

Understanding Genetics And Evolution

Question Paper 1

Level	GCSE (9-1)
Subject	Combined Science – Trilogy - Biology
Exam Board	AQA
Topic	4.6 Inheritance Variation and Evolution
Sub-Topic	Dev. Understanding Genetics + Evolution
Difficulty Level	Silver Level
Booklet	Question Paper 1

Time Allowed: 60 minutes

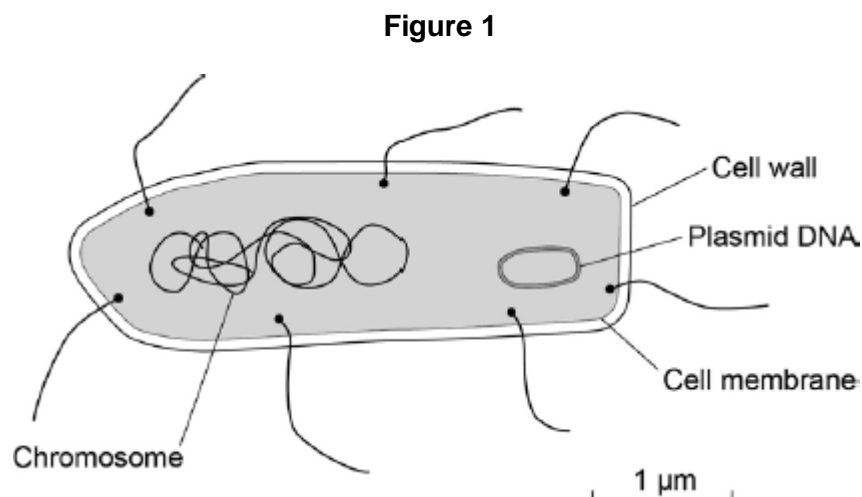
Score: / 60

Percentage: /100

Grade Boundaries:

Q1. Bacteria can cause disease.

Figure 1 shows some features of a *Salmonella* bacterium.



(a) Draw **one** line from each feature of the *Salmonella* bacterium to the function.

Feature	Function
Cell membrane	Controls the movement of substances into and out of the cell
Plasmid DNA	Carries genetic information
	Provides support and protection
	The site of protein synthesis

(2)

(b) How is *Salmonella* spread between people?

Tick **one** box.

Animal bites

☐

Contaminated food

☐

Sneezing

☐

Sexual contact

☐

(1)

- (c) Give **two** ways you could stop *Salmonella* from spreading.

1

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2

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(2)

- (d) Harmful bacteria can also be useful.

Scientists are doing research to find out if *Salmonella* can be used in a vaccine to treat cancer.

The *Salmonella* vaccine can be injected into the blood or swallowed in a tablet.

One benefit of injecting the vaccine is that it gets to the cancer quickly in the blood.

What is another benefit?

Tick **one** box.

All cancers can be treated by the injection

☐

It will not cause sickness and diarrhoea
side effects

☐

The injection is not painful to the patient

☐

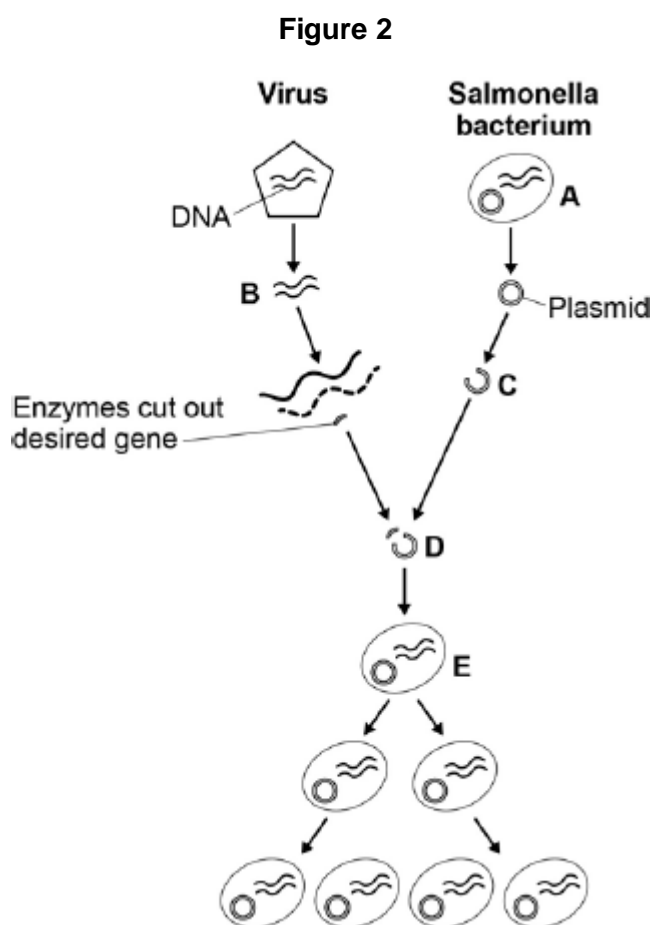
The injection introduces cancer cells into the body



(1)

- (e) The *Salmonella* bacterium used in the vaccine is genetically modified using part of a virus.

Look at **Figure 2**.



Complete the sentences.

Use the letters from **Figure 2**.

Bacteria reproduce quickly in part

DNA with the desired gene is removed from the virus in part

The chosen gene is inserted into the plasmid in part

(3)
(Total 9 marks)

Q2.(a) Which of the following is the **best** definition of a species?

Tick (✓) **one** box.

Organisms with many features in common

☐

Organisms that live in the same habitat and eat the same food

☐

Organisms that reproduce together to form fertile offspring

☐

(1)

(b) **Figure 1** is a photograph of the Grand Canyon.

The layers of rock contain fossils.

Figure 1



© Sumikophoto/iStock/Thinkstock

Scientists found five fossils of different species of animal, **P**, **Q**, **R**, **S** and **T**, at the positions shown in **Figure 1**.

(i) What is the evidence in **Figure 1** that animals **P** and **Q** were alive at the same time?

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(1)

- (ii) Was animal **R** alive at an earlier time or at a later time than animals **P** and **Q**?

Give the reason for your answer.

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(1)

- (iii) Which **two** of the following would be evidence that animal **T** may have evolved from animal **S**?

Tick (✓) **two** boxes.

The fossils of animals **S** and **T** have many features in common, but **T** is more complex than **S**.

☐

The fossils of animals **S** and **T** are the same size.

☐

The fossils of animals **S** and **T** have the same skin colour.

☐

The fossil of animal **S** was found in a deeper layer of rock than the fossil of animal **T**.

☐

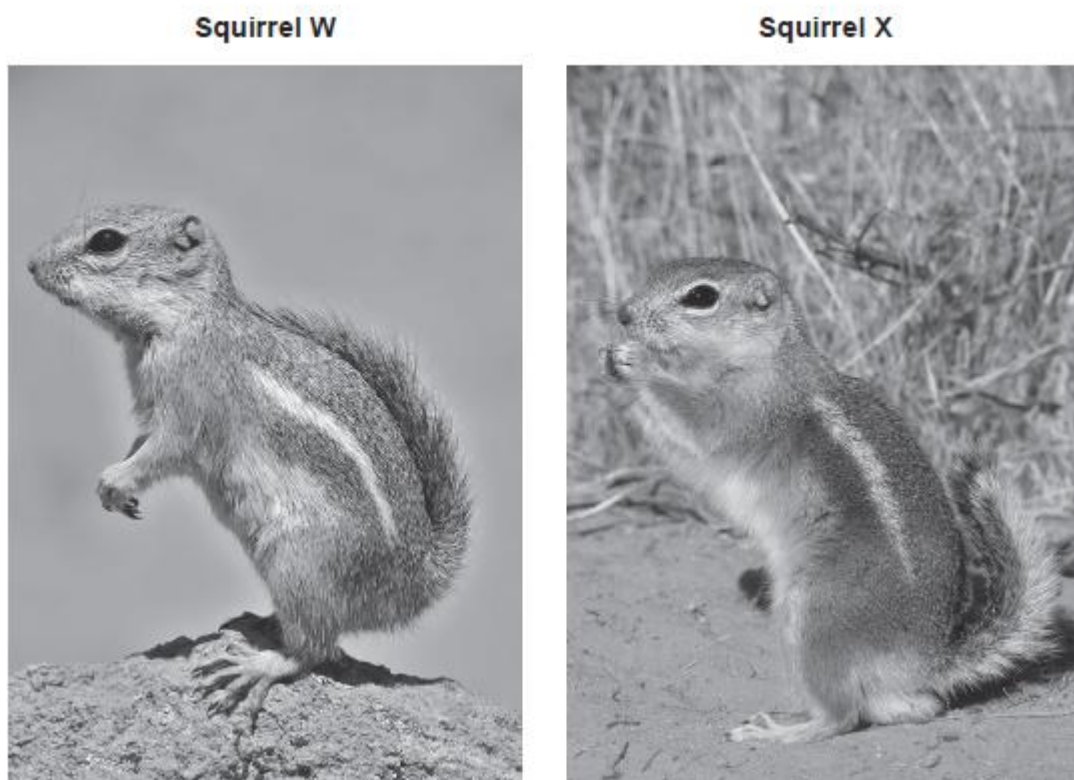
The fossil of animal **T** is more similar to the fossil of animal **R** than to the fossil of animal **S**.

☐

(2)

- (c) **Figure 2** shows two species of ground squirrel, **W** and **X**.

Figure 2



Squirrel **W** lives on the high ground to the south of the Grand Canyon.

Squirrel **X** lives on the high ground to the north of the Grand Canyon.

The land to the north of the Grand Canyon is about 300 metres higher than the land on the south side. The north side also has lower winter temperatures and has more rain and snow than the south side.

- (i) The two species of squirrel are very similar.

Describe **one** way, which you can see in **Figure 2**, in which squirrel **X** is different from squirrel **W**.

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(1)

- (ii) The Grand Canyon was formed about 6 million years ago.

Explain how the two different species of squirrel could have developed from a common ancestor.

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(6)

- (iii) Squirrels **W** and **X** are separate species, but they are still very similar.
Suggest why the two species have **not** become more different over time.

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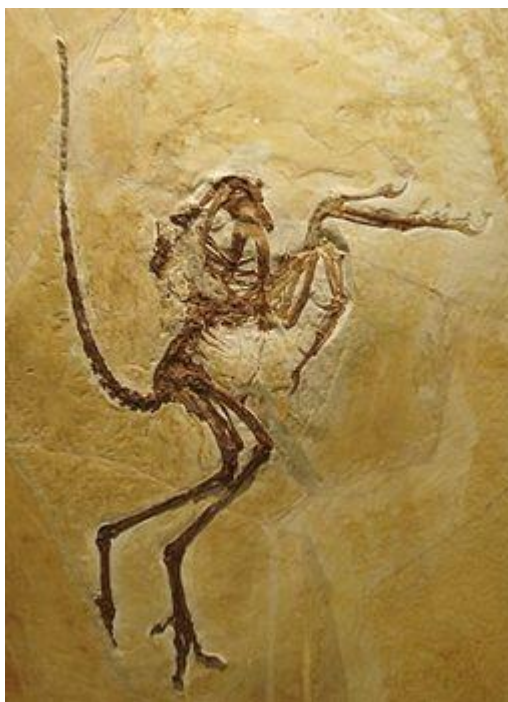
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(2)

(Total 14 marks)

Q3. The photograph shows a fossil of a prehistoric bird called *Archaeopteryx*.



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- (a) Describe **three** ways fossils can be made.

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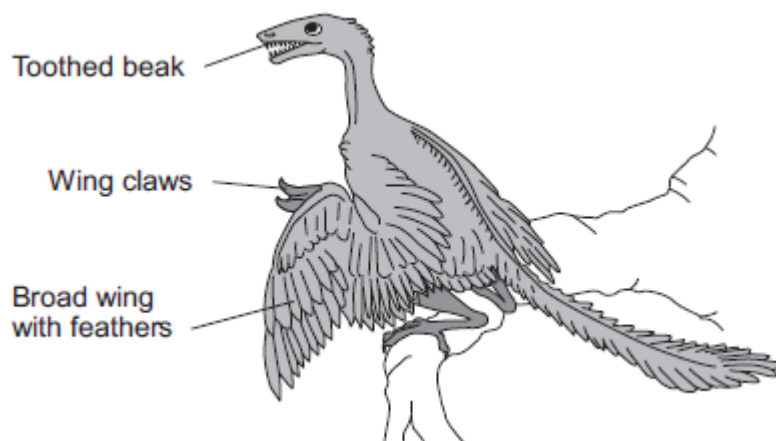
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(3)

- (b) The drawing shows what an *Archaeopteryx* might have looked like when it was alive.

Scientists think that *Archaeopteryx* was a predator.



- (i) Look at the drawing.

Write down **three** adaptations that might have helped *Archaeopteryx* to catch prey.

How would **each** adaptation have helped *Archaeopteryx* to catch prey?

Adaptation 1

How it helps

.....

Adaptation 2

How it helps

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Adaptation 3

How it helps

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(3)

- (ii) *Archaeopteryx* is now extinct.

Give **two** reasons why animals may become extinct.

1

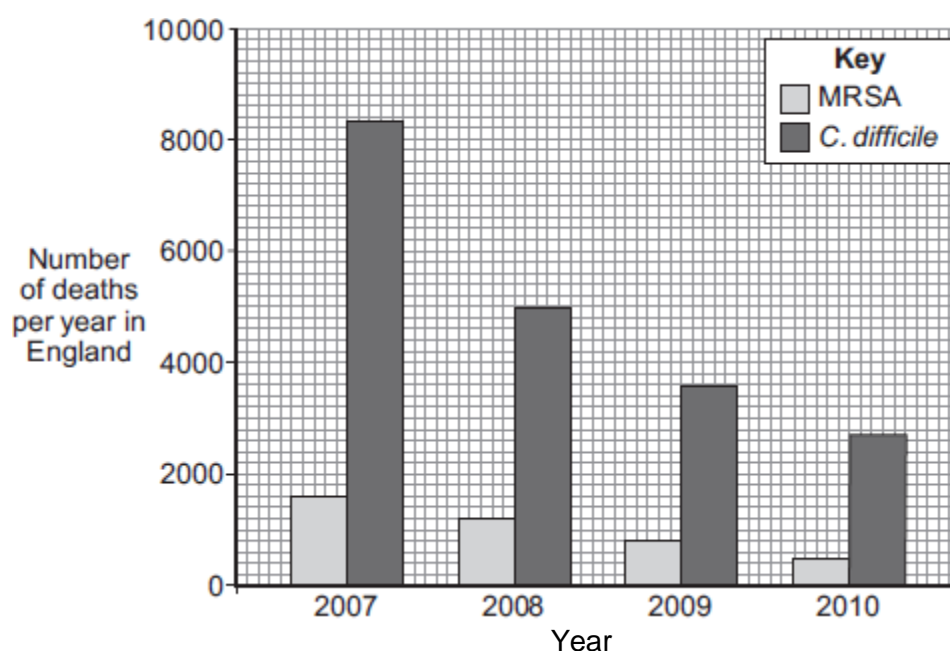
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2

(2)
(Total 8 marks)

Q4. Infections by antibiotic resistant bacteria cause many deaths.

The bar chart below shows information about the number of deaths per year in England from *Methicillin-resistant Staphylococcus aureus* (MRSA) and from *Clostridium difficile* (*C.difficile*) over 4 years.



- (a) (i) Describe the trend for deaths caused by *C.difficile*.

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(2)

- (ii) Suggest a reason for the trend you have described in part (a)(i).

Explain your answer.

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(2)

- (iii) Calculate the percentage change in deaths caused by MRSA from 2009 to 2010.

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Percentage change in deaths caused by MRSA = %

(2)

- (iv) Numbers have not yet been published for 2011.

When the numbers are published, scientists do **not** expect to see such a large percentage change from 2010 to 2011 as the one you have calculated for 2009 to 2010.

Suggest **one** reason why.

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(1)

- (b) Before 2007 there was a rapid increase in the number of deaths caused by MRSA.

Describe how the overuse of the antibiotic methicillin led to this increase.

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(3)
(Total 10 marks)

Q5. An animal called *Tiktaalik* became extinct about 360 million years ago.

The photograph shows the fossilised skeleton of *Tiktaalik* and a model of what scientists think *Tiktaalik* looked like.

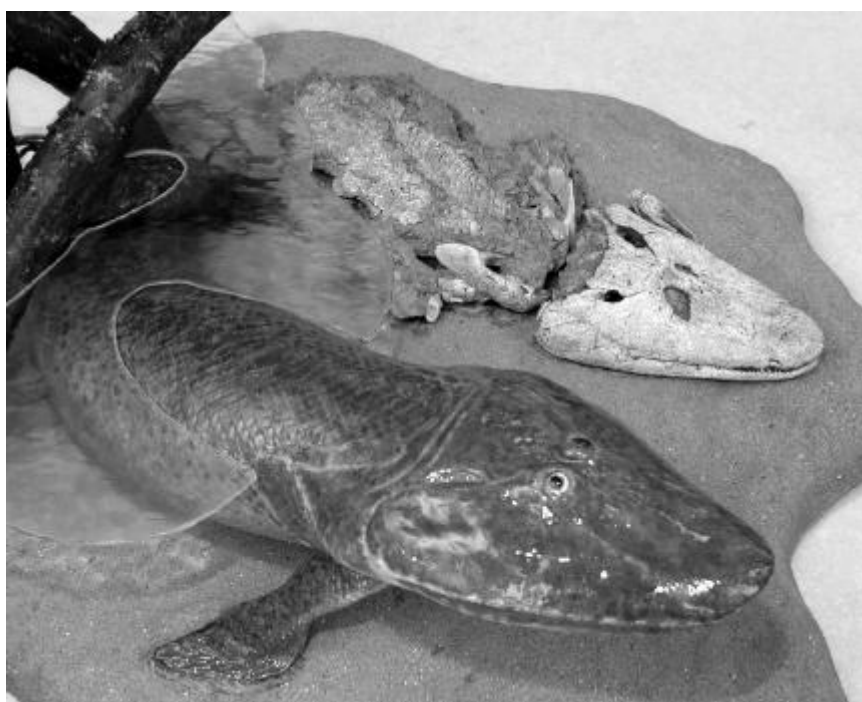


Image © University of Chicago, Shubin Lab. Model by Tyler Keillor

(a) Scientists found only the fossilised skeleton of *Tiktaalik*.

Explain why.

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(2)

(b) Scientists think that *Tiktaalik* lived mostly in water, but that it was one of the first animals to be able to move onto land.

Use evidence from the photograph to suggest why.

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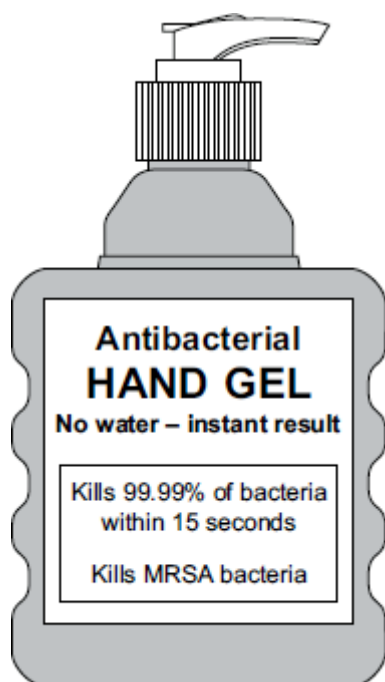
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(2)
(Total 4 marks)

Q6. MRSA strains of bacteria are causing problems in many hospitals.

(a) The diagram shows a hand-gel dispenser.



Hand-gel dispensers are now placed at the entrance of most hospital wards.

Explain why.

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(2)

- (b) Explain, as fully as you can, how MRSA strains of bacteria became difficult to treat.

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(3)

(Total 5 marks)

- Q7.** (a) (i) Some diseases can be tackled by using antibiotics and vaccination.
Explain fully why antibiotics cannot be used to cure viral diseases.

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(2)

- (ii) A recent study found that babies in 90 % of hospitals are infected with the MRSA bacterium.

Explain how the MRSA bacterium has developed resistance to antibiotics.

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(2)

- (b) A person can be immunised against a disease by injecting them with an inactive form of a pathogen.

Explain how this makes the person immune to the disease.

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(3)

(Total 7 marks)

Q8. Doctors give antibiotics to patients to kill bacteria in their bodies.

Explain how the overuse of antibiotics has led to the evolution of antibiotic-resistant bacteria.

*To gain full marks in this question you should write your ideas in good English.
Put them into a sensible order and use the correct scientific words.*

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(Total 3 marks)

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