**Genetics (answers)**

|  |  |
| --- | --- |
| Instructions to students  • You have 50 minutes to complete the test.  • Please answer all questions in the spaces provided.  • There is to be no talking during the test. | Marks  Section I: Multiple-choice questions: 10 marks  Section II: Short-answer questions: 34 marks  Section III: Extended-response questions: 6 marks  Total: 50 marks |

|  |  |
| --- | --- |
| Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Class: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Score: /50  Grade: % |
| Comments: | |

Section I: Multiple-choice questions

For each question, circle the correct answer.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 How many different phenotypes are there in the punnet square? | | | |  |  |  | | --- | --- | --- | | P2 | *N* | *n* | | *N* | *NN* | *Nn* | | *n* | *Nn* | *nn* | |
| A | 4 | |
| B | 3 | |
| C | 2 | |
| D | 1 | |
| 2 A sex-linked trait is one that: | | | |
| A | affects the sex organs of the female. | | |
| B | only affects females. | | |
| C | is caused by a gene carried on the X chromosome. | | |
| D | only affects males. | | |
| 3 Which nucleotide will bond to adenine in DNA? | | | |
| A | Cytosine | | |
| B | Guanine | | |
| C | Uracil | | |
| D | Thymine | | |
| 4 Select the option that will complete the complementary pairs in the above strand of DNA: | | | |
| L:\1. Publishing and Editorial\1. Product\Oxford Science\Oxford Science VICTORIA\Oxford Science 10 VIC\2. Extras\16. Class tests\Artwork\Final jpegs\CT0102_07059.jpg | | | |
| A | G C,  T A | | |
| B | G T,  A C | | |
| C | C T,  T C | | |
| D | A T,  C G | | |
| 5 In a cross between two homozygous dominant individuals, the chance of a heterozygous child is: | | | |
| A | 0%. | | |
| B | 50%. | | |
| C | 75%. | | |
| D | 100%. | | |
| 6 In the above pedigree, the trait shown by the affected individuals would be: | | L:\1. Publishing and Editorial\1. Product\Oxford Science\Oxford Science VICTORIA\Oxford Science 10 VIC\2. Extras\16. Class tests\Artwork\Final jpegs\CT0103_07059.jpg | |
| A | dominant. |
| B | recessive. |
| C | either recessive or dominant. |
| D | neither recessive or dominant. |
| 7 Plants that have been modified in the laboratory to enhance desired traits are known as: | | | |
| A | transgenic organisms. | | |
| B | genetically modified organisms. | | |
| C | embryonic stem cells. | | |
| D | adult stem cells. | | |
| 8 A female with blood group AB and a male with blood group O have a child. | | | |
| The genotypes and phenotypes of the ABO blood group are as follows:   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | Genotype | IAIA | IAi | IAIB | IBIB | IBi | ii | | Phenotype | A | A | AB | B | B | O |   The child is: | | | |
| A | most likely to have blood group A. | | |
| B | most likely to have blood group O. | | |
| C | most likely to have blood group B. | | |
| D | equally likely to have blood group B or blood group A. | | |

|  |  |
| --- | --- |
| 9 The type of cells that might be used in the future to treat diseases such as cancer and multiple sclerosis as well as spinal cord injuries, are: | |
| A | embryonic stem cells. |
| B | nerve cells. |
| C | sex cells. |
| D | adult stem cells. |
| 10 In rabbits, normal colour (C) is dominant to albino (c). A boy crossed a normal rabbit that has one albino gene with an albino rabbit. The offspring would be expected to be: | |
| A | all normal colour. |
| B | all albino. |
| C | 75% normal colour and 25% albino. |
| D | 50% normal colour and 50% albino. |

|  |  |
| --- | --- |
|  | Section I  total marks:  /10 marks |

Section II: Short-answer questions

|  |  |
| --- | --- |
| 11 Label the three parts of the nucleotide shown in the diagram below. | |
| L:\1. Publishing and Editorial\1. Product\Oxford Science\Oxford Science VICTORIA\Oxford Science 10 VIC\2. Extras\16. Class tests\Artwork\Final jpegs\CT0104_07059.jpg | |
| phosphate, deoxyribose sugar, base | |
|  | /3 marks |
| 12 Give three practical applications of genetic engineering. | |
| Any three applications, such as medicine, cleaning up pollution and agriculture | |
|  | /3 marks |
| 13 What are the two types of genetic mutation? What is the difference between them? | |
| Point mutations and frame shift mutations (2 marks). In point mutations, one base replaces another. Frame shift mutations are where one or more bases are deleted from the base sequence (2 marks). | |
|  | /4 marks |

|  |  |
| --- | --- |
| 14 Identify the complementary base pairs of DNA and name type of bond joins these bases together. | |
| Adenine and thymine (1 mark)  Guanine and cytosine (1 mark)  Hydrogen bonds (1 mark) | |
|  | /3 marks |
| 15 Write the complementary base sequence of: **A G C C G T A T A A**.  Is this a sequence of DNA or RNA? Justify your choice. | |
| T C G G C A T A T T (1 mark)  DNA (1 mark). Because there is thymine present rather than uracil (1 mark). | |
|  | /3 marks |
| 16 What two factors affect the phenotype of an organism? | |
| Its genotype (OR the genes it inherits) and its environment | |
|  | /2 marks |

|  |  |
| --- | --- |
| 17 ‘A dominant trait is one that is expressed by a greater percentage of the population and a recessive trait is one that is expressed by a very small percentage of the population.’  Is this statement true or false? Give reasons for your answer. | |
| False (1 mark). Explanation may include the correct definitions of dominant and recessive OR that the recessive trait may in some cases be carried by a greater percentage of the population (1 mark). | |
|  | /2 marks |
| 18 Describe the difference between a mutation and mutagen. | |
| A mutation is a change at the DNA level whereas a mutagen is a chemical or physical agent that has the potential to cause a mutation. | |
|  | /2 marks |
| 19 How can privacy be an issue with regards to genetic screening? | |
| Privacy could be an issue with regard to genetic screening because information about a person’s DNA could be misused. This information could lead to discrimination against people whose DNA indicates genetic health risks. They might have fewer employment opportunities and their health insurance costs could rise. | |
|  | /2 marks |

|  |  |
| --- | --- |
| 20 Identify the type of cell division shown in the diagram below. Give a reason for your choice. | |
| L:\1. Publishing and Editorial\1. Product\Oxford Science\Oxford Science VICTORIA\Oxford Science 10 VIC\2. Extras\16. Class tests\Artwork\Final jpegs\CT0105_07059-r.jpg | |
| Mitosis (1 mark). The daughter cell is identical to the parent cell OR the daughter cell has the full number of chromosomes OR another valid reason (1 mark). | |
|  | /2 marks |
| 21 Describe the difference between a mutation and mutagen. | |
| A mutation is a change at the DNA level whereas a mutagen is a chemical or physical agent that has the potential to cause a mutation. | |
|  | /2 marks |

|  |  |
| --- | --- |
| 22 Determine the pattern of inheritance shown in the pedigree diagram below. | |
| L:\1. Publishing and Editorial\1. Product\Oxford Science\Oxford Science VICTORIA\Oxford Science 10 VIC\2. Extras\16. Class tests\Artwork\Final jpegs\CT0106_07059-r.jpg | |
| X-linked (1 mark); recessive (1 mark) | |
|  | /2 marks |
| 23 Mendel discovered that in pea plants the green pea pod is dominant over the yellow pea pod. Use *G* to represent the allele for green pea pods and *g* to represent the allele for yellow pea pods.  • Write the genotype for a homozygous plant with yellow pea pods.  • Write the phenotype for a heterozygous plant.  • Draw and complete a Punnett square to represent the cross of two heterozygous plants. | |
| L:\1. Publishing and Editorial\1. Product\Oxford Science\Oxford Science VICTORIA\Oxford Science 10 VIC\2. Extras\16. Class tests\Artwork\Final jpegs\CT0107_07059.jpg | |
| 1 *gg*  2 Green pods | |
| 3   |  |  |  | | --- | --- | --- | |  | *G* | *g* | | *G* | *GG* | *Gg* | | *g* | *Gg* | *gg* | | |
|  | /4 marks | |
|  | Section II total marks:  /34 marks |

Section III: Extended-response questions

|  |  |
| --- | --- |
| 24 The karyotype below is of an individual that has a chromosomal mutation. Discuss how this type of chromosomal mutation occurs due to non-disjunction. In your answer:  • identify whether this individual is male or female  • identify the syndrome this individual has  • describe what non-disjunction is and how non-disjunction can lead syndromes, such as the one shown in the karyotype. | |
| L:\1. Publishing and Editorial\1. Product\Oxford Science\Oxford Science VICTORIA\Oxford Science 10 VIC\2. Extras\16. Class tests\Artwork\Final jpegs\CT0108_07059-rm.jpg | |
| This individual is a female as they have 2 X chromosomes (1 mark). They have three copies of chromosome 21 instead of two, so the individual has Down syndrome (1 mark).  Non-disjunction is when the chromosomes fail to separate during meiosis (1 mark). This leads to extra or less chromosomes present in daughter cells (1 mark),  Down syndrome is a result of non-disjunction of chromosome 21 during the formation of an egg or sperm (1 mark). Upon fertilisation, the zygote/individual has three copies of chromosome 21 rather than two (1 mark). | |
|  | /6 marks |
|  | Section III total marks:  /6 marks |