

Biology

Written examination 2



2006 Trial Examination

SOLUTIONS

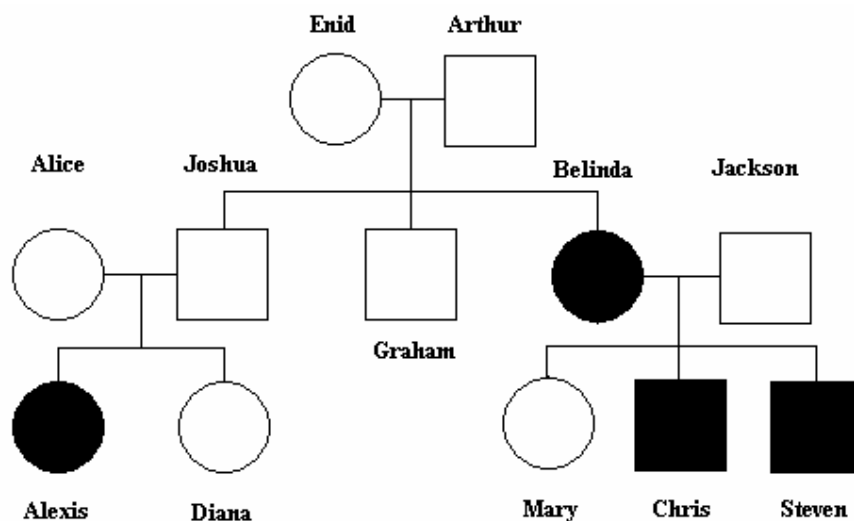
SECTION A- Multiple-choice questions (1 mark each)

1. C	14. A
2. A	15. C
3. B	16. D
4. A	17. D
5. D	18. C
6. D	19. D
7. B	20. A
8. C	21. A
9. B	22. C
10. C	23. A
11. B	24. A
12. C	25. D
13. B	

SECTION B- Short-answer questions

- Question 1**
- a. $5' - \text{ATGCGCTTTTCAGGC} - 3'$
 - b. $5' - \text{AUGCGCUUUUCAGGC} - 3'$
 - c. Transcription
 - d. The introns are removed and the exons are spliced together in a smaller piece
 - e. Polypeptide
 - f. Met – Arg – Phe – Ser – Gly
 - g. Translation
- Question 2**
- a. DNA has a negative charge.
 - b. The gel exists as a matrix of tiny bubbles connected to one another
 - c. C only
 - d. D only
 - e. 0%

Question 3 a. Labelled pedigree chart very similar to this (1)



Affected individuals shown (1) Known carriers may also be shown.

Key included – the shapes used should be as above – a filled in square to represent an affected male, an empty square for an unaffected male, a filled in circle for an affected female and an empty circle for an unaffected female (1)

- b. i.** Pp (or similar notation) (1) and affected individuals are homozygous recessive, Joshua and Alice had an affected child, Alexis through both of them were unaffected. Alexis must have obtained 1 recessive allele from each parent, indicating that Joshua must be heterozygous.
- ii.** pp (or similar notation) Belinda has the symptoms associated with porphyria and therefore must be homozygous for the recessive condition (Enid and Arthur were her parents, and neither were affected, so both must be heterozygous).
- c.** Autosomal recessive (1)

The evidence that shows that this condition is recessive is the fact that 2 unaffected parents such as Enid and Arthur can have an affected child - Belinda (1) (the relationship between Alice, Joshua and Alexis shows the same information)

The evidence that this condition is autosomal is that fact that an unaffected male, Joshua, can have an affected daughter, Diana. If the condition is sex linked recessive then Diana would have to have 2 affected X chromosomes, 1 of which would come from Joshua, which means that he would have to be affected. As he isn't affected this condition cannot be sex linked and must be autosomal (1) (the relationship between Enid, Arthur and Belinda shows the same information).

- Question 4 a.** Parents FTTT x fttt
Gametes FT ft
(1 mark for parents and gametes)

	FT	FT
ft	FfTt	FfTt
ft	FfTt	FfTt

1 mark

Genotypic ratio 100% FfTt

Phenotypic ratio 100% Tall plants with white flowers.

- b.** These genes are linked (1)
If the genes were independently assorted then the ratio of the 4 phenotypes of the offspring would be approximately 1:1:1:1 since this is not the case the genes must be linked(1)
There are 4 phenotypes of the offspring – 2 parental and 2 recombinant which indicates that crossing over must have occurred establishing that the genes are linked (1) (cross over frequency is 18.25% indicating these 2 genes are 18.25 map units apart on the same chromosome)
- c.** i) Recombinant.
ii) tF
tf This answer must not be ttFf as that does not show linkage.

- Question 5 a.** H
- b.** A
- c.** Casts
- d.** Radiometric dating
- e.** Not always (1) **and** depends on the half-life of the radioactive isotope used **or** must use igneous rock for accurate dating which may not be present in large amounts in the strata (1).

- Question 6**
- a. Some individuals already had a mutation for insecticide-resistance (1).
When the field was sprayed the resistant individuals are **selected for** and survived, as did a few others by chance (1).
Survivors bred a new generation, with a high number of resistant individuals. Therefore, most of the population is now resistant (1).
 - b. Artificial selection
- Question 7**
- a. Any of the following
A disease could wipe them all out
Phenotypes could be very similar
Inbreeding would result in weakened offspring
Any other reasonable suggestion
 - b. Founder effect
 - c. Black. There has been enough time for the truly dominant colour to occur in the majority of the population.
 - d. Speciation **or** genetic drift
- Question 8**
- a. Out-of-Africa hypothesis (1).
This hypothesis states that modern humans originated in Africa, then spread outwards to the other continents and the data suggests that one group migrated out of Africa and all other populations were descended from that single group.(1).
 - b. They were outcompeted by *H. sapiens* **or** they succumbed to a disease **or** similar answer.
 - c. During the last Ice Age, the sea levels dropped, so a land bridge formed between Asia and Australia. **Or** they could have travelled by boat, raft or similar means.
- Any of the following
Recording information - communication
Tool making
Fire making
Clothes and shelter making
Cooperative hunting
Development of agriculture
Commerce