AQA – Genetics, populations, evolutions and ecosystems – A2 Biology

1. June/2020/Paper_2/No.6

0 6 . 1 Mutation is one cause of genetic variation in organisms.

Give **two** other causes of genetic variation.

[2 marks]

1 _____

_____

2 _____

_____

In a species of flowering plant, the **T** allele for tallness is dominant to the **t** allele for dwarfness. In the same species, two alleles $\mathbf{C^R}$ (red) and $\mathbf{C^W}$ (white) code for the colour of flowers. When homozygous red-flowered plants were crossed with homozygous white-flowered plants, all the offspring had pink flowers.

0 6 . 2 Name the relationship between the two alleles that code for flower colour.

[1 mark]

_____

0 6 . 3 A dwarf, pink-flowered plant was crossed with a heterozygous tall, white-flowered plant.

Complete the genetic diagram to show all the possible genotypes and the ratio of phenotypes expected in the offspring of this cross.

[3 marks]

Phenotypes of parents: Dwarf, pink-flowered × Tall, white-flowered

Genotypes of parents: _____ _____

Genotypes of offspring: _____

Phenotypes of offspring: _____

_____ _____

Ratio of phenotypes: _____

0 6 . 4 A population of this species of plant contained 9% of red-flowered plants.

Use the Hardy–Weinberg equation to calculate the percentage of pink-flowered plants in this population.

Show your working.

[2 marks]

Answer _____ %

2. June/2019/Paper_2/No.2

0 2 Sickle cell disease (SCD) is a group of inherited disorders. People with SCD have sickle-shaped red blood cells. A single base substitution mutation can cause one type of SCD. This mutation causes a change in the structure of the beta polypeptide chains in haemoglobin.

0 2 . 1 Explain how a single base substitution causes a change in the structure of this polypeptide.

Do **not** include details of transcription and translation in your answer.

[3 marks]

Haematopoietic stem cell transplantation (HSCT) is a long-term treatment for SCD. In HSCT, the patient receives stem cells from the bone marrow of a person who does not have SCD. The donor is often the patient's brother or sister. Before the treatment starts, the patient's faulty bone marrow cells have to be destroyed.

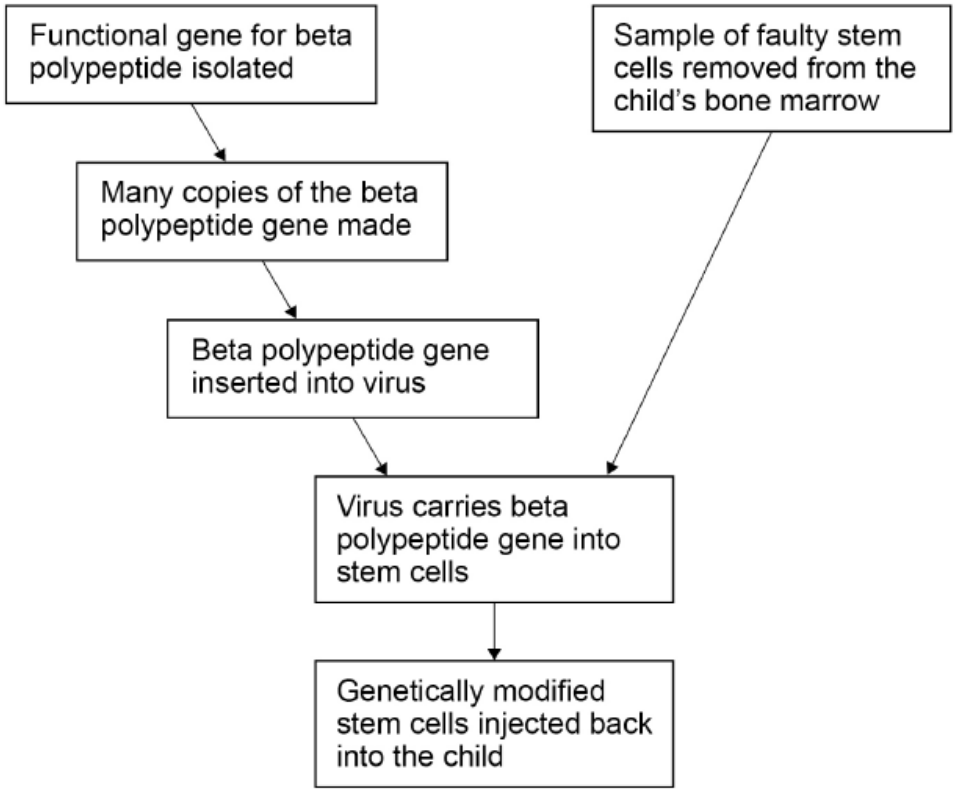
0 2 . 2 Use this information to explain how HSCT is an effective long-term treatment for SCD.

[3 marks]

A new long-term treatment for SCD involves the use of gene therapy.

Figure 2 shows some of the stages involved in this treatment in a child with SCD.

Figure 2



0 2 . 3 Some scientists have concluded that this method of gene therapy will be a more effective long-term treatment for SCD than HSCT. Use all the information provided to evaluate this conclusion.

[3 marks]

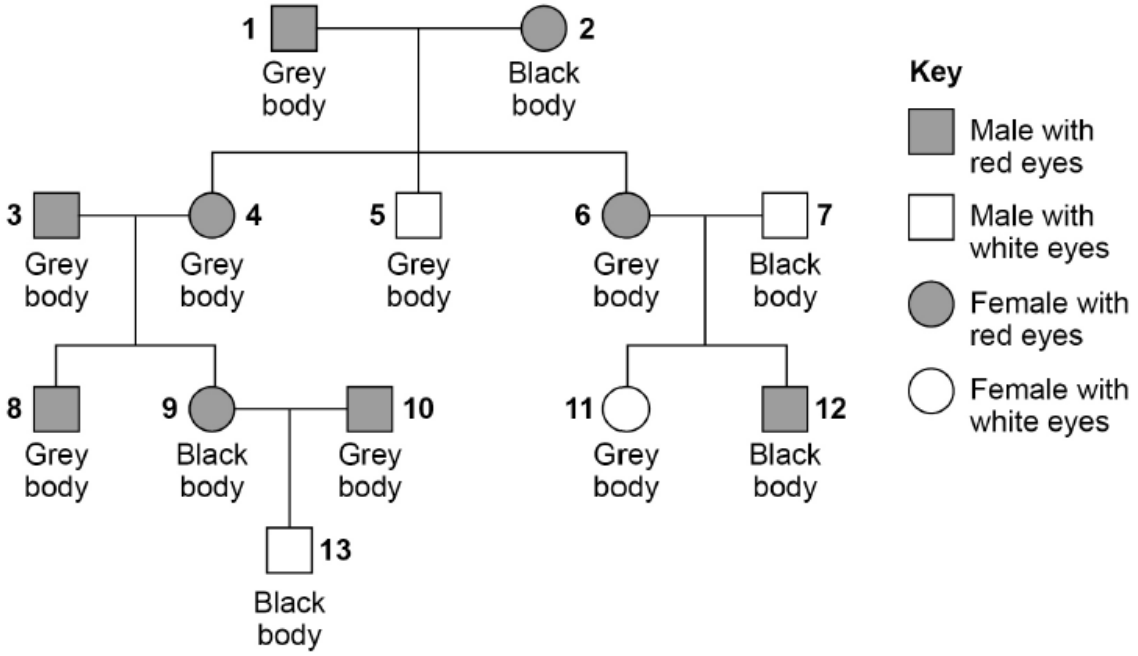
3. June/2019/Paper_2/No.6

0 6 In fruit flies, a gene for body colour has a dominant allele for grey body, **G**, and a recessive allele for black body, **g**.

A gene for eye colour has a dominant allele for red eyes, **R**, and a recessive allele for white eyes, **r**, and is located on the **X chromosome**.

Figure 4 shows the phenotypes of fruit flies over four generations.

Figure 4



0 6 . 1 Give the full genotype of the fly numbered **6** in **Figure 4**.

[1 mark]

Genotype = _____

0 6 . 2 Give **one** piece of evidence from **Figure 4** to show that the allele for grey body colour is dominant.

[1 mark]

_____

_____

_____

_____

0 6 . 3 Explain one piece of evidence from **Figure 4** to show that the gene for body colour is **not** on the **X chromosome**.

[2 marks]

0 6 . 4 A heterozygous grey-bodied, white-eyed female fly was crossed with a black-bodied, red-eyed male fly.

Complete the genetic diagram below to show all the possible genotypes and the ratio of phenotypes expected in the offspring from this cross.

[3 marks]

Phenotypes of parents: Grey-bodied, white-eyed female × Black-bodied, red-eyed male

Genotypes of parents: _____ × _____

Genotypes of offspring _____

Phenotypes of offspring _____

Ratio of phenotypes _____

0 6 . 5 A population of fruit flies contained 64% grey-bodied flies. Use the Hardy–Weinberg equation to calculate the percentage of flies heterozygous for gene **G**.

[2 marks]

Answer = _____ %

4. June/2019/Paper_2/No.9

0 9 The sundew is a small flowering plant, growing in wet habitats such as bogs and marshes. The soil in bogs and marshes is acidic and has very low concentrations of some nutrients. The sundew can trap and digest insects.

0 9 . 1 Describe how you could estimate the size of a population of sundews in a small marsh.

[5 marks]

0 9 . 2 Suggest and explain how digesting insects helps the sundew to grow in soil with very low concentrations of some nutrients.

[2 marks]