

AQA – Genetic information, variation and relationships between organisms – AS Biology P2

1. June/2021/Paper_2/No.3

0 3 . 1

In taxonomy, an organism is identified by referring to the species name and the genus name.

What term is used to describe this method of naming organisms?

[1 mark]

0 3 . 2

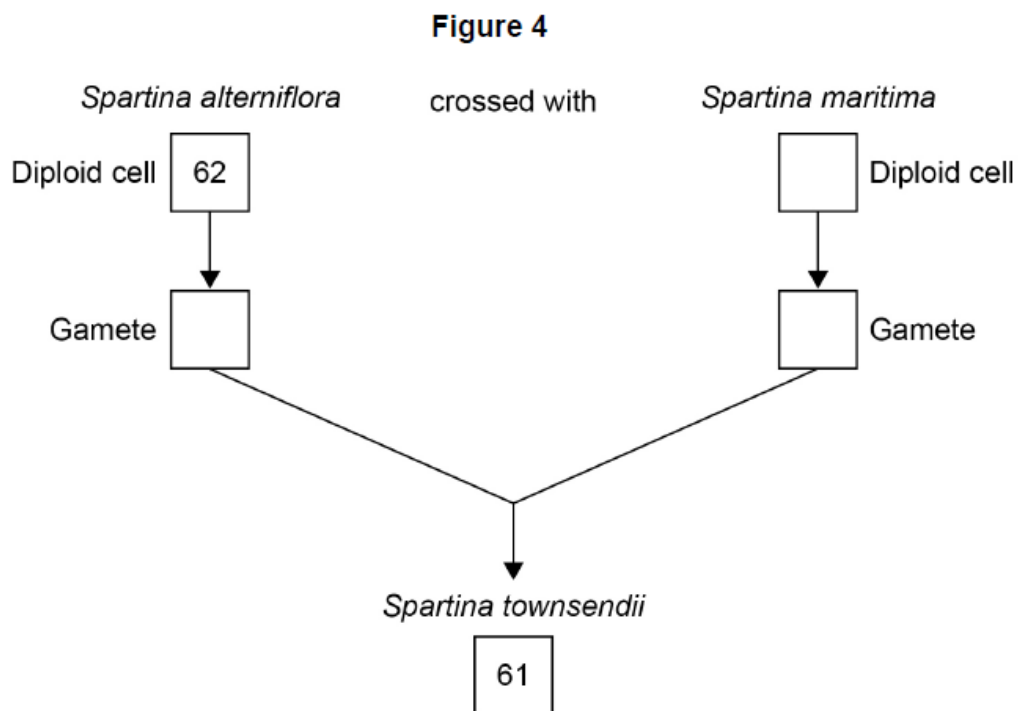
Define the term mutagenic agent.

[1 mark]

0 3 . 3

Figure 4 shows how the species *Spartina townsendii* is produced.

The number of chromosomes in cells is shown in some of the boxes.



Complete **Figure 4** by giving the correct number of chromosomes in each of the boxes.

[1 mark]

A mutation in the number of chromosomes in a *S. townsendii* cell produced a new species, *Spartina anglica*.

Figure 5 shows the number of chromosomes in leaf cells of these species.

Figure 5

S. townsendii

61

S. anglica

122

0 3 . 4

Name the type of mutation that changed the number of chromosomes in *S. townsendii* to produce *S. anglica*. Explain your answer.

[3 marks]

Name of mutation _____

Explanation _____

0 3 . 5

Genetic variation within a species is increased during meiosis by crossing over and the independent segregation of homologous chromosomes.

Apart from mutation, explain **one** other way genetic variation within a species is increased.

[2 marks]

2. June/2021/Paper_2/No.6

0 6

The fruit fly is a species of small insect.

The fruit fly has a gene that codes for an enzyme called alcohol dehydrogenase (AD). AD catalyses the breakdown of alcohol when alcohol is in the insects' food.

The gene coding for AD has two alleles, AD^F and AD^S .

0 6 . 1

The enzyme encoded by the AD^F allele catalyses the breakdown of alcohol **faster** than the enzyme encoded by the AD^S allele. Suggest why.

[3 marks]

A scientist took a random sample of adult fruit flies from a population. He measured the frequency of the AD^F allele in this sample (generation 0). He then:

- selected 100 of these insects at random and kept them in a container
- fed the insects food containing alcohol
- let the insects reproduce
- repeated these steps for 45 generations of fruit fly reproduction.

The scientist measured the frequency of the AD^F allele in the 45th generation.

0 6 . 2

Suggest why the scientist took his sample from the population at random.

[1 mark]

Table 2 shows the scientist's results.

Table 2

Generation of fruit fly reproduction	Frequency of AD ^F
0	0.20
45	0.74

0 6 3 Alcohol is toxic to fruit flies. Suggest and explain why the frequency of the AD^F allele changed during the 45 generations.

[4 marks]

0 6 4 Identify the type of selection investigated in the 45 generations of fruit fly reproduction. Tick (✓) **one** box.

[1 mark]

No selection

Directional selection

Random selection

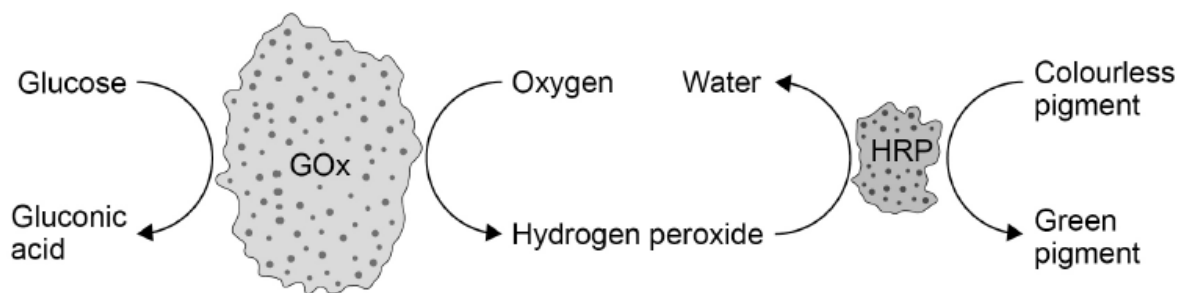
Stabilising selection

3. June/2021/Paper_2/No.8

0 8

A scientist investigated a sequence of reactions catalysed by **two** enzymes, GOx and HRP. **Figure 9** shows this sequence of reactions.

Figure 9



0 8 . 1

Use **Figure 9** to identify all of the products formed when this sequence of reactions is completed.

[1 mark]

0 8 . 2

The scientist joined DNA molecules together to make tiny cages. The cages are exactly 20 nm long, 20 nm wide and 17 nm deep.

He trapped **one** GOx molecule and **one** HRP molecule together in each cage. The GOx molecule and HRP molecule fill 9% of the cage volume.

The volume of a GOx molecule is eight times larger than an HRP molecule.

Use this information to calculate the volume of a GOx molecule. Give the appropriate unit with your answer.

Show your working.

[3 marks]

Answer _____

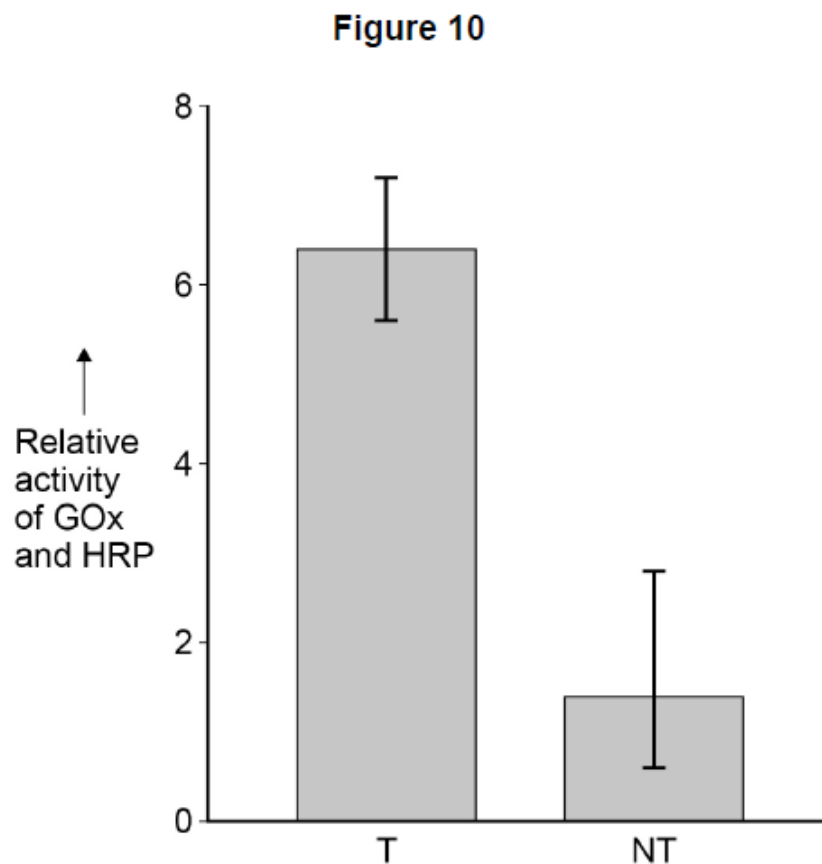
The scientist investigated the activity of GOx and HRP enzymes when they are:

- trapped inside cages (**T**) and
- not trapped (**NT**), but free in solution with **no** cages.

Figure 10 shows his results.

The error bars show ± 2 standard deviations.

± 2 standard deviations include 95% of the data.



0 8 . 3

What can you conclude from **Figure 10** about the effect of trapping GOx and HRP inside cages?

[3 marks]

0 8 . 4

The design of the scientist's investigation did **not** include a suitable control.

Suggest a suitable control.

[1 mark]
