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 randomly drawn from the entire secondary school Biology syllabus across all the cognitive levels. The questions are structured and are **all** compulsory.

Paper 2 has a total of 8 questions, divided in two sections, **A** and **B**. Section **A** has five compulsory structured questions, drawn from any five topics in the Biology secondary school syllabus, each carrying 8 marks. Section **B** has three questions, each carrying 20 marks. Question **six** is compulsory; mainly assessing data manipulation and interpretation skills while questions **seven** and **eight** are essays. A candidate is expected to attempt only one of the two essay questions.

Paper 3 is a practical paper, with three questions drawn from any three topics in the secondary school Biology syllabus. The paper mainly tests the candidate's manipulative, observation and interpretation skills and/or abilities from the hands-on tasks presented in the paper.

3.3.1 Candidates' General Performance

The performance of the candidates in the three Biology papers from 2013 to 2021 is presented in the table below.

Table 9: Candidates' Overall Performance in Biology from 2013 to 2021

Year	Paper	Candidature	Maximum score	Mean score	Standard Deviation
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**
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**

Year	Paper	Candidature	Maximum score	Mean score	Standard Deviation
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**
2021	1		80	19.58	14.88
	2		80	21.73	13.87
	3		40	15.72	7.05
	Overall	**710,533**	**200**	**57.01**	**32.98**

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 continued improvement in performance since 2017.

(iii) The 2021 mean scores and standard deviations increased in the two theory papers but dropped in the practical paper compared to the 2020 performance in the three papers.

(iv) The standard deviation values indicate that the papers adequately discriminated learners of different abilities.

3.3.2 Analysis of Performance in the Papers

3.3.2.1 Paper 1 (231/1)

(i) Analysis Of Popular Items In Paper 1 (231/1)

Question 1

Explain why it is necessary for plants to have their leaves spread out. (2 marks)

Question 10

(a) Distinguish between gaseous exchange and respiration. (2 marks)

(b) Explain the importance of algae in a pond. (2 marks)

Question 12 Paste

Complete the table below, outlining the differences between members of Class Diplopoda and Chilopoda based on the characteristics given. (3 marks)

Characteristic	Diplopoda	Chilopoda
(a) Body shape		
(b) Body segmentation		
(c) Number of legs per segment		

Most candidates scored maximally in the items above. This could either be due to the candidates having prepared and adequately mastered content in the examined content areas or the items tested low cognitive abilities.

(ii) Analysis Of Poorly Performed Questions

Question 7

The word equation below shows a process that takes place in a certain living organism.

$$\text{Lactose} + \text{Water} \xrightleftharpoons{K} \text{Substance J} + \text{Galactose}$$

(a) Name process **K**. (1 mark)

(b) State the importance of substance **J** in the living cells. (1 mark)

Weakness

Most candidates failed to recognize that the reaction presented is a reversible reaction and hence were not able to link the label, **K,** to the appropriate reaction in the equation. This illustrates the candidates' failure to keenly read, study and comprehend the questions before responding.

Learners should be exposed to tasks and/or test items that require their utmost attention.

Expected Response

(a) Condensation;

(b)
- Provides energy (during respiration);
- Are building units for larger/complex carbohydrates.

Question 3(b)

Explain the observation made in the test tube if similar setup included young growing plants in the jar containing grasshoppers at the beginning of the experiment. (2 marks)

Weakness

Most of the responses presented for this test item were out of context, implying either the candidates' inability to link concepts across the topics or deficiency to evaluate, infer and make relevant judgements based on the presented scenarios. Most candidates indicated that the grasshoppers would feed on the young growing plants in the jar, a response that was not any closer to the examined concept of respiration and gaseous exchange in living organisms.

Expected Response

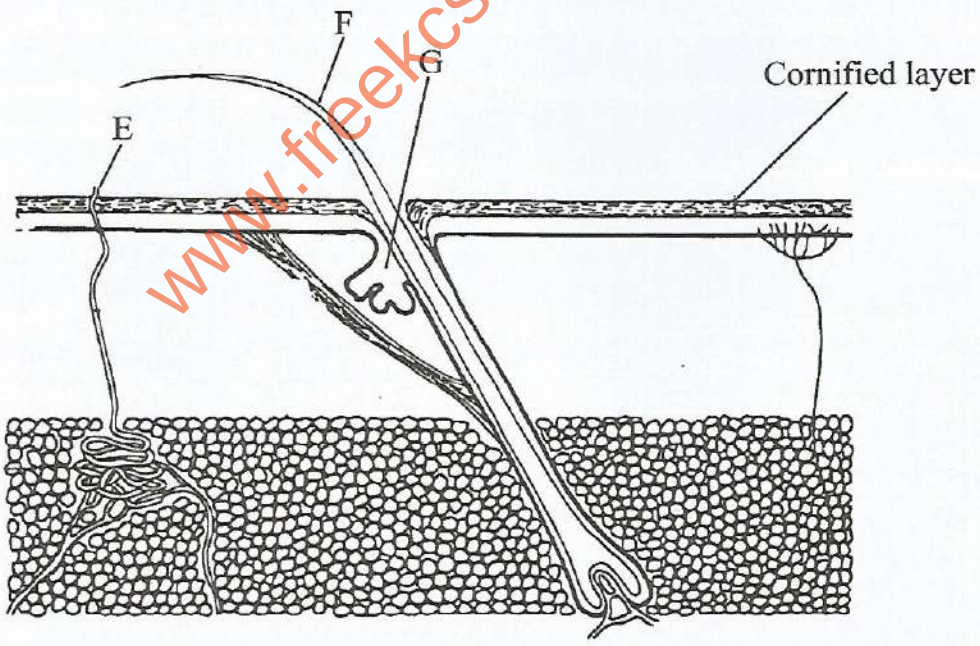
Rate of formation of the precipitate will be slower/no white precipitate will form in the test tube; (part of) the carbon (IV) oxide (produced by grasshoppers) is used up by the growing plants to make food/ photosynthesize;

3.3.2.2 Biology Paper 2 (231/2)

(i) Analysis of Popular Items in the Paper

Question 3

The diagram below shows a section through the mammalian skin.



(a) (i) Name the substance produced by the part labelled **G**. (1 mark)

(ii) State **two** functions of the substance named in 3(a)(i). (2 marks)

(b) Name the part labelled **E**. (1 mark)

(c) Explain the function of the part labelled **F** to the mammal. (2 marks)

(d) (i) Name **one** part of the human body where the cornified layer is thickest. (1 mark)

(ii) Give a reason for your answer in 3(c)(i). (1 mark)

Most candidates scored maximally in this item. This could be because the candidates had prepared and adequately mastered content in the examined area: Homeostasis and Excretion-The Skin.

(ii) Analysis of Poorly Performed Questions

It was further generally observed that most candidates had difficulty in interpreting genetic concepts, hence performing dismally in the items that were drawn from this topic.

Question 4 Paste

(a) Two dogs with black fur mated and produced an offspring with both black and brown fur. Given letter **N** represents the gene for black fur, determine the phenotypic ratio of the offspring. (5 marks)

(b) The photographs below show a hairy pinna in a human ear.

(i) Explain why this trait is only found in males. (2 marks)

(ii) Name **one** other trait that only appears in males. (1 mark)

Weakness

Most candidates who attempted the question displayed inadequate understanding of the difference between monohybrid inheritance and codominance as well as the concept of sex-linked genes.

Candidates should be exposed to tasks tailored towards bringing out the difference between monohybrid inheritance and codominance as well as proper understandingn of sex-linked genes. Information Communication Technology (ICT) using animations can be effectively used to illustrate such differences and clearly present sex-linked traits concept.

Expected responses

a)

Parental phenotype: ♂ Black fur male ♀ Black fur female

Parental genotype: Nn Nn ;

Gametes: (N) (n) x (N) (n) ;

;

F_1 offspring: NN Nn Nn nn ;

NN: Black fur homozygous; Nn, Nn: Black fur heterozygous; nn: Brown fur

Phenotypic ratio: 1 Black fur homozygous : 2 Black fur heterozygous : 1 nn Brown fur ;

b) (i) The trait is sex-linked; the gene responsible for the hairy pinna is found/attached to the Y-chromosome;

(ii) (Premature) baldness; hairy nose; Duchene muscular dystrophy;

Question 6 (g)

(g) (i) Predict the concentration of progesterone hormone seen days after the study period if fertilisation did **not** take place. (1 mark)

(ii) Give a reason for your answer in 6(g)(i). (1 mark)

Weakness

Most candidates who attempted the question failed to interpret, infer and hence give a valid judgement of the anticipated/predicted outcome.

Candidates should be exposed to more tasks that require their judgement and inference based on varied data and/or scenarios.

Expected responses

i) Will remain low/keep decreasing (any value below 20 mg/cm3);

ii) The Corpus luteum will have broken down/degenerated;

3.3.2.3 Biology Paper 3 (231/3)

(i) Analysis of Popular Items in the Paper

As observed above, the performance in 231/3 has been on an improvement trajectory since 2016 save for this year's (2021) where its mean and standard deviation recorded a drop compared to the previous year's (2020).

This could be attributed to the candidates' inability to make accurate observations and draw relevant conclusions. Majority of candidates' responses further implied lack of independence during the performance of the tasks.

Candidates should be accorded opportunities to work and present their work independently. Being exposed to the contents of the advance instructions (to schools) dwarfs the achievement and development of their Science skills as outlined in the secondary school Biology course objectives.

(ii) Analysis of Poorly Performed Questions

Question 2(a)

You are provided with solution **M** which is a food substance.

Procedure

(a) Using the reagents provided, test for the food substance present in substance **M** and complete the table below. (12 marks)

Food Test	Procedure	Observations	Conclusion

Weaknesses

The item requiring candidates to test for the presence of lipids in the provided food substance (with both the filter/white paper and Olive oil provided) illustrated deficiency in independence and creativity amongst the candidates. Majority of the responses presented indicated the candidates did not have an idea of what they were to use the Olive oil for in the experiment.

Expected responses

Food Test	Procedure	Observations	Conclusion
Lipids (fats/oils);	Put/rub/apply a drop of **M** on a filter/plain white paper and allow it to dry;	Permanent translucent mark is left on the paper (mark not similar to the one left by Olive oil);	Absence of lipids/fats;

4.0 GENERAL ADVICE TO TEACHERS

Independence during hands-on practical activities to enhance the acquisition and development of Science skills amongst learners. Resources/materials within the students' environment should be used to demystify and reinforce students' understanding of some biological concepts and processes.

A variety of reference materials should be used during the teaching and learning process (textbooks, scientific journals and publications as well as animations and videos). The variety in approaches and general presentation of concepts enhances understanding and interest amongst students.