

Question 33 — Genetics: The Code Broken? (25 marks)

Answer parts (a)–(c) in a writing booklet.

- (a) Construct a table to identify how each of the following mutations affects chromosome number in an organism: 3

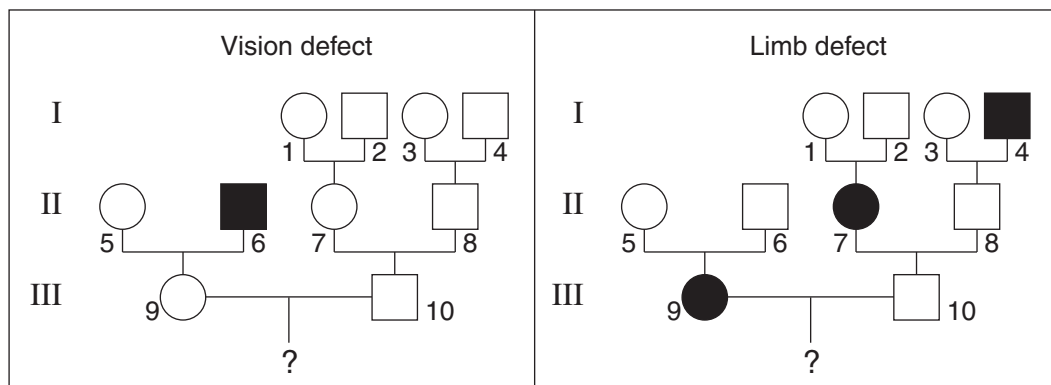
Trisomy, Polyploidy, Base Substitution.

- (b) A somatic cell has a diploid number of 4. 4

Draw diagrams that show the similarities and differences between the chromosomes in:

- this diploid cell and
- a haploid cell which could result from meiotic division of this cell.

- (c) The pedigrees show the inheritance of two genetic disorders in the same family. Person 8 is not a carrier of the vision defect.



Key ● Affected female ■ Affected male
○ Normal female □ Normal male

- (i) Predict whether genes for each of these defects are dominant or recessive. 1

- (ii) Individuals 9 and 10 have requested genetic counselling. 4

Predict the possible ratios of the phenotypes of their children if the genes were linked. Predict the ratios if they were not linked. Show working.

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Question 33 (continued)

Answer parts (d)–(e) in a SEPARATE writing booklet.

- (d) (i) Explain how data can be collected and analysed to identify the relative position of linked genes. **3**
- (ii) Give **THREE** reasons why the human genome project could not be achieved by studying linkage maps. **3**

(e)

New Artificial Life Form Produced!

Recently, knowledge of gene cloning and gene cascades has been used to produce a whole artificial chromosome. This chromosome was inserted into a bacterium and resulted in surviving, reproducing bacteria.

Evaluate how our understanding of gene cloning and gene cascades has led to the development of new applications for technologies such as the one shown above. **7**

End of Question 33