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Student number

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Name _____

Date _____

Attempt/Time taken _____

GCSE BIOLOGY

Topic Paper: 6.2 Variation and evolution
Part 1

Time allowed: 50 minutes

Materials

For this paper you must have:

- the Periodic Table/Data Sheet, provided as an insert (enclosed)
- a ruler with millimetre measurements
- a calculator, which you are expected to use where appropriate.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- All working must be shown.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

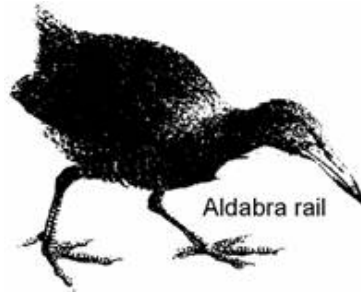
- The Periodic Table/Data Sheet is provided as in insert.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering questions you need to make sure that your answer:
 - is clear, logical, sensibly structured
 - fully meets the requirements of the question
 - shows that each separate point or step supports the overall answer.



46 Marks



Q1. Flightless birds called Rails once inhabited 20 islands in the Pacific Ocean. During the last two centuries they have disappeared from 15 of these islands. The Aldabra Rail, shown below, is one of the few survivors. The island which it lives on is very remote.



Suggest **three** reasons why Rails have disappeared from 15 of the 20 islands they once inhabited.

1.
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2.
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3.
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(Total 3 marks)

Questions continue on the next page



Q2. 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.

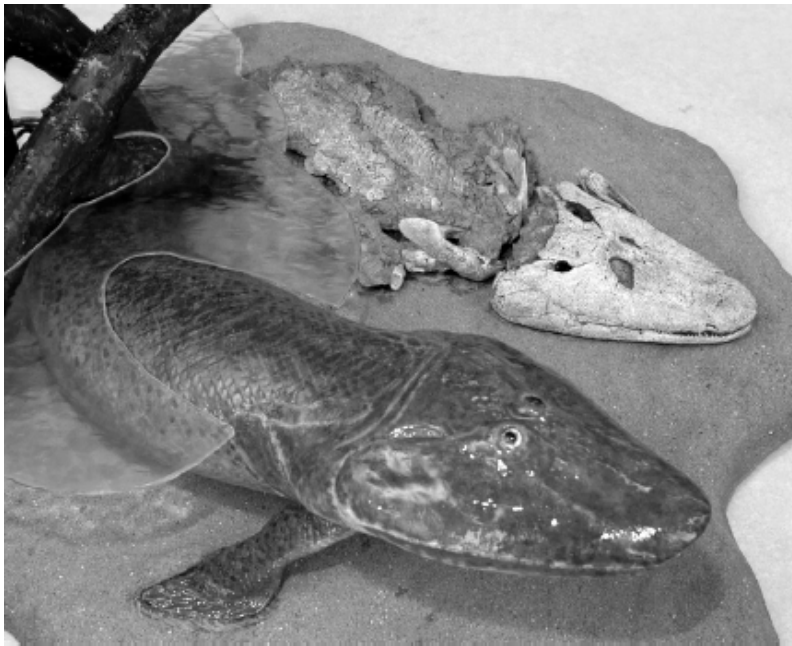


Image © University of Chicago, Shubin Lab. Model by Tyler Keillor

(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.

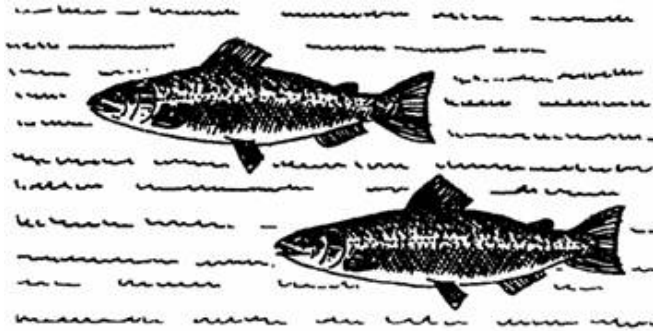
Use evidence from the photograph to suggest why.

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(2)
(Total 4 marks)



Q3. Wild salmon hatch from eggs laid in rivers. The small salmon then swim downstream to the sea. After 3-4 years they return to breed, usually in the same river in which they were hatched. If fish return to a different river they do not breed as successfully as those returning to the same one. This means that each river has its own breeding population of salmon. Each breeding population is slightly different from all the others.



Use the idea of natural selection to explain how each river has its own breeding population.

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(Total 4 marks)

Questions continue on the next page



Q4. The dodo is an extinct bird. The drawing shows an artist's impression of the bird.



The dodo lived on a small island in the middle of the Indian Ocean. Its ancestors were pigeon-like birds which flew to the island millions of years ago. There were no predators on the island. There was a lot of fruit on the ground. This fruit became the main diet of the birds. Gradually, the birds became much heavier, lost their ability to fly and evolved into the dodo.

(a) Suggest an explanation for the evolution of the pigeon-like ancestor into the flightless dodo.

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(4)



- (b) The dodo became extinct about 80 years after Dutch sailors first discovered the island in the eighteenth century.

Scientists are uncertain about the reasons for the dodo's extinction.

Suggest an explanation for this uncertainty.

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(1)
(Total 5 marks)

Q5. Read the extract.

Super-bug may hit the price of coffee

The coffee bean borer, a pest of the coffee crop, can be controlled by the pesticide endosulphan. However, strains of the insect that are up to 100 times more resistant to the pesticide have emerged on the South Pacific island of New Caledonia.

For full resistance to be passed on to an offspring two copies of the new resistance allele

- 5 should be inherited, one from each parent. There is much inbreeding with brother-sister matings happening in every generation, so it takes only a few generations before all the descendants of a single resistant female have inherited two copies of the resistance allele.

If this resistance spreads from New Caledonia, it will mean the loss of a major control

- 10 method. This will present a serious threat to the international coffee industry.

- (a) Suggest how the allele for resistance to endosulfan may have arisen.

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(1)

- (b) (i) How would you expect the proportion of normal coffee bean borers on New Caledonia to change over the next few years?

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(ii) Explain why this change will take place.

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(3)

(c) Explain why “it takes only a few generations before all the descendants of a single resistant female have inherited two copies of the resistance allele.” (lines 6-8)

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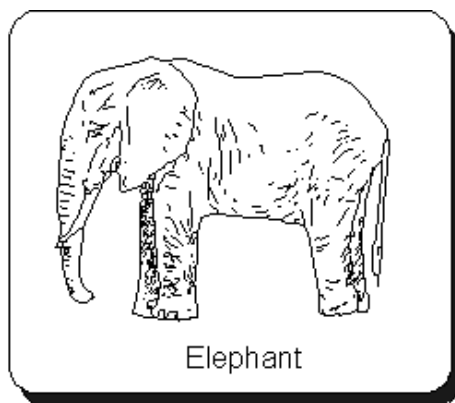
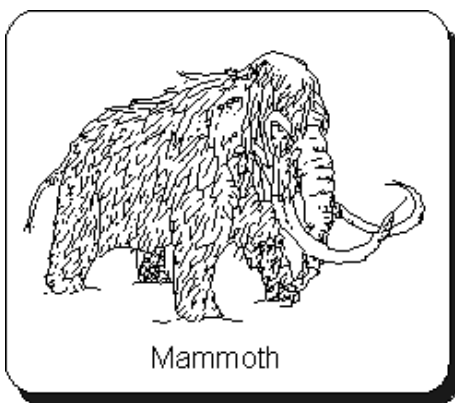
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(3)

(Total 7 marks)

Q6. The drawings below show a mammoth, an extinct relation of the elephant which lived in arctic regions, and a modern elephant which lives in tropical areas.





The mammoth, which was very hairy, and the elephant, are both thought to have evolved from a scantily haired ancestor. Explain, as fully as you can, how the **mammoth** evolved from the common ancestor.

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(Total 5 marks)

- Q7.** (a) Fossils provide evidence for what early life forms were like. From the evidence, scientists think that life began on Earth more than 3 billion years ago.

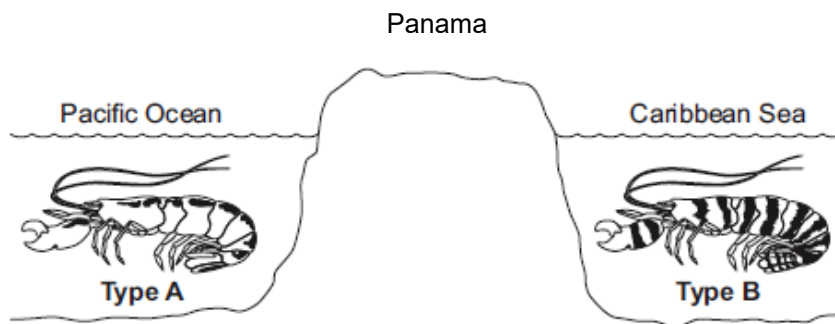
Many early life forms were soft-bodied.
Explain why this makes it difficult for scientists to be certain about what these early life forms were like.

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(2)

- (b) The illustration below shows two types of pistol shrimp.

The shrimps live in shallow, tropical seas on opposite sides of Panama.



Not to scale

Scientists put one **Type A** shrimp and one **Type B** shrimp together in a tank of seawater. The two types of shrimp snapped their claws aggressively at each other. They did not mate.

The scientists said that this was evidence for the **Type A** and **Type B** shrimps being classified as two different species.

