# Quiz – Chapter B1 You and your genes

## Instructions and answers for teachers

These instructions cover the learner activity section which can be found on [page 9](#_Topic_B1_Cell). This quiz supports OCR GCSE (9-1) Biology A (Twenty First Century Science), J257.

**When distributing the activity section to the learners either as a printed copy or as a Word file you will need to remove the teacher instructions section.**

**The Activity**

This quiz is a teaching and learning resource containing 10 multiple choice questions on the theme of You and your genes.

This resource can be used to test and consolidate understanding at the end of a topic or to revisit and refresh knowledge at a later point in the course.

**Learning Outcomes**

This lesson element relates to the specification learning outcomes of

B1.1 – What is the genome and what does it do?

B1.2 – How is genetic information inherited?

**Introduction**

Multiple choice questions allow rapid coverage of a wide range of sub-topics.

Contrary to a widespread belief among learners, multiple choice questions are not necessarily easy – they can be easy, moderate or difficult.

The questions are written so that the incorrect answers are plausible distractors based on common errors or misconceptions.

### Quiz – answers

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| **1** | | Which of the following statements about mutations are correct? **[1]**  V - Mutations occur when the sequence of bases in DNA are changed  W - Mutations always cause a change in phenotype  X - Mutations don't always have an effect on the protein made  Y - Mutations are not beneficial to organisms  Z - Only mutations in non-coding DNA affects how genes are expressed | |
|  | | **A** | V and W |
|  | |  | Incorrect answer. Often mutations (substitution ones in particular) don't change the order of amino acids in the polypeptide as some amino acids are coded for by more than one triplet or don't affect the functioning of the final protein (W) A common misconception. |
|  | | **B** | V, X and Z |
|  | |  | Incorrect answer. Mutations in coding DNA can affect the phenotype of an organism (Z) |
|  | | **C** | V and X |
|  | |  | Correct answer. Mutations are changes in DNA (V) and although they can cause changes in phenotype, they don't always (X) |
|  | | **D** | V, W and Y |
|  | |  | Incorrect answer. W is incorrect (as explained above) and there are a number of beneficial mutations e.g. peppered moth evolution (Y) - another common misconception  C |
|  | Your answer | | |

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| **2** | | A plant breeder crossed a yellow flower with a white flower.  **All** of the flowers that resulted from this cross had white flowers.  Which is the correct reason for this observation? **[1]** | |
|  | | **A** | Both parent plants are heterozygous and the white allele is dominant. |
|  | |  | Incorrect answer. Students often confuse the terms homozygous and heterozygous. |
|  | | **B** | Both parent plants are homozygous and the white allele is dominant. |
|  | |  | Correct answer. The white allele must be dominant to 'mask' the yellow allele in the offspring and the white parent must have two white alleles otherwise 50% of the offspring would be yellow. |
|  | | **C** | The yellow parent plant is a carrier of the white allele |
|  | |  | Incorrect answer. The term ‘carrier’ in this situation would infer that the white allele is recessive. |
|  | | **D** | The white parent plant is heterozygous, the yellow parent plant is homozygous and the yellow allele is recessive. |
|  | |  | Incorrect answer. The white parent plant must be homozygous for ALL offspring to be white.  B |
|  | Your answer | | |
| **3** | | Cystic fibrosis is a genetic disease caused by a recessive allele.  A couple who are both carriers of the cystic fibrosis allele have a child who has the disease.  They would like to have another child.  What is would be the probability that their second child also has cystic fibrosis? **[1]** | | |
|  | | **A** | No chance. | |
|  | |  | Incorrect answer. Some students believe that results of punnett squares are fixed and not probabilities, so if it is a 1 in four chance of inheriting the disease and the first child has the disease, the next three won't inherit the disease. | |
|  | | **B** | 1 in 4 chance | |
|  | |  | Correct answer. 1 in 4 chance both parents pass on their recessive allele. | |
|  | | **C** | 1 in 2 chance | |
|  | |  | Incorrect answer. This would only result when one parent is a carrier and the other has the disease. | |
|  | | **D** | 100% certain | |
|  | |  | Incorrect answer. This would only occur if both parents have the disease.  B | |
|  | Your answer | | | |
| **4** | | Genes code for proteins.  mRNA is a copy of a gene made in the nucleus of the cell.  This then moves into the cytoplasm where protein synthesis occurs in a ribosome.  Which of the following statements are correct? **[1]**  W - amino acids are joined together to make a polypeptide which is released from the ribosome.  X - amino acids are joined together and folded to make a functioning protein which is then released from the ribosome.  Y - polypeptides are not modified into functioning proteins on ribosomes.  Z - Proteins synthesised on ribosomes are made up of long chains of bases in a specific order, coded for by the DNA in the cell nucleus. | |
|  | | **A** | X only |
|  | |  | Incorrect answer. Many students believe that a folded protein is released from a ribosome and no further modification occurs. |
|  | | **B** | X and Z |
|  | |  | Incorrect answer. Many students will confuse the chain of bases forming the mRNA with the chain of amino acids making up the polypeptide (Z). |
|  | | **C** | W, Y and Z |
|  | |  | Incorrect answer. Z is incorrect (as explained above). |
|  | | **D** | W and Y |
|  | |  | Correct answer. A polypeptide is released from the ribosome (W) and is then modified if necessary in the rough endoplasmic reticulum (Y). |
|  | Your answer  D | | |

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| **5** | | Which of the following statements correctly describes the DNA in a prokaryotic cell such as bacteria? **[1]** | |
|  | | **A** | DNA is **not** contained within a nucleus. |
|  | |  | Correct answer. It is free-floating in the cytoplasm. |
|  | | **B** | DNA **is** contained within a nucleus. |
|  | |  | Incorrect answer. Prokaryotes do not have nuclei. |
|  | | **C** | DNA is only present in the form of a plasmid. |
|  | |  | Incorrect answer. Students may recognise the term 'plasmid' and assume this is the correct answer. Plasmids however are **additional** DNA to the free-floating circular DNA present. |
|  | | **D** | All prokaryotic cells contain plasmids. |
|  | |  | Incorrect answer. Some prokaryotes have only circular DNA with no plasmids present.  A |
|  | Your answer | | |
| **6** | | A fertilized egg cell has 23 pairs of chromosomes.  One of the pairs are called the sex chromosomes.  In an individual sperm cell what sex chromosome(s) would be found? **[1]** | |
|  | | **A** | Either one X chromosome only **or** one Y chromosome only. |
|  | |  | Correct answer. Females only pass on one X chromosome and males pass on either one X or one Y chromosome in their gametes. |
|  | | **B** | An X **and** a Y chromosome. |
|  | |  | Incorrect answer. Some students will understand that males are XY but have not realised that gametes only carry one of these sex chromosomes. |
|  | | **C** | Two X chromosomes. |
|  | |  | Incorrect answer. Some students confuse male and female sex chromosomes. |
|  | | **D** | One Y chromosome only |
|  | |  | Incorrect answer. Some students may believe that the mother always passes on the X chromosome and fathers always pass on the Y chromosome .  A |
|  | Your answer | | |

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| **7** | Many scientists have been involved in discovering how characteristics are inherited.  Which scientist(s) discovered that hereditary units pass from both parents to their offspring and are dominant or recessive? **[1]**  **Put a ring around the correct answer.** | | |
|  |  | Rosalind Franklin | |
|  |  | Incorrect answer. She imaged DNA crystals using x-rays. | |
|  |  | Watson and Crick | |
|  |  | Incorrect answer. Described DNA as a double helix held together by complementary base pairs. | |
|  |  | Gregor Mendel | |
|  |  | Correct answer. | |
|  |  | Erwin Chargaff | |
|  |  | Incorrect answer. He discovered that DNA contained equal quantities of adenine and thymine and equal quantities of cytosine and guanine. | |
|  |  | All scientists were involved in making discoveries about inheritance and students will have come across most if not all of them so should understand Gregor Mendel and his pea experiments discovered 'hereditary units' (genes). | |
| **8** | Genetic testing of fetuses for genetic diseases such as cystic fibrosis can help parents make decisions about whether to carry on with a pregnancy or not.  People have many different opinions about genetic testing.  Which of the following people is making an ethical statement? **[1]**    **Put a ring around the correct answer.** | |
|  |  | Daniel |
|  |  | Incorrect answer. Is stating a risk of the genetic test. |
|  |  | Andrea |
|  |  | Incorrect answer. Is stating a risk of the genetic test. |
|  |  | Julia |
|  |  | Correct answer. Julia is making an ethical statement about the moral rights/wrongs about genetic testing. |
|  |  | Nicholas |
|  |  | Incorrect answer. Is stating that treatment of cystic fibrosis is improving. |

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| **9** | Match the following key words on the left with the correct definition on the right. **[1]**   |  |  |  | | --- | --- | --- | | **Gene** |  | **Long molecules of DNA** | |  |  |  | | **Genotype** |  | **Sections of DNA that code for a protein** | |  |  |  | | **Chromosome** |  | **The entire genetic material of an organism** | |  |  |  | | **Genome** |  | **The combination of alleles an organism has for each gene** | | |
|  |  | Explanation of correct or incorrect matching: |
|  |  | Some students will confuse the lengths of DNA in chromosomes and genes. |
|  |  | Some students will confuse genotype with genome. |

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| **10** | Some diabetics can be treated by injecting insulin.  Human insulin can be made by the process of genetic engineering using bacteria as hosts.  Match the key words on the left with the correct function in genetic engineering. **[1]**   |  |  |  | | --- | --- | --- | | **Vector** |  | **Joins pieces of DNA together** | |  |  |  | | **Restricted enzyme** |  | **Transfers ‘foreign’ DNA into an organism** | |  |  |  | | **DNA ligase** |  | **Cuts DNA open** | |  |  |  | | **gene/resistance marker** |  | **Identifies host cells containing the desired gene from those that have not incorporated the desired gene** | | | |
|  |  | Explanation of correct or incorrect matching: |
|  |  | Students will often confuse DNA ligase and restriction enzymes. |
|  |  | With a number of key terms, students may sometimes confuse the roles of the different terms used in genetic engineering. |
|  |  | Gene/resistance markers are often genes that give resistance to certain antibiotics or genes that code for fluorescence to identify genetically engineered cells. |

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## Learner Activity

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|  | | **A** | V and W |
|  | | **B** | V, X and Z |
|  | | **C** | V and X |
|  | | **D** | V, W and Y |
|  | Your answer | | |
| **2** | | A plant breeder crossed a yellow flower with a white flower.  **All** of the flowers that resulted from this cross had white flowers.  Which is the correct reason for this observation? **[1]** | | |
|  | | **A** | Both parent plants are heterozygous and the white allele is dominant. | |
|  | | **B** | Both parent plants are homozygous and the white allele is dominant. | |
|  | | **C** | The yellow parent plant is a carrier of the white allele | |
|  | | **D** | The white parent plant is heterozygous, the yellow parent plant is homozygous and the yellow allele is recessive. | |
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| **3** | | Cystic fibrosis is a genetic disease caused by a recessive allele.  A couple who are both carriers of the cystic fibrosis allele have a child who has the disease.  They would like to have another child.  What is would be the probability that their second child also has cystic fibrosis? **[1]** | | |
|  | | **A** | No chance. | |
|  | | **B** | 1 in 4 chance | |
|  | | **C** | 1 in 2 chance | |
|  | | **D** | 100% certain | |
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| **4** | | Genes code for proteins.  mRNA is a copy of a gene made in the nucleus of the cell.  This then moves into the cytoplasm where protein synthesis occurs in a ribosome.  Which of the following statements are correct? **[1]**  W - amino acids are joined together to make a polypeptide which is released from the ribosome.  X - amino acids are joined together and folded to make a functioning protein which is then released from the ribosome.  Y - polypeptides are not modified into functioning proteins on ribosomes.  Z - Proteins synthesised on ribosomes are made up of long chains of bases in a specific order, coded for by the DNA in the cell nucleus. | |
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