

**AQA – Inheritance, variation and evolution – GCSE Biology Paper 2**

1. June/2021/Paper\_2F/No.1

0 1

The theory of evolution states that organisms alive today evolved by natural selection from other species that are now extinct.

0 1 . 1

Which **two** scientists proposed the theory of evolution by natural selection?

**[2 marks]**

Tick (✓) **two** boxes.

Alexander Fleming

Alfred Russel Wallace

Carl Linnaeus

Carl Woese

Charles Darwin

Fossils provide evidence for evolution.

**Figure 1** shows a fossil footprint of a dinosaur.

**Figure 1**

0 1 . 2

What is a fossil?

[2 marks]

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0 1 . 3

How was the fossil in **Figure 1** formed?

[1 mark]

Tick (✓) **one** box.

Body parts were replaced by minerals.

The animal walked on mud.

The animal was frozen in ice.

0 1 . 4

Dinosaurs are extinct.

Give **two** causes of extinction.

[2 marks]

1 \_\_\_\_\_

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2 \_\_\_\_\_

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0 1 . 5 Which **two** of the following provide evidence for evolution?

**[2 marks]**

Tick (✓) **two** boxes.

Bacteria can become resistant to an antibiotic.

Early forms of life lived in the ocean.

Older fossils are simpler than more recent ones.

Older layers of rock are closer to the surface.

## 2. June/2021/Paper\_2F/No.5

0 5

Potato blight is a disease of potato plants.

Potato blight is caused by the fungus *Phytophthora infestans*.

0 5 . 1

What is the genus of the fungus that causes potato blight?

[1 mark]

Tick (✓) **one** box.*infestans**Phytophthora**Phytophthora infestans*

0 5 . 2

The fungus grows near the surface of the potato.

How does growing near the surface help the fungus to respire?

[1 mark]

Tick (✓) **one** box.

The fungus can get nitrogen from the soil.

The fungus can get oxygen from the air.

The fungus can get water from the potato.

A farmer sprays his potato plants with a pesticide.

The pesticide kills the fungus that causes potato blight.

Spraying the crop with a pesticide could decrease biodiversity in a river flowing through his farm.

0 5 . 3 What does 'biodiversity in a river' mean?

[1 mark]

Tick (✓) **one** box.

The variety of species of animals in the river.

The variety of species of organisms in the river.

The variety of species of plants in the river.

0 5 . 4 The farmer sprayed pesticide on his potato plants. The next day it rained heavily.

Explain why the biodiversity in the river decreased.

[2 marks]

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Another method of preventing potato blight is to breed potatoes that are resistant to blight.

Resistance to potato blight is controlled by two alleles:

**R** = a dominant allele for having resistance to blight.

**r** = a recessive allele for **not** having resistance to blight.

A scientist crosses two potato plants. Each plant has the genotype **Rr**.

0 5 . 5 Complete **Figure 9** to show the possible genotypes of the offspring produced.

[2 marks]

**Figure 9**

		Male gametes	
		R	r
Female gametes	R	RR	
	r		

0 5 . 6 Draw a ring around **one** of the homozygous genotypes in **Figure 9**.

[1 mark]

0 5 . 7 What percentage of the offspring in **Figure 9** will be resistant to potato blight?

[1 mark]

Tick (✓) **one** box.

25%       50%       75%       100%

0 5 . 8 Potatoes can also reproduce asexually.

Potatoes from one plant can be planted in the ground to produce new potato plants.

**All** the new plants from a parent plant that is resistant to blight will also be resistant to blight.

Explain why.

[2 marks]

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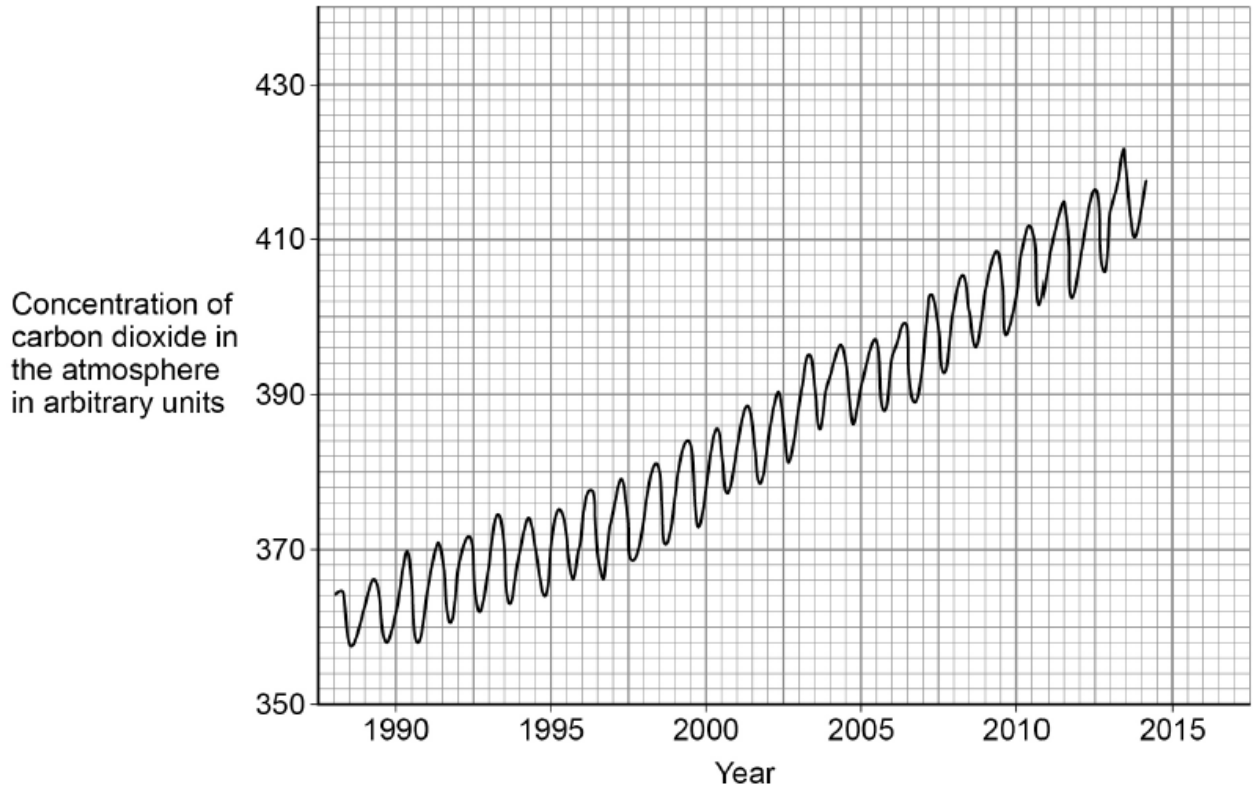
## 3. June/2021/Paper\_2F/No.7

07

Scientists are very concerned about the changes in concentration of carbon dioxide in the Earth's atmosphere.

**Figure 12** shows the concentration of carbon dioxide in the atmosphere between 1988 and 2014.

**Figure 12**



07.1

Describe **two** patterns shown in **Figure 12**.

Use data from **Figure 12** in your answer.

[4 marks]

1 \_\_\_\_\_

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2 \_\_\_\_\_

\_\_\_\_\_

0 7 . 2

Give **two** human activities that affect the concentration of carbon dioxide in the atmosphere.

[2 marks]

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

0 7 . 3

The trend shown in **Figure 12** may continue for many years.

Explain what effect the changing concentration of carbon dioxide in the atmosphere could have on living organisms.

[4 marks]

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## 4. June/2021/Paper\_2F/No.8

0 8

The nucleus of a cell contains DNA.

0 8

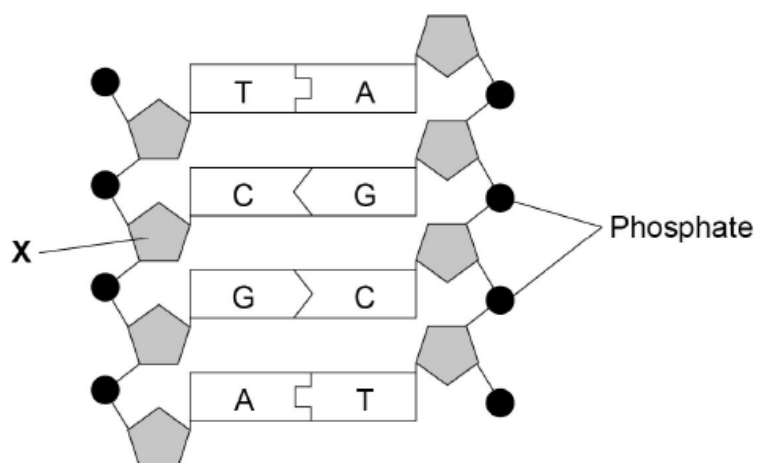
. 1

Name the structures inside the cell nucleus that contain DNA.

[1 mark]

Figure 13 shows part of a DNA molecule.

Figure 13



0 8

. 2

Name the part of the DNA molecule labelled X.

[1 mark]

0 8

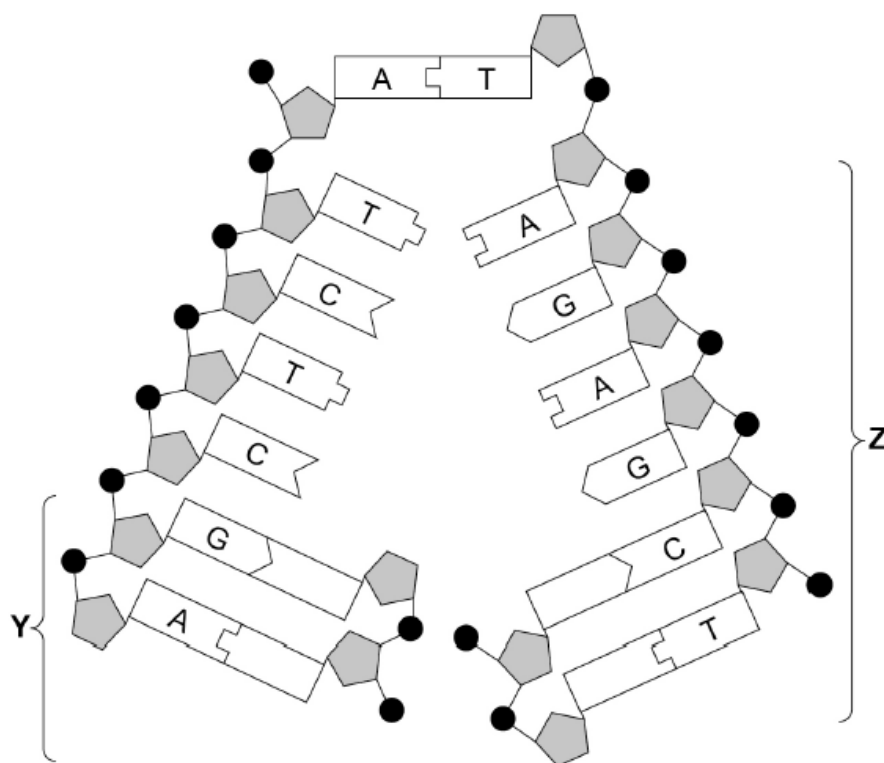
. 3

What type of substances are labelled A, C, G and T in Figure 13?

[1 mark]

Figure 14 shows another section of a DNA molecule.

Figure 14



08.4

Four of the substances you named in Question 08.3 are **not** labelled in part Y of Figure 14.

Label each of these substances with the correct letter, A, C, G or T.

Use information from other parts of Figure 14 to help you.

[1 mark]

08.5

What is happening to the DNA in part Z of Figure 14?

[1 mark]

Tick (✓) **one** box.

- Differentiation
- Evolution
- Fertilisation
- Replication

0 8 . 6 A gene is a length of DNA.

What type of substance does a gene code for?

[1 mark]

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0 8 . 7 Most human body cells contain  $6 \times 10^{-12}$  grams of DNA.

What mass of DNA will a human sperm cell contain?

[1 mark]

Tick (✓) **one** box.

$6 \times 10^{-6}$  grams

$6 \times 10^{-12}$  grams

$3 \times 10^{-6}$  grams

$3 \times 10^{-12}$  grams

0 8 . 8 What is the name of the type of cell division that produces sperm cells?

[1 mark]

Tick (✓) **one** box.

Binary fission

Differentiation

Meiosis

Mitosis

5. June/2021/Paper\_2H/No.1

0 1

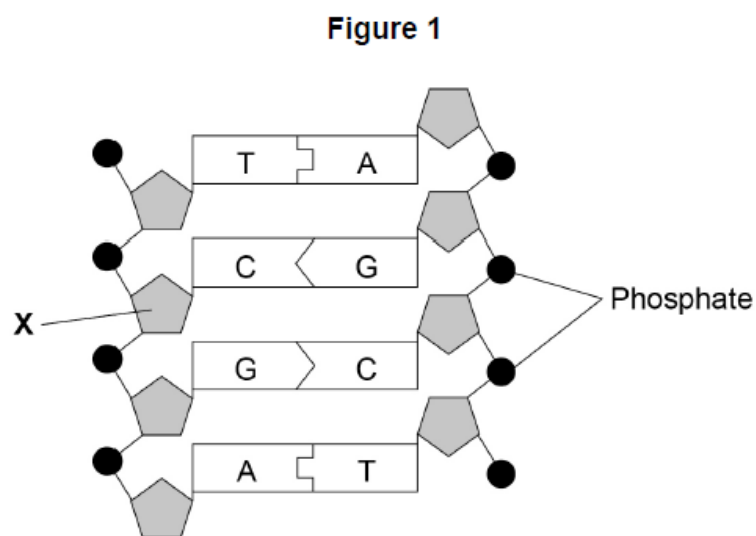
The nucleus of a cell contains DNA.

0 1 . 1

Name the structures inside the cell nucleus that contain DNA.

[1 mark]

Figure 1 shows part of a DNA molecule.



0 1 . 2

Name the part of the DNA molecule labelled X.

[1 mark]

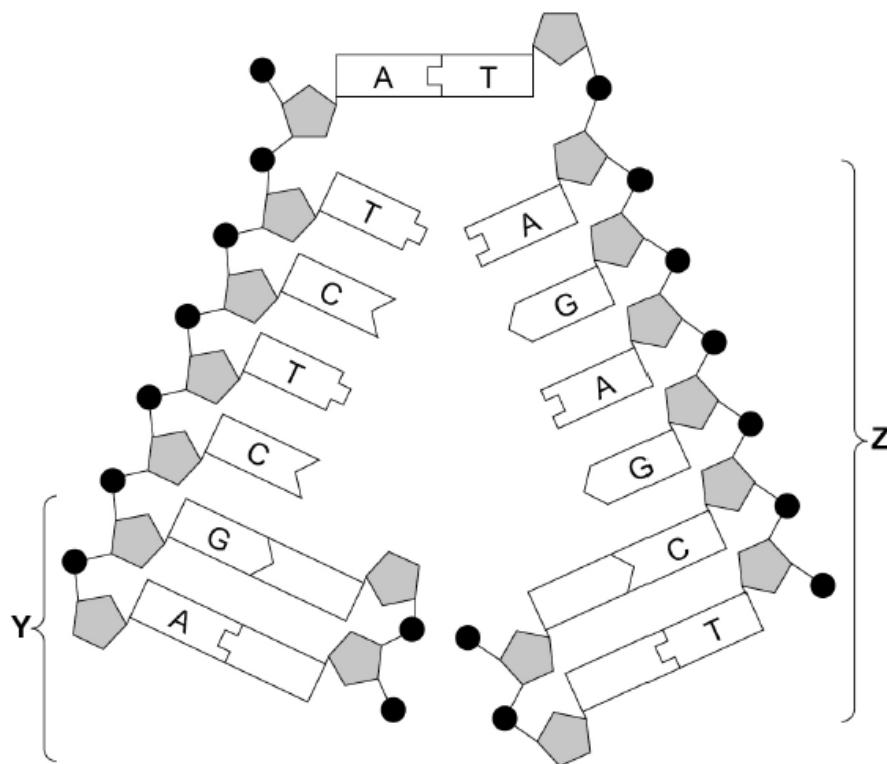
0 1 . 3

What type of substances are labelled A, C, G and T in Figure 1?

[1 mark]

Figure 2 shows another section of a DNA molecule.

Figure 2



0 1 . 4

Four of the substances you named in Question 01.3 are **not** labelled in part **Y** of **Figure 2**.

Label each of these substances with the correct letter, **A**, **C**, **G** or **T**.

Use information from other parts of **Figure 2** to help you.

[1 mark]

0 1 . 5

What is happening to the DNA in part **Z** of **Figure 2**?

[1 mark]

Tick (✓) **one** box.

- Differentiation
- Evolution
- Fertilisation
- Replication

0 1 . 6 A gene is a length of DNA.

What type of substance does a gene code for?

[1 mark]

---

0 1 . 7 Most human body cells contain  $6 \times 10^{-12}$  grams of DNA.

What mass of DNA will a human sperm cell contain?

[1 mark]

Tick (✓) **one** box.

$6 \times 10^{-6}$  grams

$6 \times 10^{-12}$  grams

$3 \times 10^{-6}$  grams

$3 \times 10^{-12}$  grams

0 1 . 8 What is the name of the type of cell division that produces sperm cells?

[1 mark]

Tick (✓) **one** box.

Binary fission

Differentiation

Meiosis

Mitosis

## 6. June/2021/Paper\_2H/No.8

0 8

Sickle cell anaemia is an inherited condition that affects red blood cells.

Sickle cell anaemia is caused by a mutation in the gene for haemoglobin. Haemoglobin is the red pigment found in red blood cells.

A person who is homozygous for the normal haemoglobin allele ( $H^A$ ) produces normal red blood cells.

A person who is homozygous for the mutated allele ( $H^S$ ):

- produces red blood cells with abnormal haemoglobin
- has red blood cells that can form an altered shape
- has sickle cell anaemia and becomes ill.

A person who is heterozygous:

- has both normal and abnormal haemoglobin in the red blood cells
- has sickle cell trait
- is generally healthy but can become ill in certain circumstances.

0 8 . 1

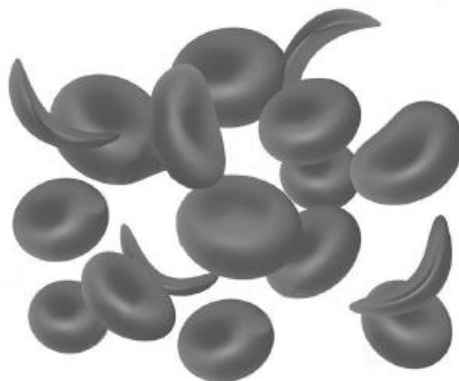
Give the reason why a mutation in the gene coding for haemoglobin could be harmful. **[1 mark]**

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0 8 . 2 **Figure 13** shows some red blood cells from the blood of a person with sickle cell trait.

**Figure 13**



Calculate the proportion of cells in **Figure 13** that have an altered shape.

**[2 marks]**

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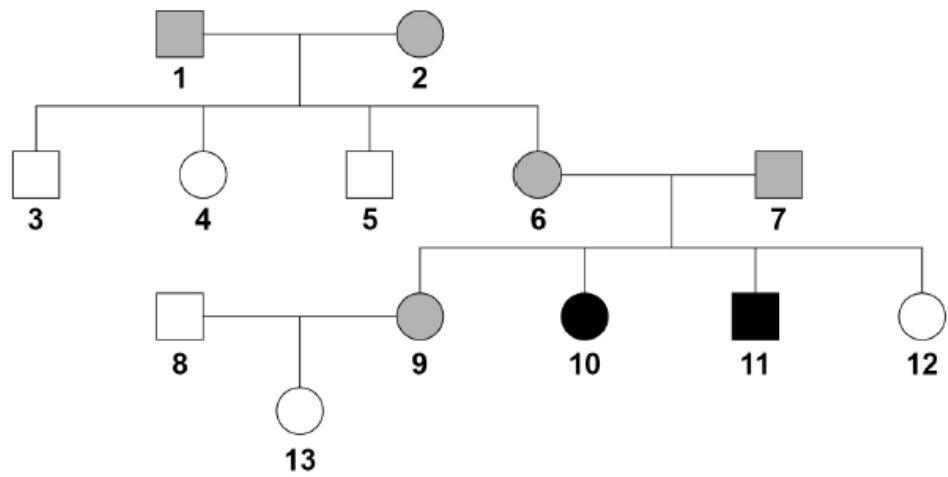
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Proportion = \_\_\_\_\_









Figure 14 shows the inheritance of sickle cell anaemia in one family.

Figure 14



**Key**

-  Unaffected male
-  Unaffected female
-  Male with sickle cell anaemia
-  Female with sickle cell anaemia
-  Male with sickle cell trait
-  Female with sickle cell trait

0 8 . 3 Persons 8 and 9 in Figure 14 are expecting a second child.

Determine the probability that the child will be a girl with sickle cell trait.

You should:

- draw a Punnett square diagram
- identify the phenotype of each offspring genotype
- use the symbols:  
 $H^A$  = normal haemoglobin allele  
 $H^S$  = mutated haemoglobin allele.

[5 marks]

0 8 . 4

Without medical treatment, people with sickle cell anaemia are frequently ill and have a reduced life expectancy.

The malarial parasite cannot live in the red blood cells of a person who has the  $H^S$  allele.

A scientist stated:

'It is an advantage for people to have the  $H^S$  allele in countries where malaria occurs.'

Evaluate the scientist's statement.

[3 marks]

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