



NATIONAL SENIOR CERTIFICATE EXAMINATION  
NOVEMBER 2022

**LIFE SCIENCES: PAPER II**  
**MARKING GUIDELINES**

Time: 2 hours

100 marks

---

These marking guidelines are prepared for use by examiners and sub-examiners, all of whom are required to attend a standardisation meeting to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.

The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.

---

**SECTION A****QUESTION 1**

- 1.1 1.1.1 A person who studies genetic conditions who helps people understand genetic conditions/genetic history in family support, guide and give options to people in making decisions regarding these conditions e.g., having children with inherited disorders
- 1.1.2 A piece of DNA/DNA molecule/genetic material made up of nucleotides containing genes/coding DNA and non-coding DNA wrapped around (histone) proteins two chromatids joined by a centromere NB: NOT 'a strand' of DNA
- 1.2 1.2.1 A
- 1.2.2 D
- 1.2.3 C
- 1.2.4 B
- 1.3 1.3.1 Recessive/homozygous recessive
- 1.3.2 Transcription
- 1.3.3 Mutation/gene editing
- 1.4 1.4.1 Normal/unaffected/non-sufferer/doesn't have condition
- 1.4.2 Homozygous recessive/aa
- 1.4.3 25% OR 1/4 OR 1 in 4 OR 1:4 OR a quarter
- 1.5  $371\,500 \div 74\,300$  (method mark, even if numbers are wrong)  
= 5 people
- 1.6 1.6.1 Withdrawal of gums (making teeth appear bigger)
- 1.6.2 Drinking animal blood as a treatment for anaemia/getting iron/haem from animal blood
- 1.6.3 Skin sensitive to light/skin damage

- 1.7 No – it is not harming anyone because vampires are fictional characters  
it helps people to understand the condition therefore educating the public  
it is interesting to make the comparison  
it helps to possibly explain why people believe that vampires really existed  
therefore helping to understand cultural history

Yes – it makes light of a serious disease/it takes away from the seriousness of the condition/dangerous symptoms/life threatening  
therefore, shows disrespect

It could cause people to discriminate against victims of CEP/dehumanise them due to negative connotations/'evil' stigma attached to vampires  
people might victimise sufferers

Stops people spreading awareness of disease/won't be recognised as a disease

Mention 3 reasons/mention 1 or 2 reasons and explain

Try to link answers to what is present but don't infer too much

CAP at 2 marks if no decision – mark all facts (for and against) and credit with the decision which gives them the most marks but cap at 2

If argue one way and then argue the other way, mark first way only

- 1.8 1.8.1 DNA carries the genetic code in cells RNA is used to carry the code to the ribosomes for translation/tRNA carries amino acids to ribosomes/rRNA makes up ribosomes  
DNA never contains uracil/RNA never contains thymine  
DNA often longer than RNA  
DNA contains deoxyribose sugar, RNA contains ribose sugar  
DNA is double stranded while RNA is single stranded  
(must refer to comparison between the same character in DNA and RNA)  
Accept any other correct comparison

1.8.2 UGG UGC

- 1.8.3 GCG codes for the mRNA  
CGC  
ACG codes for mRNA UGC (NB – only mark 'mRNA' once)  
which codes for cysteine (cannot get this mark in isolation – have to relate 'cysteine' to the correct mRNA code)  
which provides a functional/normal protein/enzyme/haeme  
therefore, individual does not suffer/isn't affected from/by CEP

(NB – be careful to NOT mark the words/terms from the question – read the question every time before marking)

**QUESTION 2**

- 2.1 2.1.1 Nucleotide
- 2.1.2 Crossing over
- 2.1.3 Meiosis/meiosis I
- 2.1.4 Homologous
- 2.2 2.2.1 NB question asks how gamete ENDS UP with one of each gonosome:  
Gonosomes (X and Y) line up  
Opposite one another/as bivalent  
on equator  
During anaphase I/meiosis I  
Spindle fibres attach to gonosomes  
Spindle fibres contract/pull  
homologous partners to opposite poles/ends of cell
- therefore, X and Y will separate  
and end up in separate cells/daughter cells/haploid cells
- 2.2.2 100%  
to be male a child needs the Y chromosome  
therefore, a father passes his Y chromosome to all of his sons
- 2.2.3 nDNA consists of greater quantities of DNA than mtDNA (37 500 nucleotides) –  
the more DNA present, the more differences there can be due to mutations/recombination.  
nDNA is made up of DNA from two different parents/mtDNA is from one parent  
therefore, nDNA is a combination of DNA from two people  
mtDNA tends to stay much the same over generations  
therefore, less differences occur between individuals  
nDNA has crossing over occurring (in meiosis)  
therefore, nDNA is a unique mixture of alleles from different homologous partners/alleles swapped in crossing over  
whereas mtDNA remains unchanged as no meiosis (and no crossing over)  
therefore, mtDNA is just a replicate of existing mtDNA  
nDNA undergoes segregation and independent assortment in meiosis  
no meiosis in mtDNA therefore no genetic recombination  
Meiosis in nDNA can lead to mutations (chromosomal)  
(can't say that 'nDNA has character and mtDNA does not' for 2 marks)

- 2.3 2.3.1 mtDNA haplogroup L0d is present in more Karretjie people/greater proportion of Khoisan mtDNA shared/more common/any reference to table  
indicating females' origins are Khoisan  
Y chromosome haplogroup I is present in more Karretjie people/greater proportion of European mtDNA shared/more common/any reference to table  
indicating males' origins are European
- 2.3.2 Yes – of importance:  
Allows us to see verify their genetic history  
adds to knowledge of indigenous people of SA  
Allows community to feel they belong to a community  
SA is a culturally diverse nation  
Shows that we are not so different from one another  
as we share DNA  
therefore, helps prevent discrimination  
Allows us to see the history and effects of colonialism in Africa  
Furthers knowledge of science.
- No – of no importance  
It does not change their living circumstances  
Costs a lot in terms of time and money  
but does not improve living conditions of the Karretjie people  
Reveals possible private/sensitive information about their history  
without their permission  
Mention 3 reasons/mention 1 or 2 reasons and explain  
CAP at 2 marks if no decision – mark all facts (for and against) and credit  
with the decision which gives them the most marks but cap at 2  
If argue one way and then argue the other way, mark first way only  
Try to link answers to what is present but don't infer too much
- 2.4 2.4.1 A pattern/picture of DNA bands  
Unique to an individual  
To show relatedness/for crime analysis/paternity  
Produced by separating DNA/sections of non-coding DNA  
Using electrophoresis  
Into bands of similar lengths  
Allowing identification of a person based on where distinctive DNA bands line up on a gel
- 2.4.2 Non-coding DNA is more variable than coding DNA/Coding DNA tends to be much the same between all people  
Non-coding DNA can be used to produce a unique genetic profile  
(Any mutations in non-coding DNA do not affect the individual therefore this DNA tends to vary more  
Therefore, people will vary more in their non-coding regions)  
Therefore, it is easier to tell the difference between different people

- 2.4.3 Baby 1 – Meitjies & Plaatjie;  
Baby 2 – Katjie & Hendrik  
Part of the DNA bands from the respective parents  
are present in each of the babies  
as each baby inherits part) of its DNA from each parent  
(no justification is needed)  
If parents are wrong, then still mark for justification
- 2.4.4 Identifying suspects at a crime scene  
Identification of poached rhino horn  
Authentication of food items (e.g., caviar, wine)  
Identification of victims of disasters  
Identification of soldiers killed in battle  
Tracing missing persons  
Identification of genetic disorders  
Matching tissues for organ transplant

**SECTION B****QUESTION 3**

<b>Women's contribution to genetic studies have received more recognition over time.</b>	
<b>Agree</b>	<b>Disagree</b>
<b>Statistics</b> Enrolment of women in Wits genetics equal to that of males in 2020(B) Women make up increasing percentages in academic institutions (B) (E), increase has been significant in the last 20 years(B) Have been over 50% representation as lecturer and senior lecturer since 1920 (B) Increased number of women employed in more prestigious careers (e.g. professor) (B) Increased number of women employed in genetics laboratory work in US census (B)	<b>Statistics</b> Still small overall percentage of women in academic fields (B) Women still more employed in less prestigious fields (e.g. professors) (B) Even in 2020 still less than (50%) involvement of women in laboratory work (B) Women face sexism and discrimination in workplace(B, (A))
<b>Contributions by women</b> More women recognised in genetics over time (D) Pick individual women as examples – McClintock – Nobel Prize (D), Sakati – three genetic conditions named after her (D), Gilbert, Corbett, Türeci – all involved in Covid vaccine manufacture(D) Only women are recognised after 2020 – no men	<b>Contributions by women</b> Men better known than women(D) (A) Not that many women recognised (D) Pick individual women as example – Nettie Stevens not recognised for her work(D), race discrimination – Daly – first Black women to get PhD only in late 1940s (D) and Temtamy – first Arab woman to get doctorate in genetics only in 1974(D), Lyons and Chase did not get Nobel Prize (D) Klug received Nobel Prize for work first done by Daly (D) Only McClintock received Nobel Prize (D) Few women receiving Nobel Prizes (D) (A)
<b>Promotion of women in science</b> Israel proclaimed 2002 year of advancing women in science and technology (A) Scholarship in Israeli universities (E) UN declared 11 Feb as International Day of Women and Girls in Science(A) Mattel introduced Barbie doll range depicting women in genetics (E)	<b>Promotion of women in science</b> Only one year (A) and one day of the year to celebrate women in science (A) Few scholarships for women in genetics (E) Number of awards for women in science has not kept up with number of professors (E) Barbie doll example of trivialising women(E) Barbie doll example shows that women are not receiving enough recognition(E)
<b>Society/Salary</b> Gender gap in salary disappeared among researchers in high positions (C) Proportion of women professors have increased (E) Big companies like L'Oréal recognising women (E)	<b>Society/Salary</b> Many reasons women not in science – encouraged to go into humanities, fewer role models, myth of male brain, family–work balance, political and religious reasons, discrimination still occurs in attitudes of teachers (A,) and societal attitudes (A) (max 2) (A) Most well-known scientists are male (A) Male scientist viewed more favourably than a woman with the same qualifications (C) Salary lower than men's (C) Gender gap only disappears at very high positions (C)
<b>Awards</b> Lots of scholarships available for study for women(E) Success rate of application, pre-selection, interviews and awarding of research grant money same for women as for men (E) Many famous women in genetics have received awards(E) 54% of people in BioNTech are women (D)	<b>Awards</b> Most scholarships are only available in USA (E) More men receiving Nobel Prize(D) Still less success rate for women applying for research grant money(E) Small number of women who are professors are getting awards (E) Only 4 countries are offering scholarships for women

<p><b>Own info</b></p> <p>Can name female scientists (From A) therefore do get recognition</p> <p>Rosalind Franklin is taught in school, many institutes named after her</p> <p>Emmanuelle Charpentier, Jennifer Doudna received Nobel Prize, CRISPR</p> <p>Himla Soodyall recognised as top population geneticist</p> <p>Facts not credible as gender not taken into account LGBTQ++</p> <p>Women in developing countries may be better recognised due to demographic transition</p> <p>Can use personal observations for own, but these MUST be given to senior sub to consider. These cannot rely on just a single observation (e.g. one person's experience)</p>	<p><b>Own info</b></p> <p>Can't think of a female scientist (from A) therefore not getting recognition</p> <p>School syllabus only overs men in science</p> <p>Learn only that penicillin discoverer was Fleming</p> <p>Rosalind Franklin example of discrimination</p> <p>Facts not credible as gender not taken into account LGBTQ++</p> <p>Can use personal observations for own, but these MUST be given to senior sub to consider. These cannot rely on just a single observation (e.g. one person's experience)</p>
<p><b>Source D (timeline) can be used as facts for either stance – pupils may use this timeline to talk about how things USED to be for women BUT things have now changed (D+) OR use the facts to say that women have never been recognised (D-)</b></p> <p><b>If pupil just lists women/men by name as examples, then cap at 2</b></p> <p><b>Facts:</b></p> <p><b>1–2 = 1 mark; 3–5 = 2 marks; 6–8 = 3 marks; &gt;=9 marks = 4 marks</b></p> <p><b>Source credibility requires full assessment – not a learned response</b></p> <p><b>Plan – requires at least 3 facts, 1 counter, 1 own</b></p> <p><b>Presentation – start at 4 then work down</b></p> <p><b>Supporting argument – NB to look at rubric</b></p>	

**Total: 100 marks**



**Note: Essay should be 2½ to 3 pages long.**

**Time allocation suggestion: Reading of sources 10 min.; Planning 10 min.; Writing essay 40 min.**

	1 mark	2 marks	3 marks	4 marks	Possible mark (40)
<b>Planning x 2</b>	<ul style="list-style-type: none"> <li>Decision given</li> <li>Key points present for and against the argument</li> </ul>	<ul style="list-style-type: none"> <li>Decision given</li> <li>Key points developed for and against the argument</li> </ul>	<ul style="list-style-type: none"> <li>Decision given</li> <li>Key points developed for and against the argument</li> <li>Source references identified (e.g., Source A/own information)</li> </ul>		6
<b>Decision</b>	<ul style="list-style-type: none"> <li>Vague</li> <li>Changed position within essay</li> </ul>	<ul style="list-style-type: none"> <li>Clear decision made</li> </ul>			2
<b>Use of knowledge from sources x 2</b>	<ul style="list-style-type: none"> <li>Up to ¼ of potential detail in sources used to support argument</li> </ul>	<ul style="list-style-type: none"> <li>Up to ½ of potential detail in sources used to support argument</li> </ul>	<ul style="list-style-type: none"> <li>Up to ¾ of potential detail in sources used to support argument</li> </ul>	<ul style="list-style-type: none"> <li>Source detail – very close to full potential used to support argument</li> </ul>	8
<b>Use of own knowledge</b>	<ul style="list-style-type: none"> <li>Some facts given beyond the source to support argument</li> </ul>	<ul style="list-style-type: none"> <li>Many facts given beyond the source to support argument</li> </ul>	<ul style="list-style-type: none"> <li>Some facts given beyond the source to support argument</li> <li>Facts integrated into the argument</li> </ul>	<ul style="list-style-type: none"> <li>Many facts given beyond the source to support argument</li> <li>Facts integrated into the argument</li> </ul>	4
<b>Content relevance</b>	<ul style="list-style-type: none"> <li>Repetition mostly avoided</li> <li>Some minor digression</li> <li>Supporting argument relevant</li> </ul>	<ul style="list-style-type: none"> <li>Repetition mostly avoided</li> <li>Some minor digression</li> <li>Supporting argument relevant</li> <li>Quality of source extracts acknowledged</li> </ul>			2

	1 mark	2 marks	3 marks	4 marks	Possible mark (40)
<b>Quality of argument supporting decision x 2</b>	<ul style="list-style-type: none"> <li>Writing consists of facts with little linkage or reasoning</li> <li>Reasoning incorrect</li> </ul>	<ul style="list-style-type: none"> <li><b>Maximum if no clear decision in support</b></li> <li>Reasoning correct, but hard to follow</li> <li>Ordinary: some linkage evident</li> </ul>	<ul style="list-style-type: none"> <li>Supports the position</li> <li>Reasoning is clear</li> <li>Minor errors in flow</li> <li>Linkage sometimes missed</li> </ul>	<ul style="list-style-type: none"> <li>Strongly supports a clear position</li> <li>Reasoning is very clear and succinct</li> <li>Flow is logical</li> <li>Compelling with regular linkage</li> <li>Well-integrated argument</li> </ul>	8
<b>Fairness – counter opinions to decision</b>	<ul style="list-style-type: none"> <li>One to two counter opinions given from the sources</li> </ul>	<ul style="list-style-type: none"> <li>Three to four counter opinions given from the sources</li> </ul>	<ul style="list-style-type: none"> <li>Integration of one to two counter opinions from the sources into argument</li> </ul>	<ul style="list-style-type: none"> <li>Integration of three to four counter opinions from the sources into argument</li> </ul>	4
<b>Presentation</b>	<ul style="list-style-type: none"> <li>Writing is almost unintelligible</li> <li>Tone, language, terminology unscientific and very weak</li> <li>Introduction <b>and/or</b> conclusion <b>not</b> present</li> </ul>	<ul style="list-style-type: none"> <li>Tone, language, terminology weak</li> <li>Introduction <b>and</b> conclusion present</li> </ul>	<ul style="list-style-type: none"> <li>Tone is consistent and suited to scientific language</li> <li>Good and appropriate language and terminology</li> <li>Mostly appropriate paragraphing</li> <li>Introduction and conclusion have merit</li> </ul>	<ul style="list-style-type: none"> <li>Tone is mature and suited to scientific language</li> <li>Excellent and appropriate language and terminology</li> <li>Correct paragraphing with good transitions</li> <li>Interesting introduction, satisfying conclusion</li> </ul>	4
<b>Scientific merit</b>	Essay shows academic rigour, accurate reasoning, insight and cohesiveness.				2