

GENERAL COMMENTS

Students who could express themselves clearly and present answers in a logical order were more likely to be awarded full marks for a question. Some students gave excellent responses to the questions. Questions requiring an explanation proved more challenging for students. Responses often lacked sufficient detail or were not related to the situation given in the question. Students need to be reminded to refer to information given in the stem of the question and make appropriate reference to the context in their answer.

SPECIFIC INFORMATION

Section A

Question	Correct response	%
1	C	74
2	A	55
3	D	54
4	A	56
5	B	81
6	C	46
7	B	53
8	B	29
9	D	71
10	B	80
11	D	70
12	D	68
13	B	35
14	A	67
15	D	65
16	B	95
17	B	69
18	A	77
19	C	92
20	D	76
21	D	74
22	C	78
23	B	79
24	B	66

Section B

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. Comments on student performance on the question follow the answers for each part of the question.

Question 1

a. (Average mark 0.51/Available marks 1)

An allele is an alternative form of a gene **or** a different form of a gene.

b. (0.5/1)

The heterozygote has a different phenotype from the two homozygous individuals **or** the effect of each allele is identifiable in the phenotype of the heterozygote **or** both alleles are expressed in the phenotype of the heterozygote.

Many students incorrectly described alleles as dominant and recessive. Teachers must emphasise that it is phenotypes that are dominant or recessive, not alleles. Students can be penalised for incorrect use of terminology.

ci–ii. (1.01/2)

ci.

four

cii.

six

di–ii. (1.11/2)

di.

Tyrosinosis is a dominant trait.

dii.

II-4 and II-5 have an unaffected child. If the trait were autosomal recessive all of their children would be affected. Tyrosinosis is dominant because III-3 and III-6 are unaffected **or** parents II-4 and II-5 have unaffected offspring.

In their answer, students must refer to individuals on the pedigree. A general statement 'the trait occurs in each generation' was not sufficient to be awarded a mark.

ei–ii. (1.02/2)

ei.

Allelic symbols, e.g. T: Tyrosinosis or biochemical disorder, t: unaffected or not affected.

Students were expected to give both the symbol and what the symbol denoted in their answer.

eii.

Individual I – 1 **Tt** and Individual III – 6 **tt**.

f. (0.51/1)

3/4 or 75% or probability of 0.75 or 3:1.

Question 2

ai–ii. (1.5/3)

ai.

Starchy endosperm is the dominant phenotype.

aii.

In a single gene cross between two heterozygotes, offspring showing the dominant trait to those showing recessive trait are expected in a ratio of approximately three to one **and** in the figure there are seven dark or sugary seeds and 19 starchy seeds (and the sample shown is typical). This ratio indicates that starchy is the dominant phenotype.

Many students made the statement that there are more starchy seeds than sugary seeds. This statement alone was not sufficient to be awarded full marks. Students are reminded to use the information that they have been given in the question to support their answer.

bi–ii. (0.64/3)

bi.

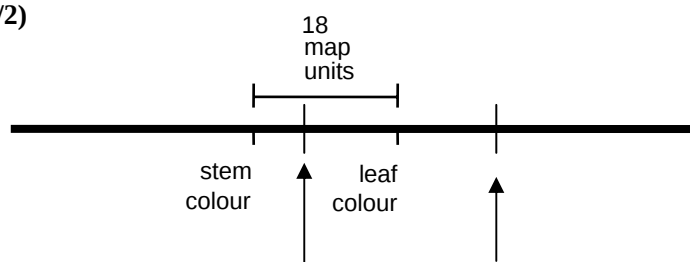
Plant X $G l/g L$ or $\frac{Gl}{gL}$

bii.

Plant Y $g l/g l$ or $\frac{gl}{gl}$

Teachers need to emphasise ways in which linked genes can be denoted. The linkage relationship was not clearly shown by a large number of students. Many responses incorrectly suggested that the alleles for the two dominant traits were on the same chromosome.

c. (1.08/2)



Question 3

a. (0.4/1)

Cross the black and white male kitten with a black female.

Some student responses were very vague and made no mention of the sex of the cat.

b. (0.78/2)

If the white on the black and white cat was genetically determined then two different phenotypes would be expected in the offspring.

parents Ff (black and white kitten) X ff (black females)
offspring (1/2) Ff black and white; (1/2) ff black

c. (0.79/2)

If the white on the black and white cat was due to environmental damage during development then only one phenotype would be expected in the offspring.

parents ff (black and white kitten) X ff (black kittens)
offspring all ff - black kittens in all litters

This was well answered by a large number of students. A few students made careless errors when determining the genotypes of the offspring.

Question 4

a. (0.53/1)

The presence of uracil in place of thymine indicates that it is mRNA and not DNA.

b. (0.3/1)

Guanine to Adenine **or** G to A **or** Guanine (G) replaced by Adenine (A).

Students needed to be careful with their wording. Any response that did not clearly indicate that guanine was the original base and adenine the new base was not awarded a mark. A common incorrect response was 'guanine was substituted for adenine'.

c. (0.68/1)

The amino acid arginine is replaced by the amino acid cysteine in the amino acid sequence.

di-ii. (1.65/4)

di.

Transcription

dii.

DNA double helix unwinds, one strand acts as a template for mRNA production or a single strand of DNA acts as a template

and

bases are added to the growing RNA strand which are complementary to the DNA

and

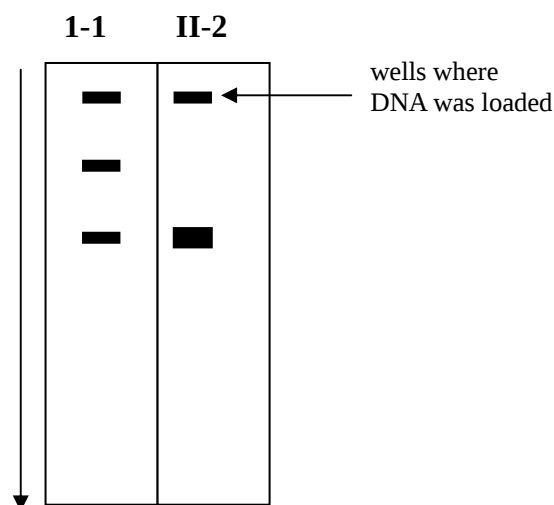
RNA polymerase recognises the promoter region and binds to the DNA **or** RNA polymerase recognises a termination sequence and transcription finishes and the mRNA moves to the cytoplasm.

e. (0.66/2)

Any two of:

- have recognition sequences specific to the enzyme
- produce sticky or blunt ends when they cut DNA
- were originally extracted from bacteria
- are named after the bacterium from which they were extracted.

f. (0.38/2)



Question 5

a. (0.46/2)

The sea between islands in the Galapagos acts as a geographic barrier for speciation or islands separated from each other by water, or islands are separated and this prevents gene flow. Different islands have different selection pressures due to different habitats.

Students are reminded to include detail in their answers. For example, an answer of 'Isolation', does not contain sufficient information.

b. (0.21/1)

The finches may have migrated by flying and were able to survive in the new environment **or** the species was present when the islands were once joined and now the islands have now separated **or** an ancestral species flew to various islands and remained the same.

c. (0.73/1)

Natural selection **or** evolution.

Question 6

a. (0.82/1)

The red form.

b. (0.6/2)

Predators (e.g. birds) are the selection pressure **and** flowers present in spring which camouflage the red beetles from predators. The black beetles are more obvious and are eaten by predators while the red beetles survive and reproduce **or** a different predator is present in spring that eats black beetles in preference to the red beetles.

Very few students identified the selection pressure. Some incorrectly identified the pressure as the colour of the flowers.

Question 7

a. (0.25/1)

Stratigraphy, the relative depth of the fossil in the limestone layers or position relative to other layers, older fossils are generally deeper **or** knowing the age of the limestone in which the fossil is found **or** indicator/index fossils.

bi–ii. (0.82/2)

bi.

Archaeopteryx were not common **or** lived in area where conditions were unsuitable for fossilisation **or** only lived in a small region **or** the animal deteriorated before fossilisation.

bii.

Before fossilisation the individual was partially eaten or decomposed **or** its bones were scattered by water/predators. After fossilisation the fossil could have been broken or destroyed by Earth's movements.

c. (1.29/2)

B

Modern birds have a more recent common ancestor with Rahona or modern birds and Rahona were the last two groups to diverge.

Most students could correctly identify diagram B. Fewer could go on and explain why the diagram suggested that modern birds are more closely related to Rahona.

d. (1.16/2)

The wings are analogous structures **and** the structures have a similar function but different structure or similar function but not due to a recent common ancestor **or** similar function and not due to being closely related.

Question 8

a. (0.76/2)

Heterozygotes have relatively high reproductive rate **and** they pass on allele **g** to their offspring.

b. (0.48/2)

The Founder effect or population established from a few individuals which randomly results in different allele frequencies depending upon the genotypes of the founding members **or** a Bottleneck or population reduced to a few individuals randomly result in different allele frequencies **or** Genetic Drift, in a population there may be chance events which can cause changes in allele frequencies and this has a greater potential impact on a small population.

Students who referred to the example given and mentioned what may happen if the founding members of a population were all heterozygotes or alternatively all homozygotes(GG) were awarded full marks.