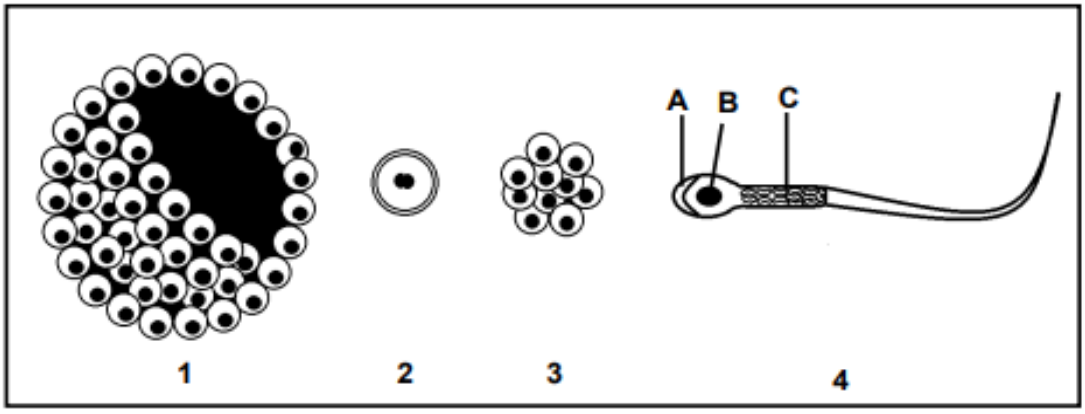
(b) Will have her levels of hormone **B** constantly monitored (2)

2.3.3 Explain how the levels of hormone **A** on days 0 to 5 will differ in a pregnant female. (3)
(10)

2.4 Describe the secretion of the ovarian hormones and their role in the menstrual cycle. **(5)**

NOVEMBER 2020 (2) – P2

1.4 The diagrams below show structures formed during human reproduction.



1.4.1 Identify part **A**. (1)

1.4.2 Name the organelle found in large numbers in part **C**. (1)

1.4.3 Give the NUMBER (**1**, **2**, **3** or **4**) only of the diagram that represents the following:

(a) Morula (1)

(b) Structure that will implant in the uterus (1)

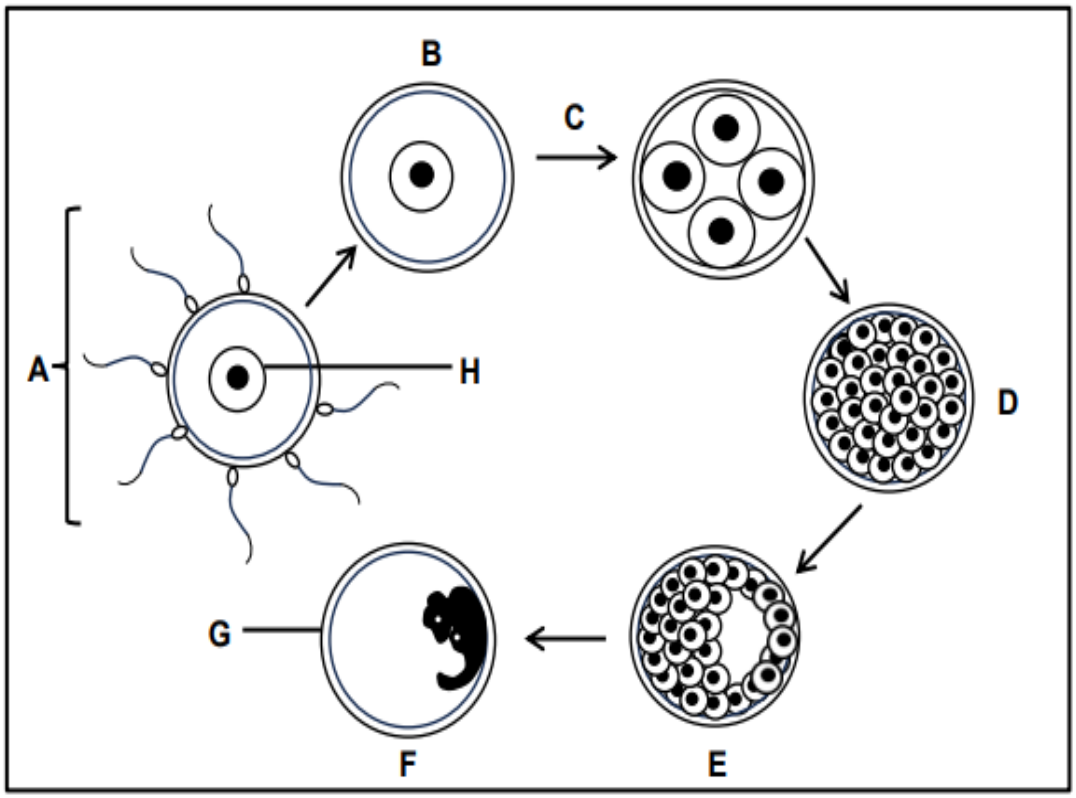
(c) Blastula/Blastocyst (1)

1.4.4 Give the LETTER and NAME of the part that will enter the ovum during fertilisation. (2)

1.4.5 Name the type of cell division that occurred to produce the structure in diagram **3**. (1)
(8)

NOVEMBER 2023 – P1

1.5 The diagram below shows events that may take place inside a human female body.



1.5.1 Identify structure:

(a) **B** (1)

(b) **D** (1)

(c) **E** (1)

1.5.2 Name the:

(a) Process taking place at **A** (1)

(b) Inner wall of the uterus where structure **E** implants (1)

1.5.3 State the type of cell division that takes place at **C**. (1)

1.5.4 How many chromosomes are normally found in **H**? (1)

1.5.5 Identify the extra-embryonic membrane **G**. (1)
(8)

PITFALLS TO AVOID

- Many candidates know the functions of the female hormones, but they need to learn to apply their knowledge of the hormones when there is an **under-secretion** of the particular **hormone** due to damage to the endocrine tissue secreting it. What will be the consequences?
- Candidates MUST prepare well to answer questions on the fluctuations of the **4 female hormones** during the **menstrual cycle**. In conjunction with the graphs, study the **changes** in the **ovary** and the thickness of the **endometrium** over the 28-day menstrual cycle.
- Be ready to answer questions on the effect of **Progesterone** on the endometrium and how progesterone inhibits FSH and LH (negative feedback)
- Some learners **confuse** ”Menstruation” with “Menstrual Cycle”
- Some learners **incorrectly** refer to the corpus luteum as the corpus callosum.
- Many candidates do not examine the **chorion and chorionic villi** in their preparation for assessment tasks.
- Most candidates don’t know the difference between the **umbilical arteries and umbilical vein’s** functions.
- Learners need to practice the skill of applying knowledge of functions to when a specific part is injured / **damaged.**

MARKING GUIDELINES

NOVEMBER 2022 – P1

2.3.1 - Stimulates ovulation✓
- Stimulates the development of the corpus luteum✓
(Mark the first TWO only) (2)

2.3.2 (a)
- FSH✓/a high concentration of hormone A
- will stimulate follicles to develop✓
- Therefore, ova will be produced✓ increasing the chances to fall pregnant (3)

(b)
- A peak in hormone B✓/LH
- will indicate that ovulation is about to happen✓
- therefore, an ovum will be available for fertilisation✓ Any (2)

2.3.3
- The levels will remain low✓ because
- the high progesterone levels✓ during pregnancy
- will inhibit the secretion of FSH✓ /hormone A (3)

(10)

2.4
- The Graafian follicle✓
- secretes oestrogen✓
- causing the endometrium to become thicker✓/more glandular or vascular
- The corpus luteum✓
- secretes progesterone✓
- which (further) increases the thickness of the endometrium✓
- High levels of progesterone inhibit FSH secretion✓ Any **(5)**

NOVEMBER 2020 (2) – P2

1.4.1 Acrosome✓

1.4.2 Mitochondria✓

1.4.3 (a) 3✓

(b) 1✓

(c) 1✓

1.4.4 B✓- Nucleus✓

1.4.5 Mitosis✓

NOVEMBER 2023 – P1

1.5.1 (a) Zygote✓

(b) Morula✓

(c) Blastocyst✓/blastula

1.5.2 (a) Fertilisation✓

(b) Endometrium✓

1.5.3 Mitosis✓

1.5.4 23✓

1.5.5 Chorion✓

UNIT 4: GENETICS (48 Marks)

View the Saturday School Video lessons on monyetlaproject.co.za (12/4/2025 & 19/4/2025 & 26/4/2025 & 3/5/2025 & 10/5/2025)

WHAT TO STUDY

TICK THE BOX ONCE COMPLETED ☑

- ☐ **Genetic Terminology**
- ☐ **Mendel's 3 Laws / Principles**: (1) Law of Dominance
- ☐ (2) Principle of Segregation
- ☐ (3) Principle of Independent Assortment
- ☐ **Three Types of Dominance** and how to solve Genetic Problems for each:
- ☐ (1) Complete Dominance
- ☐ (2) Incomplete Dominance
- ☐ (3) Co-dominance
- ☐ Proportions **(%) and ratios** of Genotypes and Phenotypes.
- ☐ Interpretation of **Karyotypes** with special reference to **Autosomes & Gonosomes.**
- ☐ How **Gender** is determined.
- ☐ **Sex-linked alleles** – What does it mean?
- ☐ How to do Genetic Problems pertaining to **sex-linked disorders**.
- ☐ Blood Groups: Dominance at **Blood Groups**; The 3 Alleles involved – More than 2 alleles are referred to as *Multiple Alleles*
- ☐ Do **Genetic Problems** involving the inheritance of Blood Type.
- ☐ **Dihybrid Crosses** – handling 2 features at the same time, **eg** Height of Pea Plants **and** Colour of the Flower. Representation of their Genotypes **eg** for Peas, **TtWw** where T is for Tall, t for short plants **and** W for white flower, w for yellow flower.
- ☐ Interpretation of **Pedigree Diagrams**

- ☐ Mutations: What are they? Difference, **Chromosome** Mutations vs **Gene** Mutations.
- ☐ **Down Syndrome** – Explain why some people are born with 47 chromosomes.
- ☐ **Genetic Engineering**: Understand the benefits and disadvantages.
- ☐ Brief outline of: (1) **Cloning**
- ☐ (2) **GMO Products**
- ☐ (3) **The use of Stem Cells**
- ☐ How Blood Types are used to solve issues with **Paternity**. Why is DNA Profiling more detailed in indicating Paternity?
- ☐ The use of **mt-DNA** to determine family history.

QUESTIONS FROM PAST PAPERS

NOVEMBER 2023 – PAPER 2

In summer squash plants, white fruit colour **(B)** is dominant over yellow fruit colour **(b)**, and round fruit **(D)** is dominant over oval fruit **(d)**.

A summer squash plant that is homozygous for white and round fruit is crossed with a plant that is homozygous for yellow and oval fruit.

2.5.1 State the:

(a) Genotypes of the P_1-parents (2)

(b) Phenotypes of the F_1-generation (2)

2.5.2 Two plants that are heterozygous for both characteristics were crossed.

(a) Give ALL the possible genotypes in the **gametes** that will be formed. (2)

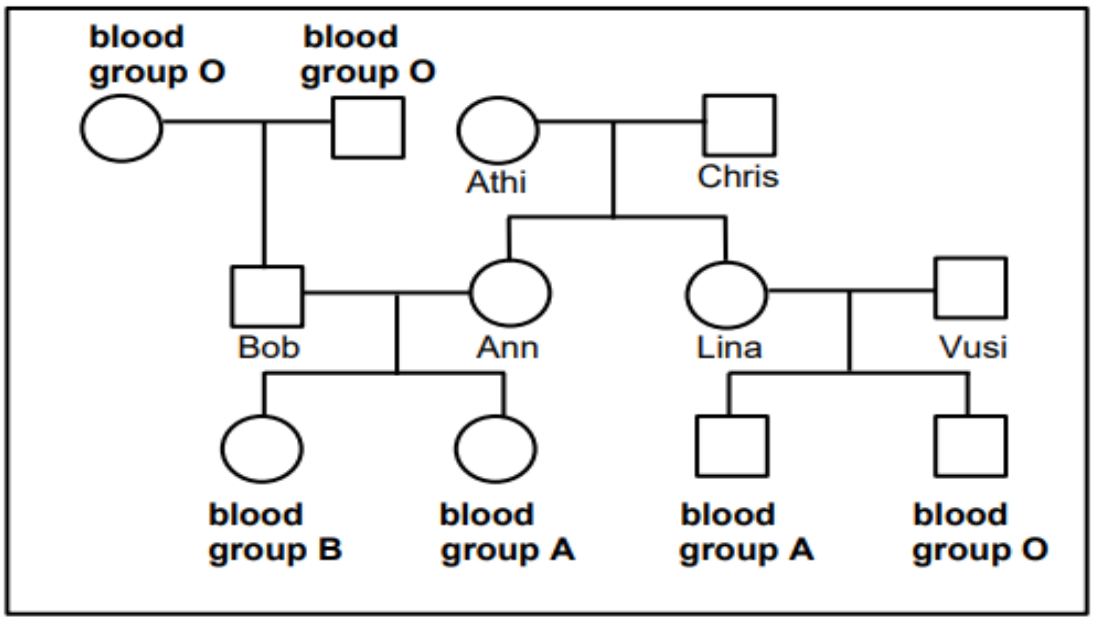
(b) How many plants in the next generation are likely to have yellow and oval fruit? (1)

2.5.3 Give the possible genotypes of both parents that must be crossed if a farmer wants summer squash that are white with oval fruit only. (2)

(9)

NOVEMBER 2023 – P2

The diagram below shows the inheritance of blood groups in a family.



1.4.1 Name the type of diagram shown. (1)

1.4.2 Give the number of alleles that control blood groups. (1)

1.4.3 How many generations are represented in the diagram? (1)

1.4.4 Lina's genotype is $I^A i$.

State ALL the possible genotypes of Vusi. (2)

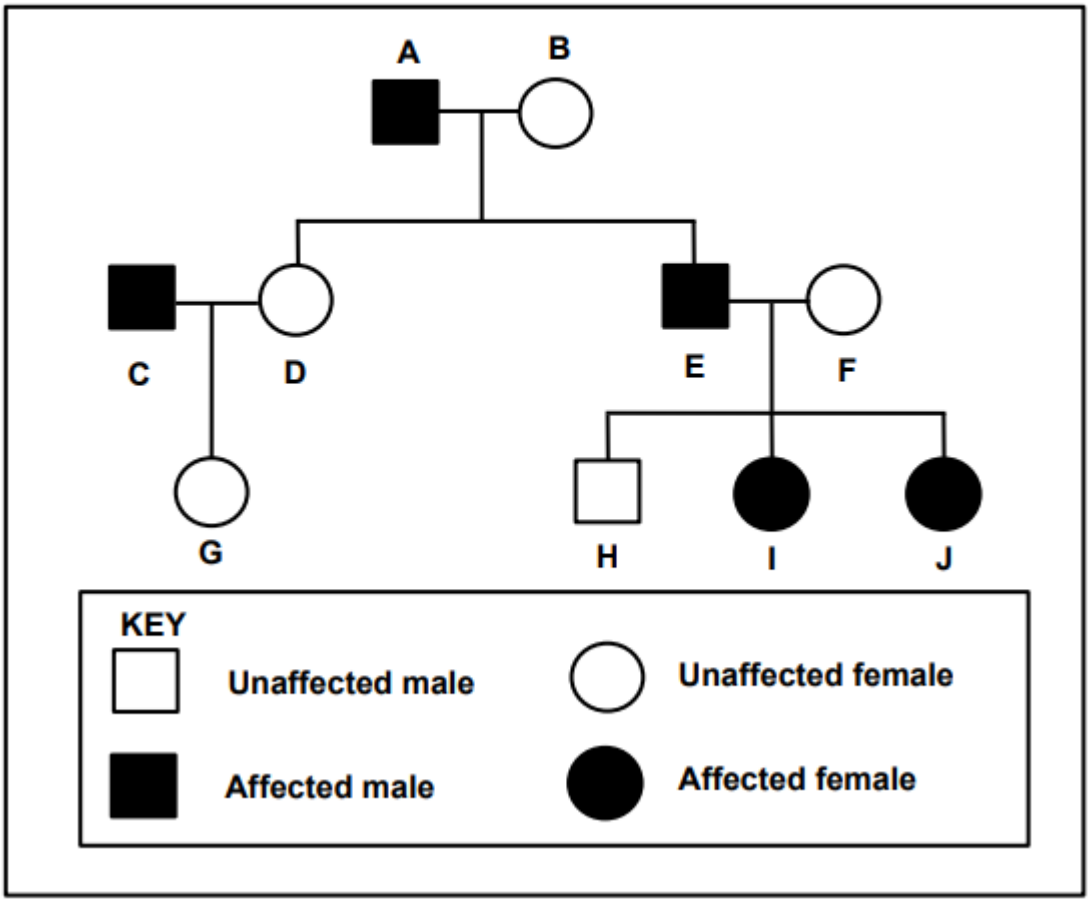
1.4.5 Give the genotype of Bob. (1)

1.4.6 Give the name of the individual which displays co-dominance. (2)
(8)

NOVEMBER 2022 - P2

Moyamoya is a disorder caused by a dominant allele (**R**). This disorder damages the arteries supplying blood to the brain.

The pedigree diagram below shows the inheritance of Moyamoya in a family.



1.4.1 How many generations are represented in the diagram? (1)

1.4.2 Give the:

(a) LETTER(S) of unaffected males (1)

(b) Genotype of individual **A** (1)

(c) LETTER(S) of individuals not biologically related to **A** and **B** (2)
(5)

NOVEMBER 2022 – P2

Brown enamel of the teeth is a sex-linked trait. A dominant allele on the **X** chromosome causes brown teeth in humans.

2.6.1 Explain why more males than females have white teeth. (4)

2.6.2 A man with brown teeth married a woman with white teeth.

Use a genetic cross to show the possible phenotypic ratios of their children. Use X^B for brown teeth and X^b for white teeth. (6)

(10)

PITFALLS TO AVOID

- Become familiar with the **language of Genetics** – *Mind the Gap Grade 12 Life Sciences* explains the concepts well at the beginning of the Chapter. Most other textbooks too. You cannot do Genetics if you don't understand the language. Eg *Phenotype, Genotype, Homozygous Heterozygous*, etc
- Many candidates don't understand the **origin** of Gene Mutations and the consequences of these mutations.
- Do you know the **different effects** of mutations? 3 Types - find out and explain the difference.
- Candidates don't practice **DIHYBRID** Questions before exams. Most NSC Paper 2 have questions on **Dihybrid crosses.**
- You need to know how to write the **Genotypes** of P1 and F1 in **Dihybrid** Crosses, ***eg*** **TtWw** for a Pea Plant with Phenotype that is Tall, with White Flowers . Also, how to write the **Genotypes of the Gametes** in Dihybrid crosses eg for the example above, TW; Tw; tW and tw.
- Use the **correct notation** when you indicate the alleles of **blood types**, eg i for O.
- Understand the **reason** why there are **Sex-linked disorders**: When genes are found on the **gonosomes** (23rd Pair of Chromosomes), it is defined as **Sex-Linked**. Eg alleles for Blood Clotting is found on X – chromosomes of pair 23. The recessive allele in this case leads to **Haemophilia**.
- Note that some disorders are caused by a **Dominant allele**, not all inherited medical conditions are caused by **recessive alleles.**
- When you work with **Pedigree Diagrams** do NOT assume that they always refer to sex-linked conditions. ONLY use the *X and Y notation*

when the question pertinently indicates that this condition is caused by Sex-linked alleles or that it leads to Sex-linked disorders.

- When a Pedigree Diagram refers to a male and female that have characteristics determined by genes found on chromosomes **other than** sex-chromosomes (gonosomes), you simply use letters such as **B for Brown and b for blue**, **do NOT use X and Y in these cases**. Candidates often loose marks by using X and Y in cases that are NOT sex-linked.
- Understand the difference between **Incomplete Dominance** and **Co-dominance** and be able to solve Genetic questions dealing with P1 to F1 through to F2 when Interbreeding occurs at F1 level.
- When you deal with Incomplete & Co-dominance **do NOT** use lower case, because there are NO recessive alleles in Incomplete and Co-dominance. **Use CAPITALS only**, eg. Red Roses x White Roses give Pink F1 (all), the Genotypes will be indicated, eg RR x WW give RW. When two RW individuals are crossed RW x RW may yield RR (red); RW(Pink) and WW (White).
- A **Punnet Square** is easy to use to determine ratios or % for Genotypes or Phenotypes.
- Practice how to explain in **paragraph form** the inheritance of certain traits described in a genetic question.
- When asked to write **ratios** of the F1 Phenotype, do NOT write %. If asked to calculate % do so by showing calculations (x 100) and write answer as %.
- When you use a Punnet Square or while doing Genetic Problems to determine possible outcomes of the offspring, clearly indicate the **Phenotype of P1** as well as the **Genotype of P1**. Indicate that M**eiosis** occurs for the production of gametes and *write* **Fertilisation** to indicate the combination of alleles. Do **NOT use Fusion** for Fertilisation. Clearly indicate F1 outcomes by indicating possible Genotypes and Phenotypes of **F1.**
- Before you write Paper 2, make sure you know how **Cloning** is done, what **GMO's** are and understand the concept of **Stem Cells** and their use.
- Understand why mt-DNA is so valuable in tracing ancestry.

MARKING GUIDELINES

NOVEMBER 2023 – PAPER 2

2.5.1 (a) BBDD✓
bbdd✓

(b) White, round fruit✓✓

2.5.2 (a) BD
bD
Bd
bd ✓✓ (2)

(b) One✓/1 (1)

2.5.3 BBdd and BBdd✓✓

OR

BBdd and Bbdd✓✓

OR

BBdd and bbdd✓✓ (2)
(9)

NOVEMBER 2023 – P2

1.4.1 Pedigree✓diagram

1.4.2 3✓/Three

1.4.3 3✓/Three

1.4.4 I^Ai
I^Bi
ii ✓✓

1.4.5 ii✓

1.4.6 Ann✓✓

NOVEMBER 2022 – P2

1.4.1 3✓/Three

1.4.2 (a) H✓

(b) Rr✓

(c) C✓and F✓

NOVEMBER 2022 – P2

2.6.1
- Males have only one X chromosome✓/The Y-chromosome does not have this allele and
- have to inherit only one recessive allele✓ to have white teeth
- whereas females have two X chromosomes✓ and have to
- inherit two recessive alleles to have white teeth✓ (4)

2.6.2

P_1 Phenotype: Male with brown teeth x Female with white teeth✓

Genotype: X^BY x X^bX^b✓

Meiosis

Fertilisation

Gametes	X^B	Y
X^b	X^BX^b	X^bY
X^b	X^BX^b	X^bY

1 mark for correct gametes
1 mark for correct genotypes

F_1 Phenotype: 1 female with brown teeth: 1 male with white teeth✓*

P_1 and F_1✓
Meiosis and fertilisation✓

***1 compulsory mark** + Any 5 (6)

UNIT 5: NERVOUS COORDINATION (54 Marks)

View the Saturday School Video lessons on monyetlaproject.co.za (27/4/24 & 11/5/24 & 18/5/24)

WHAT TO STUDY

1. There are **2 forms of communication** in the body. **Nervous Coordination** and **Chemical Coordination**. These 2 systems help us to respond to any changes in the environment around us. The changes are referred to as **stimuli.**
2. The difference between Nervous Coordination and Endocrine System.

NERVOUS COORDINATION	ENDOCRINE SYSTEM
1. Nerve impulses conduct the message. 2. Impulses transmitted by neurons. 3. Fast response. 4. Specific response in effectors eg muscles and glands.	1. Chemicals cause the response. 2. Hormones travel in blood. 3. Slower transmission 4. Number of Target organs stimulated.

3. **Protection of the Brain and Spinal Cord**: They are protected by 3 membranes called **Meninges.**
4. Examine a **diagram** of the **Brain** in your textbook: Find the location of the Cerebrum, Cerebellum, Corpus callosum, Medulla oblongata, Hypothalamus, Pituitary gland and the Spinal cord.
5. Know the **FUNCTIONS** of each:

CEREBRUM: Higher thought processes; Speech; Memory; Interprets sensations from sense organs.

CEREBELLUM: Maintains balance; Muscle coordination; Controls muscle tension.

CORPUS CALLOSUM: Connects the two hemispheres of the brain, allowing communication between the right and the left brain.

HYPOTHALAMUS: Thermostat of the body (Controls body temperature); Seat of emotions such as love. Thirst centre; Centre for appetite.

PITUITARY GLAND: Secretes hormones to stimulate endocrine glands to secrete hormones.

MEDULLA OBLONGATA: Controls heartbeat; Breathing control centre; Relays impulses between the Spinal cord and the Brain.

SPINAL CORD: Reflex Centres are situated here; It serves as a pathway for impulses to and from the brain and the body.

6. The 3 components of the NERVOUS SYSTEM

A **The Central Nervous System (CNS)** : Brain and Spinal cord

B **The Peripheral Nervous System:** Nerves that are found **outside the CNS**. This includes 12 pairs of **Cranial Nerves** that originate from the brain and 31 pairs of **Spinal Nerves** that originate from the Spinal Cord. These nerves contain **Sensory Neurons** conducting impulses from receptors **to** the CNS and **Motor Neurons** to conduct impulses **from** the CNS to the effectors (muscles and glands).

C **The Autonomic Nervous System**: This system is **not** under the control of will. It regulates processes that are **automatic** or involuntary. **Examples** are, the control of rate of heartbeat, breathing and digestion. This ensures a stable internal environment. The Autonomic Nervous System is divided into the **Sympathetic** innervation and the opposite, **Parasympathetic** innervations. The Sympathetic system **speeds most processes up**, eg faster heartbeat, faster rate of breathing and dilation of pupil. The parasympathetic system **slows systems down** to bring all **back to normal** after the temporary speeding up. The two systems above are said to be **antagonistic**, because they work opposite to one another.

7. **Label** a Nerve Cell **(Neuron)** and know the functions of the different parts of the Neuron: Dendrites; Cell body; Cytoplasm; Nucleus; Axon; Myelin sheath; Synapse.

8. **The role of Receptors:** To detect stimuli and convert them to nerve impulses. Impulses are conducted by the neurons (nerve cells) to and from the CNS

9. **Reflex Action:** This refers to quick automatic response to a stimulus. Impulses are conducted to the spinal cord, NOT the brain. Reflex actions protects the body from possible external harm.
   The Reflex Arc is the pathway of impulses from the **receptors** to the spinal cord and back to **effectors** (muscles or glands) **during a reflex action.**
   Know the correct order of events during the reflex arc,
   1. Receptors → Sensory Neuron → Dorsal Root of Spinal Nerve → Spinal Cord → Interneuron → Motor Neuron → Ventral Root of Spinal Nerve → Effector.

      Describe the **REFLEX ARC** in a diagram, draw and label.

      Also be able to **discuss** it in paragraph form. Note, when the question requires candidates to discuss the REFLEX ARC, all marks will be lost if you draw diagrams or use arrows.

10. **Disorders of the Nervous System:** (1) **Alzheimers Disease** is caused by fibres forming in the brain. Patients suffer memory loss and are confused.
(2) **Multiple Sclerosis** is caused by degeneration of the Myelin Sheaths of Neurons. This leads to loss of control in balance and movement. Muscle weakness and fatigue occur.

THE EYE

The notes on THE EYE have been compiled according to the official Exam Guidelines for Life Sciences, Grade 12.

1. You need to be able to **label a diagram** of the eye and know the **functions** of the different parts. Examine diagrams pertaining to this chapter in your textbooks.
2. What is the importance of ***Binocular Vision*****?** This refers to vision using two eyes situated in front of the head, with overlapping fields of view. This allows a person to have perception of depth.
3. Be able to describe ***accommodation of the eye*** and interpret diagrams on the topic:
When a person views an object less than 6m from the eye…
The Ciliary Muscles contract √ and
the 2 Ciliary Bodies move closer to the lens. √
This causes the tension in the Suspensory Ligaments to become slack. √
The lens therefore becomes rounder (more convex) √ and has greater refractive power. √
The light converges on the fovea √ of the retina where a clear √ image is formed. Usually [6]
In the event of viewing an object further than 6m, change the above to the opposite.

4. **Pupillary Mechanism:** This refers to what happens in the **iris** of the eye to **change the size of the pupil** when you look into **bright light** OR the opposite, when you move into a dark room.

In BRIGHT light…
The Circular Muscles of the iris Contract√ and the Radial Muscles Relax. √
These muscles work opposite to one another (antagonistic).
*Pair C for **C**ircular with **C**ontract and R for **R**adial with **R**elax.*
This results in the diameter of the pupil getting smaller, the pupil constrics. √
Less light enters the eye√ and the fovea is protected from excessive exposure to rays of the sun, preventing damage to the retina. √ **[5]**

If the question asks about the mechanism when you step int an area with **DIM** light, you write the opposite to the above for each point.

5. **Visual Defects**

A **Short-Sightedness:** Light falls in front of the fovea due to (1) Too long eyeball or (2) Cornea is too convex or (3) Lens is too round (convex).
The REMEDY is to wear concave lenses

B **Long-Sightedness:** Light falls behind the fovea due to (1) Too short eyeball, or (2) the Cornea is to flat or (3) The lens is too flat.
The REMEDY is to wear convex lenses.

C **Astigmatism:** The curvature of the Cornea is irregular.
The REMEDY is to have lenses designed for your specific defect.

D **Cataracts:** The lens becomes cloudy and opaque. This reduces the transparency of the lens and the light that reaches the fovea is not sufficient.
The REMEDY is to replace the lens with an artificial lens.

PLEASE EXAMINE DIAGRAMS FROM PREVIOUS QUESTION PAPERS TO BECOME FAMILIAR WITH THE WAY EXAMINERS TEST CANDIDATES ON TOPICS THAT RELATE TO THE EYE.

THE EAR

The notes on THE EAR have been compiled according to the official Exam Guidelines for Life Sciences, Grade 12.

1. Examine **diagrams** of the human ear in your text book. You need to know the names of all the **different parts** as well as the **functions** of all.
2. The role of the **organ of Corti** in hearing. Understand how the sense of hearing works.

This includes the **pathway of Sound Waves** through the ear until the stage where the Cerebrum interprets what you hear:
Sound Waves → Pinna → Auditory Canal → Tympanic Membrane → Malleus → Incus → Stapes → Vibrations through Oval Window → Waves in the fluid (Perilymph) of the Vestibular Canal → Pressure is transferred to the Endolymph of the Cochlea Canal → Organ of Corti → The Hair Cells of the Organ of Corti → Impulses are Generated → Auditory Nerve → Cerebrum where the sound is interpreted.

3. **Functions of the Structures of the EAR:**

Pinna - Directs Sound Waves to the Auditory Canal

Auditory Canal - Channels the Sound Waves to the Tympanic Membrane. (Previously known as the eardrum, but do not use this phrase in the exams)

Tympanic Membrane - Vibrates as a result of the Sound Waves and converts the Sound Waves to Vibrations.

Eustachian Tube - Equalise the Pressure on both sides of the Tympanic Membrane.

The 3 Ossicles (Malleus, Incus and Stapes) - These are small bones previously known as the Hammer, Anvil and Stirrup, conduct the Vibrations to the Oval Window of the Inner Ear. The ossicles amplify the sound.

The Round Window – Prevents Sound Reflection in the Inner Ear

The Organ of Corti - Converts Vibrations to Impulses.

Auditory Nerve - Conducts impulses to the Cerebrum.

4. **Balance**

(a) The **Semi-Circular Canals** contain structures called the **Cristae** with **Hair Cells** that bend in the fluid called endolymph when the head moves. When the **Hair Cells bend**, an impulse is generated. These impulses are sent to the **Cerebellum** via the Vestibular branch of the Auditory Nerve. The Cerebellum sends impulses to the **muscles** to correct the problem.
The **Cristae** in the Semi-Circular Canals are sensitive to any **movement of the head.**

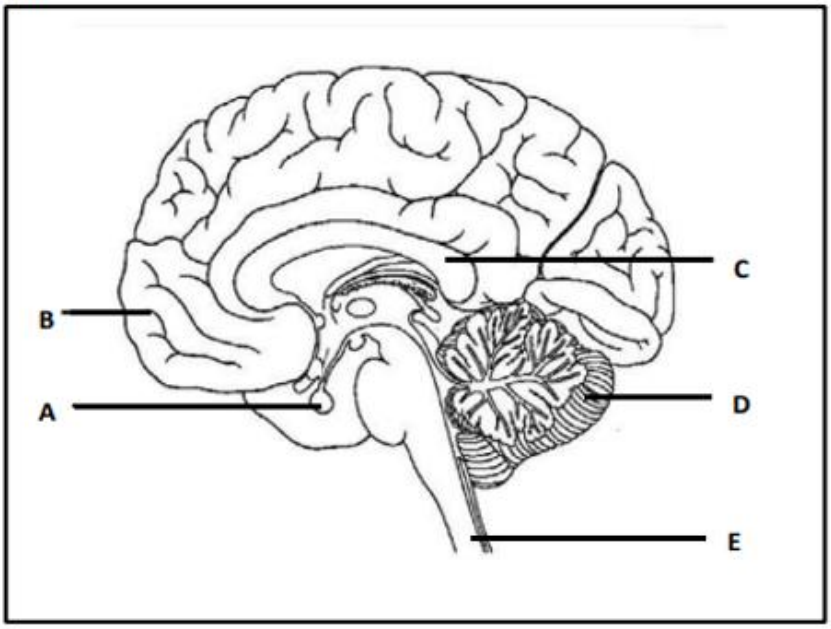
(b) **The Sacculus and Utriculus** contain structures called Maculae. The Maculae contain Hair Cells that react to gravitational pull.

5. **Hearing Defects: (a) Middle Ear Infection -** due to bacterial infection pressure builds up in the Middle Ear, very painful. The fluid causing the build-up of pressure, is drained out of the Middle Ear by Grommets which are inserted by a surgeon.
Hearing Aids amplify the sound.
Cochlear Implants stimulate the auditory nerve to send impulses to the cerebrum

QUESTIONS FROM PAST PAPERS

HUMAN RESPONSE

1.1 The diagram below represents a human brain.



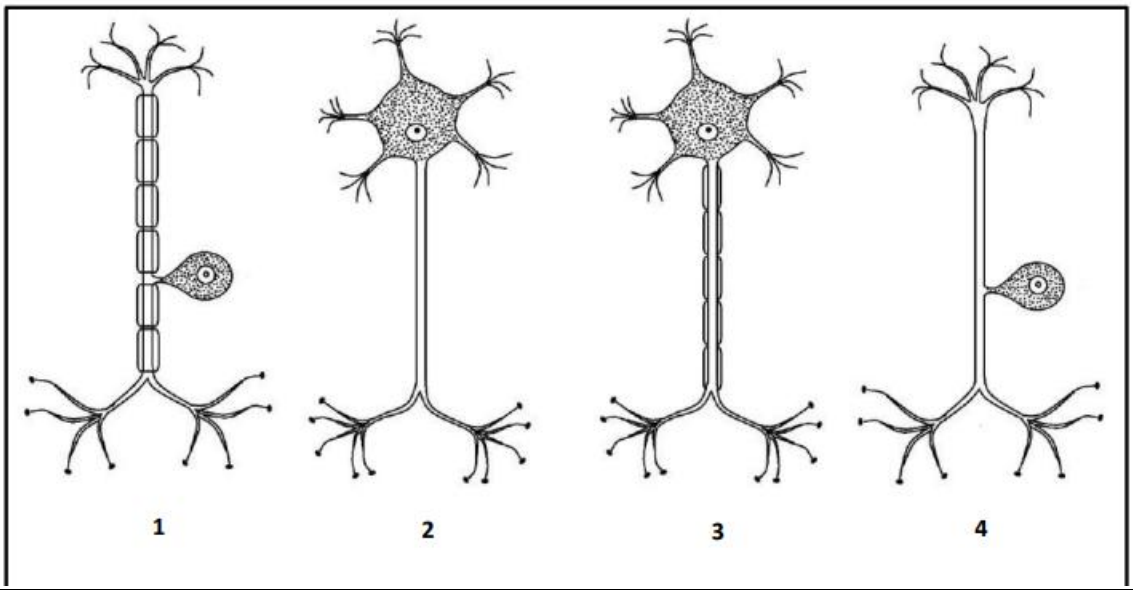
Give the LETTER and NAME of the part of the brain responsible for:

1.1.1	Memorising a cellular phone number	(2)
1.1.2	Coordinating all voluntary movements	(2)
1.1.3	Secreting hormones	(2)
1.1.4	Connecting the two hemispheres of part **B**	(2)
1.1.5	The reflex action that occurs when stepping barefooted on a sharp object	(2)

Provide the correct terminology for each of the following:

1.1.1 Nerve fibres that conduct nerve impulses away from the cell body of a neuron.
1.1.2 A functional (physiological), but not direct, connection between two successive neurons.
1.1.3 A disorder that occurs when one's own immune system surrounds, attacks and destroys the myelin sheath that envelops the axon.
1.1.4 The membranes which protect the central nervous system.
1.1.5 The nervous system which consists of cranial and spinal nerves.
1.1.6 A branch of autonomic nervous system that decreases the heartbeat back to normal.

1.3 The diagrams below show different neurons.



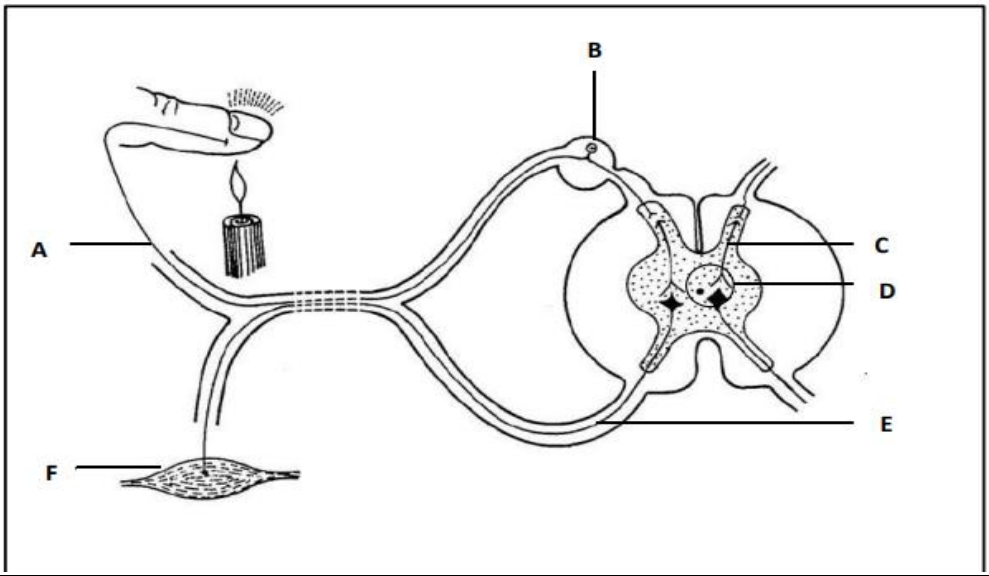
Give only the NUMBERS (**1**, **2**, **3** or **4**) of TWO neurons that:

1.3.1 Transport impulses from the receptor to the central nervous system (2)

1.3.2 Will have a faster transmission of impulses (2)

1.3.3 Are damaged if a person can feel the stimulus but is unable to react (2)

1.7 The diagram below represents a reflex arc.



1.7.1 Give the LETTER and NAME of the part that:

(a) Controls one-directional transmission of impulses (2)

(b) Transmits impulses from the sensory neuron to the correct motor neuron (2)

(c) Transmits impulses to the cell body (2)

1.7.2 Give only the LETTER of the:

(a) Neuron that is damaged when a person is able to feel pain, but cannot react to the stimulus (1)

(b) Effector (1)

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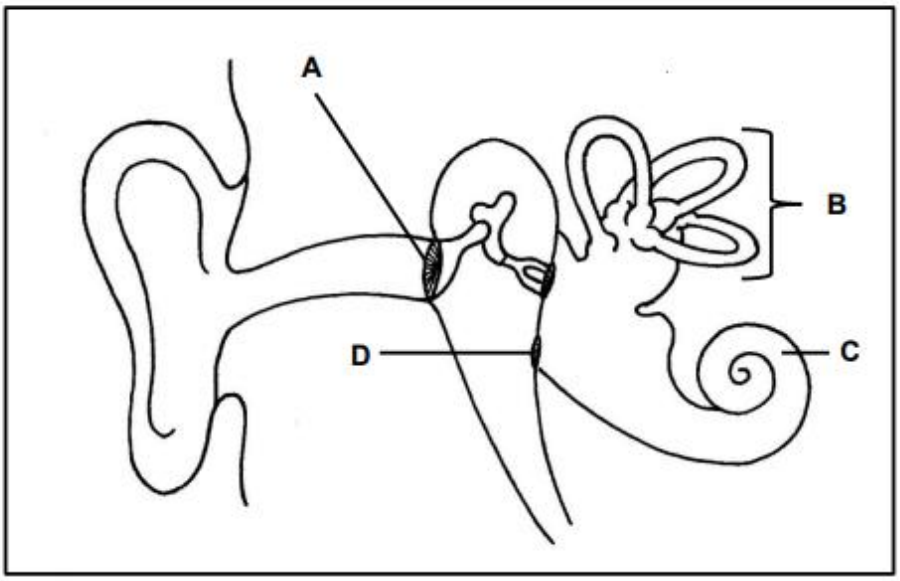
3.3 The diagram below represents a part of the human ear.



3.3.1 Identify part **C**. (1)

3.3.2 State ONE function of:

(a) Part **D** (1)

(b) The receptors found in part **C** (1)

3.3.3 Explain why a build-up of ear wax at part **A** may result in temporary hearing loss. (2)

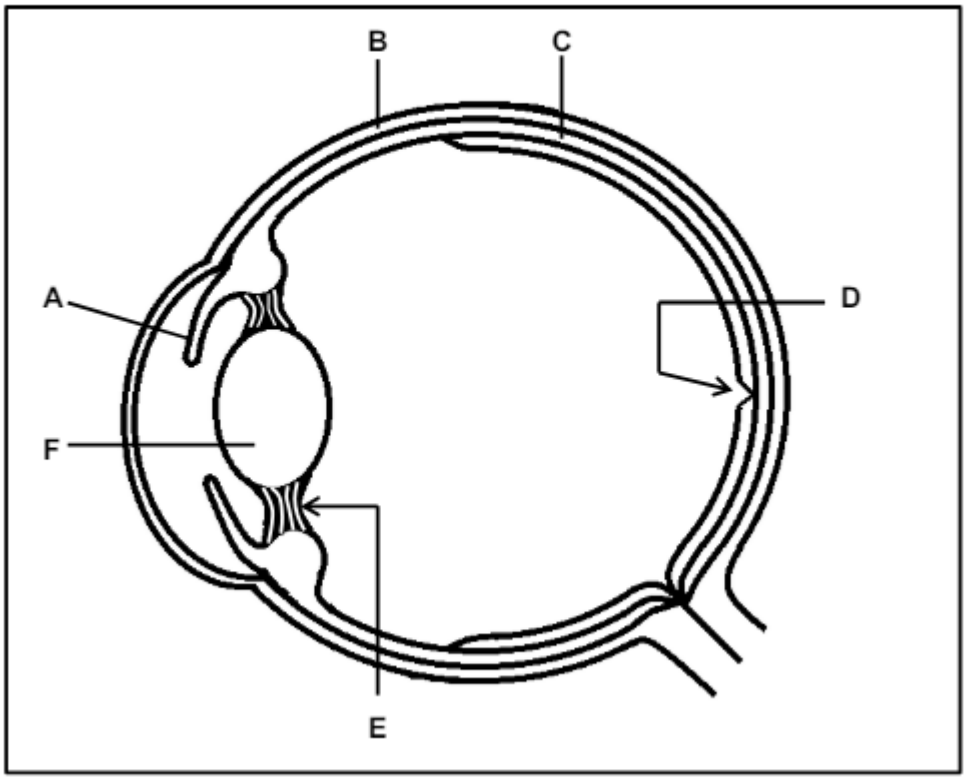
3.3.4 A grommet is a small device that allows the air to move into and out of the middle ear. This prevents pressure build-up in the middle ear.

Explain how the use of grommets in the treatment of middle-ear infections prevents hearing loss. (4)

3.3.5 Describe how the receptors in part **B** are involved in maintaining balance when there are changes in the speed and direction of movement of the head. (4) **(13)**

November 2021 – P1

2.2 The diagram below represents the structure of the human eye.



2.2.1	Identify part **C**.	(1)
2.2.2	Give ONE function of part **E**.	(1)
2.2.3	State why the clearest image will form when light rays fall on part **D**.	(1)
2.2.4	Explain ONE way in which part **B** is structurally different from part **F**.	(4)
2.2.5	Describe how the muscles in part **A** function to increase the amount of light entering the eye.	(3)
2.2.6	Describe how a blurred image forms if a person with normal vision wears spectacles with biconvex lenses while reading a book.	(3) **(13)**

PITFALLS TO AVOID 

- Do you know what **stimuli** are?
- Remember electrical charges conducted by neurons are always referred to as **impulses**. **Don't use** the word **messages**.
- Make sure you know the difference between **motor** nerves and **sensory** nerves.
- Many candidates cannot explain the effect of **damage done** to motor or sensory nerves – make sure of this.
- Learners can label a diagram of a neuron, but do you know the **function** of each part of the neuron as stipulated in the *Exam Guidelines – 2021?*
- Some candidates cannot distinguish **between Multipolar, Unipolar and Bipolar neurons** as well as the function of each.
- Learners neglect to examine the function of the **Meninges.**
- Study the functions of the different parts of the nervous system with a view to describe what the outcome will be if there is **damage done** to a specific part.
- The pathway of impulses in the **Reflex Arc** is very important. STUDY. Do you know the difference between a **Relex Action** and the **Reflex Arc**?
- Can you explain the role of **Receptors** and **Effectors** in Nervous Coordination?
- Find out what is meant by **Peripheral Nervous System** and the **Autonomic Nervous System.**
- Do you know the difference between the **Sympathetic** and **Parasympathetic** Nervous System?
- Many candidates confuse **Alzheimer's Disease** with **Multiple Sclerosis**.
- **Human Eye**: Many learners are not clear on the different labels. What is … the Cornea; Iris; Pupil: Choroid; Lens; Retina; etc? Make sure
- Candidates some times confuse **Pupillary Mechanism** with the process of **Accommodation**. Study them separately.
- Accommodation refers to the ability of they eye to create a focused image near AND far. It has to do with change in **distance.**
- Pupillary Mechanism refers to how the Pupil Size changes when you move into a "brightly lit" room and when you are in a dark room. The **pupil dilates** and **constricts** as a result of change in light intensity.
- Make sure of the difference between **"contract"** and **"constrict".** Can you explain the difference?
- Can you explain **causes for different eye defects** and the **remedy** for each?
- **Human Ear**: Explain what the effect when the **ossicles** cannot vibrate freely.
- What is the role of the **Eustachian Tube**?
- Understand that **sound waves** are changed to **vibrations** in the middle ear and vibrations cause **pressure waves** in the inner ear; finally pressure waves

are converted to **impulses** in the *Organ of Corti*. Impulses go via the Auditory Nerve to **Cerebrum** to be interpreted.

- Many candidates neglect to study the role of the **Semicircular Canals & the Sacculus and Utriculus** in maintaining **balance**. This topic is usually addressed in the exams and learners do not perform well in this aspect simply because **they don't prepare** to describe the maintenance of balance.
- Learners often don't indicate that the auditory nerves conduct **impulses** to the **Cerebellum to maintain balance**.

MARKING GUIDELINES

1.1.1 B√- Cerebrum√

1.1.2 D√- Cerebellum√

1.1.3 A√- Pituitary gland√/ Hypophysis

1.1.4 C√- Corpus callosum√

1.1.5 E√- Spinal cord√

Terminology

1.1.1 Axons√

1.1.2 Synapse√

1.1.3 Multiple sclerosis√

1.1.4 Meninges√

1.1.5 Peripheral√ nervous system

1.1.6 Parasympathetic√ nervous system

1.3.1 1√ and 4√

1.3.2 1√ and 3√

1.3.3 2√ and 3√

1.7.2 (a) E√
(b) F√

1.8.1 (a) Sclera√
(b)Cornea√
(c) Iris√

1.8.2 (a) C√- Iris√
(b) G√- Choroid√
(c) E√- Retina√

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3.3.1 Cochlea✓ (1)

3.3.2 (a) Absorbs excess pressure waves✓/releases pressure from the inner ear/ prevents an echo (1)
(Mark first ONE only)

(b) It converts stimuli/pressure waves into impulses✓ (1)
(Mark first ONE only)

3.3.3
- Part A/tympanic membrane will not be able to vibrate✓/vibrate freely
- No/less vibrations will be carried to the middle ear✓/ossicles (2)

3.3.4
- Middle ear infections cause fluid build-up in the middle ear✓
- which can block the Eustachian tube✓
- The grommet will release the pressure✓ that will build up in the middle ear/ drain the fluid from the middle ear
- The pressure on either side of the tympanic membrane is equalised✓
- preventing the tympanic membrane from rupturing✓ and
- allowing the ossicles to vibrate freely✓ Any (4)

3.3.5
- The cristae are stimulated✓ and
- convert the stimuli into impulses✓
- The impulses are sent via the auditory nerve✓
- to the cerebellum✓
- which interprets the information✓ and
- sends impulses to the skeletal muscles✓ to restore balance

Any (4)
(13)

November 2021 – P1

2.2.1	Choroid✓		(1)
2.2.2	- Holds the lens in position✓ - Connects the lens to the ciliary body✓ - Plays a role in accommodation✓ **(Mark first ONE only)**	Any	(1)
2.2.3	(D/the yellow spot) has the highest concentration of cones✓		(1)
2.2.4	- Part B/sclera is opaque✓✓/does not allow light to pass through/ white - part F/lens is transparent✓✓/allows light to pass into the eye **OR** - Part B/sclera is non-elastic✓✓/maintains the shape of the eye - part F/lens is elastic✓✓/able to change its shape **(Mark first ONE only)**		(4)
2.2.5	- The circular muscles relax✓ - The radial muscles contract✓ - causing the pupil to dilate✓		(3)
2.2.6	- The lenses in the spectacles will refract the light rays✓ - The lens of the eye also refracts✓ the light rays - The light rays will therefore be focused in front of the retina✓		(3) **(13)**

UNIT 6:

CHEMICAL COORDINATION & HOMEOSTASIS (34 Marks)

View the Saturday School Video lessons on monyetlaproject.co.za (08/6/24)

WHAT TO STUDY

TICK THE BOX ONCE COMPLETED ☑

- ☐ **Definitions:** Endocrine vs Exocrine
- ☐ What are Hormones? What is Homeostasis?
- ☐ What is Negative Feedback? Describe it with an example such as the influence of Thyroxine on TSH.
- ☐ Names of **Endocrine Glands,** the **Hormones** they secrete and **functions of the Hormones.**
- ☐ **Endocrine Glands –** Hypothalamus (ADH)
- ☐ - Pituitary (GH, TSH, FSH, LH, Prolactin)
- ☐ - Thyroid (Thyroxine)
- ☐ - Pancreas (Insulin & Glucagon)
- ☐ - Adrenal Glands (Adrenalin & Aldosterone)
- ☐ - Ovaries (Oestrogen & Progesterone)
- ☐ - Testes (Testosterone)
- ☐ Describe the Homeostatic Control for:
- ☐ Blood Glucose Levels
- ☐ Osmoregulation (Water Balance)
- ☐ Salt Concentration
- ☐ Carbon dioxide concentration in the blood
- ☐ Constant Body Temperature (Thermoregulation)
- ☐ Disorders caused by imbalances:
- ☐ Diabetes mellitus – Blood Glucose
- ☐ Goitre – Iodine deficiency

QUESTIONS FROM PAST PAPERS

NOVEMBER 2021 – P1

3.3.1 Describe the negative feedback mechanism that occurs when thyroxin levels in the blood are high. (5)

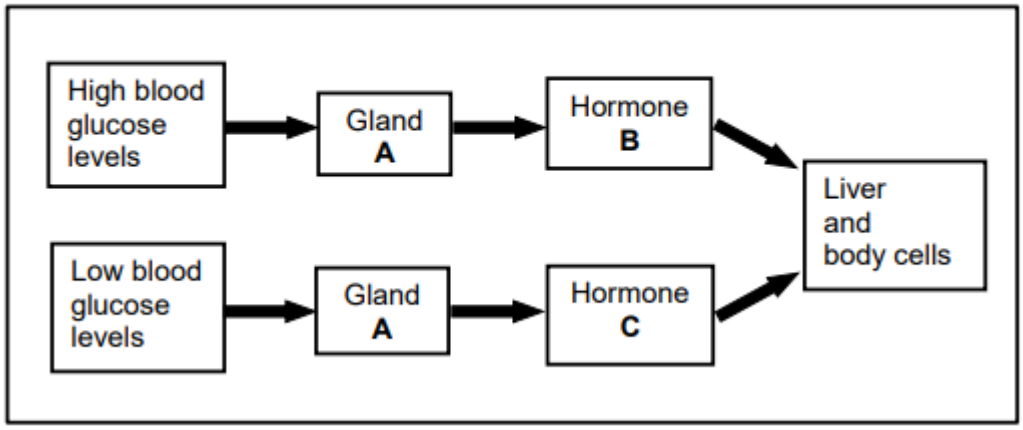
3.3.2 A person has a medical condition that results in the under-secretion of thyroxin.

Explain why this person will gain weight if the thyroxin levels remain continuously low in the blood. (3)
(8)

NOVEMBER 2022 – P1

2.6

The diagram below shows the homeostatic control of blood glucose levels.



2.6.1 Identify:

(a) Gland **A** (1)

(b) Hormone **C** (1)

2.6.2 A certain disorder causes decreased production of hormone **B**.

(a) Explain how this will affect the blood glucose levels. (3)

(b) Name the disorder. (1)

2.6.3 Scientists have been investigating the use of adrenalin as a treatment for people who cannot produce hormone **C**.

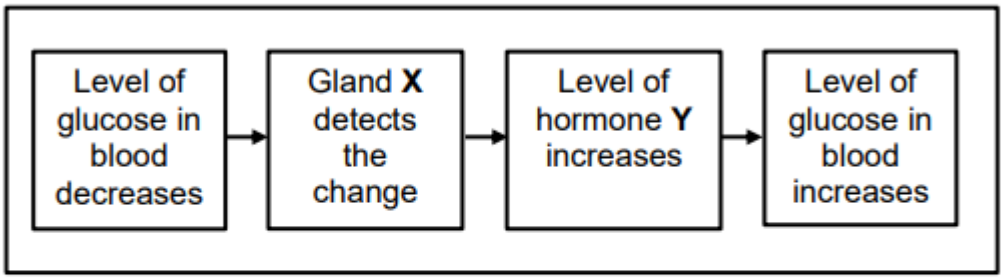
Explain why this treatment may work. (3)
(9)

NOVEMBER 2022 – P1

3.4.6 Describe the *homeostatic control* of carbon dioxide when it is high in blood. (7)

NOVEMBER 2023 – P1

1.1.3 The diagram below represents the events that occur during the homeostatic control of blood glucose.

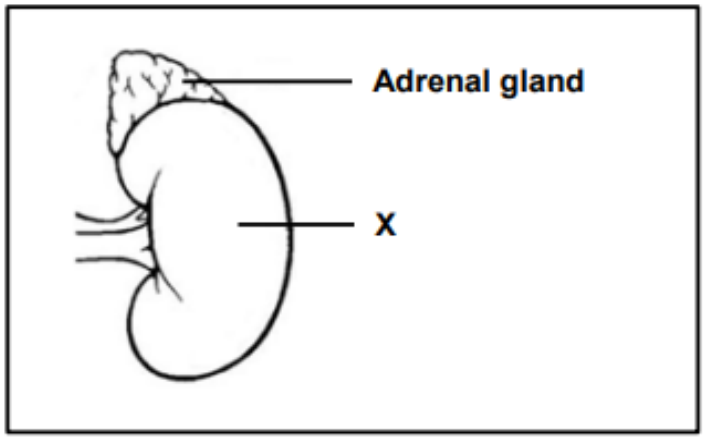


Which ONE of the following represents gland **X** and hormone **Y**?

	Gland X	Hormone Y
A	Pancreas	Glucagon
B	Pituitary	Glucagon
C	Pancreas	Insulin
D	Pituitary	Insulin

NOVEMBER 2023 – P1

The diagram below shows the location of the adrenal gland in the human body.



3.2.1 Identify:

(a) Organ **X** (1)

(b) The system to which the adrenal gland belongs (1)

3.2.2 State TWO characteristics of the type of glands that belongs to the system identified in QUESTION 3.2.1(b). (2)

3.2.3 Describe the interaction between the adrenal gland and organ **X** in maintaining homeostasis when salt levels in the blood are low. (5)

3.2.4 Explain the effect that a secretion of the pituitary gland will have on organ **X** when a person experiences dehydration. (5)
(14)

PITFALLS TO AVOID

- Many candidates loose marks in this section of work. Learners are advised to form **support groups** and explain concepts such as **Negative Feedback** with an example; **Homeostatic Control** of factors such as Blood Glucose Control; Salt; Osmoregulation; Thermoregulation and Carbon dioxide.
- Candidates are often not familiar with the basic structure of the **skin** and it's role in **Thermoregulation**. Can you describe **THREE mechanisms** for heat loss in the skin?

- Find out what's the difference between **Vasoconstriction and Vasodilation** and when will each process occur? How do these processes contribute to heat loss OR the conservation of heat.
- Many candidates do not link their knowledge of **Cellular Respiration** (Gr 11) with **the Metabolic Rate** of a person as well as the role of **Thyroxine & TSH**. Ask your educator, tutor or peer study group what this bullet point means.
- There are **FIVE Homeostatic Control Mechanisms** listed in the 1st bullet point above. Here is a **FRAMEWORK** you can use to describe each the Homeostatic processes. (1) What is the problem / imbalance?
  (2) What detects the problem?
  (3) Where is the Control Centre for this factor?
  (4) How is the imbalance corrected?
  (5) Is there a Hormone involved, name?
  (6) What does the Hormone stimulate / inhibit to correct the imbalance?
- This section of work often requires interpretation of **graphs / data**. Practice by using past paper questions the skill to interpret graphs / date. Spot **trends** and discuss **conclusions from the graphs** with your peer study group. Search for questions in **past papers** to practice this skill, you will be rewarded**!**
- Never be intimidated by graphs. **Graphs tell a story**, simply translate the lines / bars into sentences. (A picture speaks a thousand words!)

MARKING GUIDELINES

NOVEMBER 2021 – P1

3.3.1
- The pituitary gland✓ is stimulated
- to secrete less TSH✓
- Low TSH levels causes the thyroid gland✓
- to secrete less thyroxin✓
- Thyroxin levels return to normal✓ (5)

3.3.2
- The rate of metabolism/respiration in the body decreases✓
- Less glucose will be broken down✓
- and more glucose will be converted and stored as fat✓/glycogen (3)

(8)

NOVEMBER 2022 – P1

2.6.1 (a) Pancreas✓ /Islets of Langerhans (1)

(b) Glucagon✓ (1)

2.6.2 (a)
- The blood glucose levels will remain high✓
- because the cells will not be able to absorb glucose✓ from the blood
- excess glucose cannot be converted to glycogen by the liver✓/ muscles (3)

(b) Diabetes✓mellitus (1)

2.6.3
- Adrenalin stimulates the liver✓
- to convert glycogen to glucose✓
- to increase the blood glucose levels✓ (3)

(9)

NOVEMBER 2022 – P1

3.4.6
- Receptors in the carotid artery are stimulated✓ and
- impulses are sent to the medulla oblongata✓
- The medulla oblongata stimulates the heart✓
- to beat faster✓ causing
- more carbon dioxide to be taken to the lungs✓
- The breathing muscles✓/intercostal muscles and diaphragm
- contract more actively✓ and
- the rate/ depth of breathing increases✓
- More carbon dioxide is exhaled✓
- The carbon dioxide level in the blood decreases✓ /returns to normal

Any (7)

(15)

NOVEMBER 2023 – P1

1.1.3 A

NOVEMBER 2023 – P1

3.2.1	(a)	Kidney✓	(1)
	(b)	Endocrine✓ system	(1)
3.2.2	-	It releases hormones✓ - directly into the blood✓/and it is ductless **(Mark first TWO only)**	(2)
3.2.3	-	Low salt levels are detected by receptor cells✓ in the kidney - Adrenal glands are stimulated✓ to secrete - more aldosterone✓ - which stimulates the renal tubules✓ - to be more permeable to salt✓ - This increases the reabsorption of salt✓ and - the salt levels in the blood increase✓/return back to normal Any	(5)
3.2.4	-	The secretion of ADH✓ - will increase✓ - which will increase the permeability✓ - of the renal tubules✓ in **X** - so that more water is reabsorbed✓ from the filtrate	(5) **(14)**