

3.3 BIOLOGY (231)

Biology (231) is examined in 3 papers; two theory and one practical.

Both paper 1 and 2 are marked out of 80 while paper 3 is marked out of 40.

Paper 1 assesses concepts across the secondary school Biology syllabus. The questions are usually structured and are all compulsory.

Paper 2 has a total of 8 questions. It is divided in two sections, A and B. Section A has five compulsory, structured questions, sampled from five topics across the Biology syllabus, each carrying 8 marks. Section B has three questions, each carrying 20 marks. Question six is compulsory; assesses concepts on data manipulation and interpretation while questions seven and eight are essays. A candidate is expected to attempt only one of the two essay questions.

Paper 3 is usually a practical paper, with three questions drawn from any three topics in the secondary school Biology syllabus.

3.3.1 CANDIDATES' GENERAL PERFORMANCE

The performance of the candidates in the three Biology papers from 2012 to 2020 is presented in the table below.

Table 11: Candidates' Overall Performance in Biology from 2012 to 2020

Year	Paper	Candidature	Maximum score	Mean score	Standard Deviation
2012	1		80	19.77	12.84
	2		80	20.70	12.09
	3		40	11.97	6.59
	Overall	389,523	200	52.41	29.43
2013	1		80	28.03	14.49
	2		80	22.36	12.70
	3		40	12.88	7.64
	Overall	397,319	200	63.26	32.06
2014	1		80	23.91	14.49
	2		80	18.92	11.83
	3		40	20.82	8.39
	Overall	432,977	200	63.65	32.57
2015	1		80	27.42	14.46
	2		80	19.56	11.86
	3		40	22.62	9.15
	Overall	465,584	200	69.59	31.55
2016	1		80	27.30	16.40
	2		80	20.11	14.14
	3		40	10.99	6.76
	Overall	509,982	200	58.37	35.16

Year	Paper	Candidature	Maximum score	Mean score	Standard Deviation
2017	1		80	13.74	10.24
	2		80	16.43	10.37
	3		40	7.68	5.05
	Overall	545,663	200	37.85	23.45
2018	1		80	15.81	9.26
	2		80	11.92	8.67
	3		40	13.65	7.38
	Overall	589,900	200	51.38	23.26
2019	1		80	18.00	11.210
	2		80	18.00	10.036
	3		40	16.00	6.484
	Overall	618,730	200	49.87	25.50
2020	1		80	16.03	11.70
	2		80	19.83	11.75
	3		40	16.59	8.48
	Overall	651,236	200	53.03	29.50

It can be deduced from the table that:

- i) There has been a continuous increase in candidature for the past nine years.
- ii) There has been significant improvement in performance since 2017.
- iii) The standard deviation values indicate that the papers adequately discriminated learners of different abilities.

3.3.2 ANALYSIS OF PERFORMANCE IN THE PAPERS

3.3.3 Biology Paper 1 (231/1)

(i) ANALYSIS OF POPULAR ITEMS IN PAPER 1, (231/1)

Question 1

Name the taxonomic grouping that contains individuals with most similarities. (1 mark)

Question 6

State the importance of a well developed blood capillary network in the alveoli. (1 mark)

Question 13

State two characteristic features used to classify members of Class Coniferales. (2 marks)

Most candidates scored maximally in the items above. This could be attributed to the fact that these are knowledge questions in terms of the Bloom's Taxonomy.

(ii) ANALYSIS OF POORLY PERFORMED QUESTIONS

Question 15(b)

Describe cell biology as an evidence of organic evolution. (3 marks)

Weakness

Most of the candidates failed to link cell biology to evolution. Most of the candidates cited the existence of some organelles in some organisms without linking the same to their phylogenetic origins. This further illustrates their inability to link/apply the concept learnt in one topic to other topics/content areas; in this case, linking the concepts acquired in The Cell, a topic learnt in Form one, to Evolution in Form four.

Learners should be exposed to all possible approaches to various topics and sub-topics in the course and how they are related.

Expected Response

Presence of similar cell organelles (mitochondria, ribosomes, lysosomes); similar biological chemicals (ATP/proteins/DNA); similar blood pigmentation in tissues of some groups of animals (show they have a common phylogenetic origin);

Question 20

Explain the biological significance of completing a dose of antibiotics. (3 marks)

Weakness

Most of the candidates who attempted the question only managed one mark as they could not conclusively articulate how failing to complete a dose leads to the development of resistance and mutation of pathogens.

This illustrates the candidates' inability to apply the knowledge learnt in class to real life situations as well as their inability to link/apply the concept learnt in one topic to other topics/content areas; in this case, linking the concepts acquired in Evolution to Genetics, both of which are topics in Form four.

Expected Response

To completely contain/kill the (targeted) pathogens; since failure to take full dose accords the pathogens an opportunity to develop resistance to the drug; the pathogen mutates, over time, giving rise to new strains; finally the drug becomes ineffective;

3.3.4 Biology Paper 2 (231/2)

(i) ANALYSIS OF POPULAR ITEMS IN THE PAPER

None of the eight questions in the paper fully recorded consistent scores as to be regarded as popular to the candidates.

(ii) ANALYSIS OF POORLY PERFORMED QUESTIONS

It was further generally observed that most learners had difficulty in interpreting data from tables, hence performing dismally in data-based questions.

Question 2(a) and (b)

The genetic make-up of a man was found to be XXY.

- (a) Name the syndrome the individual could be suffering from. (1 mark)
- (b) Explain how the syndrome occurs. (4 marks)

Weakness

Most candidates who attempted the question failed to identify the disorder and hence could not coherently explain how it occurs.

Learners should be encouraged to understand biological principles, processes, general content and present it coherently with precision. Information Communication Technology (ICT) through the use of animations can be effectively used to illustrate such processes for clarity.

Expected responses

2(a) Klinefelter's syndrome;

2(b) Chromosomal abnormalities/mutations; result in the addition of a whole chromosome; it occurs during the (1st/2nd meiosis/meiotic division, where the homologous chromosomes/sister chromatids fail to segregate; (and so) move to the same gamete cell; if the gamete with XX fuses with a gamete with Y, the offspring becomes XXY;

Question 4 (a) and (b)

A student could clearly read a book placed 10 cm away but could not clearly identify a fellow student 12 m away.

- (a) Name the eye defect the student was suffering from. (1 mark)
- (b) Explain why the student could **not** clearly identify his colleague yet could read the book. (3 marks)

Weakness

Most candidates who attempted the question failed to identify the defect the student was suffering from, consequently being unable to explain it within the context given.

This illustrates the candidates' inability to apply the knowledge learnt in class to real life situations. This can be strengthened through practical and guided group activities.

Expected responses

(a) Short sightedness/myopia/near-sightedness;

(b) Has a long eye ball; resulting in the light rays from the colleague (student) who is 12m away being focused at a point in front of the retina (thus appearing blurred); Light rays from the book are focused on the retina;(by bringing the book closer to the eyes).

3.3.5 Biology Paper 3 (231/3)

(i) ANALYSIS OF POPULAR ITEMS IN THE PAPER

As observed in the previous year, paper three, 231/3 was also generally popular as evidenced by the improvement in performance. Generally, it was observed that students displayed poor drawing and labeling skills. Spelling mistakes in the writing of biological terms still affect a good number of candidates. To remedy this, learners should be adequately exposed to tasks that require them to draw and label parts of various specimens.

(i) ANALYSIS OF POORLY PERFORMED QUESTIONS

Question 1(a)

You are provided with a piece of specimen N and the following reagents:

- Dilute hydrochloric acid
- Dilute sodium hydroxide
- Dilute hydrogen peroxide
- Water

You have also been provided with the following apparatus:

- Three test tubes
- 10 ml measuring cylinder
- Scalpel

Procedure

- (i) Label the test tubes 1, 2 and 3.
 - (ii) Macerate (chop into tiny pieces) half of specimen N.
 - (iii) Place equal amounts of the macerated specimen into test tubes 1 and 2.
 - (iv) Cut the remaining half of the specimen into two equal pieces.
 - (v) Place one piece into test tube 3 and reserve the remaining piece.
 - (vi) Add about 2 cm³ of dilute hydrochloric acid into test tube 1, add about 2 cm³ of sodium hydroxide into each of test tubes 2 and 3.
 - (vii) Add about 5 cm³ of hydrogen peroxide into each of the three test tubes, 1, 2 and 3.
- (a) Observe the amount of effervescence in each test tube and complete the table below.

Test tube	Contents	Amount of effervescence observed	Explanation
1			
2			
3			

Weaknesses

This was the most unpopular item. Most candidates displayed low comprehension of the demands of the question, hence being unable to make appropriate observations and inferences.

Expected responses

	Test tube contents	Amount of effervescence observed	Explanation
1(a)	HCl + macerated specimen N + H_2O_2 ;	No/little effervescence/foam/frothing/bubbling;	(Although there was adequate surface area exposed (by macerating the potato) for enzymatic action), the acidic medium/low pH did not favour the working of the enzymes/catalyze/increase rate of enzymatic reaction/denature enzyme;
	NaOH + macerated specimen N + H_2O_2 ;	Vigorous/rapid/high/a lot of/more effervescence;	Adequate surface area exposed (by macerating the potato) for enzymatic action; favourable/suitable pH/alkaline medium/high pH for enzymatic action;
	NaOH + cube of specimen N + H_2O_2 ;	Moderate/average/medium effervescence;	Less/little surface area, exposed for enzymatic action;

3.3.6 GENERAL ADVICE TO TEACHERS

Hands-on practical activities should be strongly encouraged as this enhances the development of manipulative skills amongst learners (as opposed to sheer memorization of facts). Resources/materials within the students' environment should be used to demystify and reinforce students' understanding of some Biological concepts and processes.

A wider variety of Biology materials in form of text books, scientific journals and publications should be availed to enrich the students' learning environment. Testing and assessment approaches should also be diversified, integrating ICT.

Gradual and systematic development of manipulative skills amongst learners (as opposed to sheer memorization of facts). Resources/materials within the students' environment should be used to demystify and reinforce students' understanding of some Biological concepts and processes.