



GENERAL COMMENTS

In this year's examination, answers ranged from those of the highest order to others that lacked the necessary information. Students who used correct terminology and concepts and presented answers in a logical manner scored well. It is important that students follow any suggestions or requirements given within a question, such as stating specific requirements in Question 9a.

Students must endeavour to spell and use common biological terms correctly. Any ambiguous terms or abbreviations are to be avoided.

It is strongly recommended that Section B is completed in pen as responses in pencil are often difficult to read and interpret. It is most pleasing to report the minimal usage of pencil in Section B. This improved the clarity of the writing and consequently the ease of marking. It is important to note that should a student start writing in pencil and then remember the instruction, there is no need to go over the answers written in pencil. It is suitable to answer some questions, such as those with diagrams or genetic crosses, in pencil.

SPECIFIC INFORMATION

Section A – Multiple-choice questions

The table below indicates the percentage of students who chose each option. The correct answer is indicated by shading.

Question	% A	% B	% C	% D
1	28	1	68	3
2	4	78	8	9
3	10	4	4	82
4	9	6	9	75
5	11	69	12	8
6	11	78	6	4
7	2	6	71	20
8	19	2	77	2
9	4	5	76	15
10	8	24	5	62
11	3	65	28	4
12	59	14	13	14
13	68	4	19	9
14	9	11	8	72
15	7	75	9	9
16	9	6	10	75
17	13	5	64	18
18	22	2	12	63
19	20	7	17	55
20	5	73	10	11
21	94	1	3	2
22	13	64	6	18
23	71	11	5	12
24	21	5	65	9
25	68	16	8	7

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Section B – Short answer questions

For each question, an outline answer (or answers) is provided. In some cases the answer given is not the only answer that could have been awarded marks.

Question 1a.

Marks	0	1	Average
%	29	71	0.7

Autosomal recessive

Recessive or X-linked recessive was not accepted.

Question 1b.

Marks	0	1	2	Average
%	41	43	15	0.8

Molly's parents are heterozygous, as seen from the pedigree. Molly is unaffected; therefore, when determining chance, an offspring who shows the trait is not considered. Molly has two chances out of three to be heterozygous.

Students needed to give $2/3$ or another suitable way of expressing the chance, for example, 66 per cent. They also needed to indicate that Molly's parents were heterozygous.

Some students gave good examples of chance in the form of ratios. A correct ratio for this question would be 2 (heterozygotes): 1 (homozygote).

Question 1c.

Marks	0	1	2	Average
%	50	39	11	0.6

1ci.

One of:

- eukaryotic chromosomes are linear and prokaryotic chromosomes are circular
- eukaryotic chromosomes have histones and prokaryotic chromosomes do not
- prokaryotic chromosomes are replicated during binary fission and eukaryotic chromosomes are replicated during mitosis/meiosis.

1cii.

Plasmids (one of):

- replicate independently of binary fission
- can be used as vectors in genetic transformation.

A common incorrect answer was that prokaryotic chromosomes are linear when compared to plasmids. Both are circular, and plasmids and chromosomes are all made of double-stranded DNA.

If students are asked to make comparative statements and no comparison is made, it may be impossible to gain full marks. For example, saying eukaryotic chromosomes replicate or prokaryotic chromosomes do not replicate in mitosis was not suitable. Students needed to state that prokaryotic chromosomes are replicated during binary fission.

Some students made comments about membrane organelles. This is a way of distinguishing prokaryotic and eukaryotic cells but did not answer the question asked.

Question 2a.

Marks	0	1	2	3	4	Average
%	15	22	24	24	15	2

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2ai.
Transcription

2aii.
All of:

- the DNA template is copied by RNA polymerase
- pre-mRNA is produced. This undergoes post-transcriptional modification, such as introns are removed
- mRNA is produced.

Question 2b.

Marks	0	1	2	3	4	Average
%	15	14	16	22	34	2.5

2bi.
Translation

2bii.
All of:

- ribosomes read the mRNA code
- tRNA anticodons attach to the mRNA codons
- a protein/polypeptide is produced.

This question was generally well answered and most students were able to gain some marks. Contradictory information should be avoided, and students are advised to read their answers carefully and check their content for accuracy.

Question 3a.

Marks	0	1	Average
%	54	46	0.5

There are 22 autosomes in a single normal gamete.

Question 3b.

Marks	0	1	Average
%	39	61	0.6

Crossing over provides greater variation in the gametes.

A common incorrect answer was that crossing over created new alleles.

Question 3c.

Marks	0	1	Average
%	75	25	0.3

The same genetic material is still present within the cell but in a different position.

Some students incorrectly referred to the translocation as crossing over.

Question 3d.

Marks	0	1	Average
%	53	47	0.5

Anaphase II

Question 3e.

Marks	0	1	2	Average
%	67	20	13	0.5

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**3ei.**

There is a 25 per cent chance that a sperm from the man will contain a normal chromosome 1 and a normal chromosome 2.

3eii.

For each homologous pair of chromosomes there are two choices of lining up. There are therefore four possibilities, of which one combination has both normal (untranslocated) chromosomes.

Question 4a.

Marks	0	1	2	3	Average
%	23	22	29	26	1.6

All of:

- there was variation in the mussel population or thick-shelled mussels had a selective advantage
- the crabs eat more thin-shelled mussels or crabs are a selective pressure
- the thicker-shelled mussels survived, reproduced and passed their alleles on to the next generation.

Many students answered this question concisely and in a well-thought-out way. Others, however, provided confused answers such as 'the mussels needed thicker shells so they grew them.'

Question 4b.

Marks	0	1	2	Average
%	24	16	60	1.4

Either of:

- no change in variation and due to crabs (selection pressure) not being present
- variation occurs due to a different selection pressure or gene flow with the Southern population.

This question was generally well answered.

Question 5a.

Marks	0	1	2	Average
%	45	40	15	0.7

Two of:

- jaw X is more parabolic than jaw Y
- the canine teeth are larger in jaw Y
- the teeth are a more uniform size in jaw X.

The Australopithecus jaw is more parabolic and the Gorilla jaw is U shaped or more square. Too often students confused these descriptions and as a consequence did not gain the marks available. Many students incorrectly stated that jaw X was the gorilla or that jaw Y was the Australopithecus.

Question 5b.

Marks	0	1	2	Average
%	82	14	4	0.2

Both of:

- the inactivation of one centromere enables meiosis/cell replication to occur
- gametes are able to be produced.

This question was poorly answered. Most students did not answer this question in terms of the significance of the inactivation of one of the centromeres but instead answered in terms of human evolution.

Question 6a.

Marks	0	1	2	Average
%	41	16	43	1

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Either of:

- DNA hybridisation: DNA from two different sources is made single-stranded and mixed together, and the degree of bonding is determined by the melting temperature
- mitochondrial DNA sequencing: the DNA from different species is extracted, sequenced and compared.

To gain full marks it was important that the DNA method and its description were relevant to determining species relatedness.

Question 6b.

Marks	0	1	2	Average
%	42	38	20	0.8

A sample is compared to the database and used to:

- identify endangered species
- identify people selling incorrectly labelled fish
- monitor fish numbers.

Some students gave identifying illegal fishing as the reason; however, the question specifically asked for a reason other than illegal fishing.

Question 6c.

Marks	0	1	Average
%	80	20	0.2

One amino acid is coded for by more than one triplet/codon.

It was evident that many students did not understand the term 'redundancy'. Other students gave incorrect answers such as 'many codons code for amino acids'.

Question 6d.

Marks	0	1	Average
%	46	54	0.6

Either of:

- to ensure the accuracy of results
- to identify variations that exist in a species.

Question 7a.

Marks	0	1	Average
%	50	50	0.5

Either of:

- strata near the top are more recent (or the converse)
- strata are laid down in chronological order.

The question specifically asked for assumptions about the formation of fossils, hence students who stated that disturbances had not occurred could not gain full marks.

Question 7b.

Marks	0	1	2	Average
%	35	25	40	1.1

7bi.

The decrease in bird numbers was due to:

- predation by humans/dogs
- habitat destruction by dogs/humans/volcanic eruption.

7bii.

The evidence given needed to relate to the answer given in 7bi., such as:

- dog bones in the strata
- pottery, indicating human settlement

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- charred plant remains, indicating habitat destruction by humans
- charred plant remains, indicating human settlement/volcanic eruption.

The suitability of the account was assessed in this question.

Question 7c.

Marks	0	1	2	3	4	Average
%	26	19	19	20	17	1.8

7ci.

Founders (founder effect was also acceptable)

7cii.

- population separated/no gene flow
- natural selection occurs (or a suitable description of this process)
- when brought back together, they are unable to produce viable/fertile offspring

Many students were able to gain some marks for this question. Students who were awarded full marks answered this question in a clear and logical manner.

Question 8a.

Marks	0	1	Average
%	70	30	0.3

The repeats occur in non-coding regions of DNA or mutations occur in introns.

A common incorrect answer was 'the mutation is silent.'

Question 8b.

Marks	0	1	Average
%	31	69	0.7

PCR or Polymerase Chain Reaction

Question 8c.

Marks	0	1	2	Average
%	10	14	77	1.7

Family Y and one of:

- there is only one difference/mutation between Y and Ben
- Y has more or four out of five STR markers, the same as Ben
- X and Z have a greater number of differences than Y does to Ben.

Question 9a.

Marks	0	1	2	Average
%	24	30	46	1.2

The humans are the selective agent and the phenotype selected for is the tastiness/nuttiness of the fruit.

Many students restated the question stem by saying 'humans chose the best fruit', and then incorrectly stated that the selective agent was the tree and the fruit was the phenotype selected for.

Question 9b.

Marks	0	1	2	Average
%	45	31	25	0.8

9bi.

The genotype is identical or the plants are clones.

Many students incorrectly stated that the genotype is homozygous/pure breeding.

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9bii.

The lack of variety means that for example, should a disease occur, the resistance would be the same and may lead to extinction.

Question 9c.

Marks	0	1	Average
%	55	45	0.5

No, as there has been no change to the plant's DNA/genome/genes.

A common incorrect answer was 'No, as it is not genetically modified.' Students must be aware that they should not simply reword the question.