Topic Test: OxfordAQA International GCSE Combined Science 9204 Biology

Variation and evolution

Name: _____

Class: _____

Date: _____

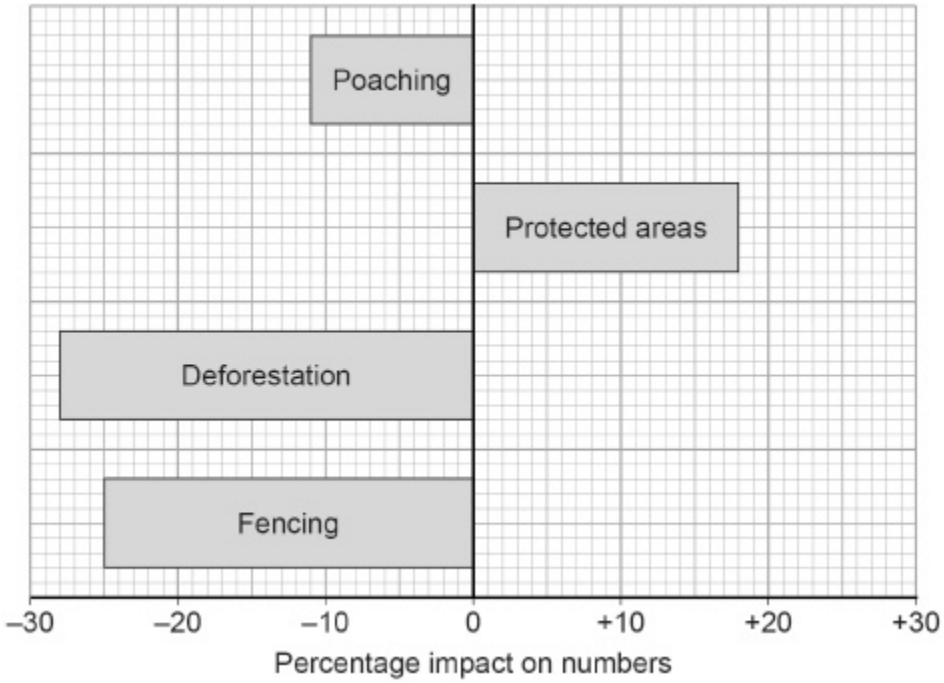
Time: **31 minutes**

Marks: **31 marks**

Comments:

1 **Figure 1** shows how different human activities affect the number of blue wildebeest in the wild.

Figure 1



(a) Describe the relative effects of human activities on blue wildebeest numbers.

(3)

(b) Over 1 million years ago the only wildebeest was the blue wildebeest.

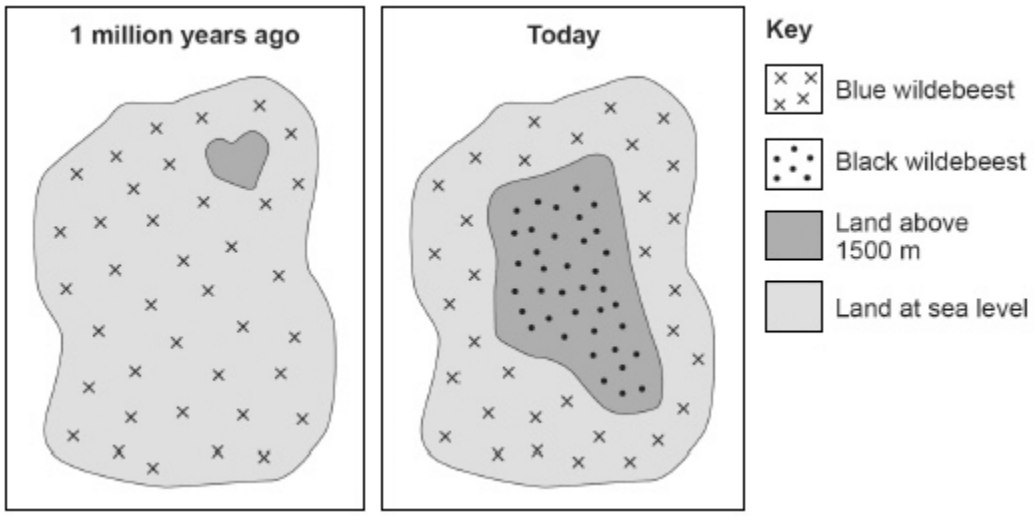
Over time the land where wildebeest lived changed. Some land rose high above sea level and is known as the Highveld.

The wildebeest must be on the same level as their partner to mate.

There are now two species: the original blue wildebeest and a newer species known as black wildebeest.

Figure 2 shows the distribution of wildebeest species 1 million years ago and today.

Figure 2



Explain how the development of the Highveld led to the formation of two separate species of wildebeest.

(5)

(Total 8 marks)

2 The Blue-moon butterfly lives on a small island called Samoa, in the Pacific Ocean.

By Emoke Dénes [CC-BY-SA-2.5], via Wikimedia Commons

In 2006 Blue-moon butterflies almost became extinct.

Wolbachia bacteria killed males before they could hatch from eggs. Only females were resistant to the bacteria.

In 2006 the number of male Blue-moon butterflies had decreased to only 1 per cent of the population. Two years later, the number of males was equal to the number of females.

(a) Scientists believe that a change in a gene suddenly occurred to make some males resistant to the bacteria.

What scientific term describes a change in a gene?

_____

(1)

(b) The numbers of male Blue-moon butterflies in the population increased quickly after the new form of the gene had appeared.

Suggest why.

_____

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(4)

(Total 5 marks)

3 Darwin suggested the theory of natural selection.

(a) Explain how natural selection occurs.

_____

_____

_____

_____

_____

_____

_____

(3)

(b) Latitude is a measure of distance from the Earth's equator.

Scientists investigated the effect of latitude on:

- the time taken for new species to evolve
- the number of living species.

The table shows the scientists' results.

Latitude in degrees North of equator	Time taken for new species to evolve in millions of years	Relative number of living species
0 (at the equator)	3–4	100
25	2	80
50	1	30
75 (in the Arctic)	0.5	20

As latitude increases environmental conditions become more severe.

(i) Describe the patterns shown by the data.

_____

_____

_____

_____

_____

_____

(2)

(ii) Suggest explanations for the patterns you have described in part (b)(i).

_____

_____

_____

_____

_____

_____

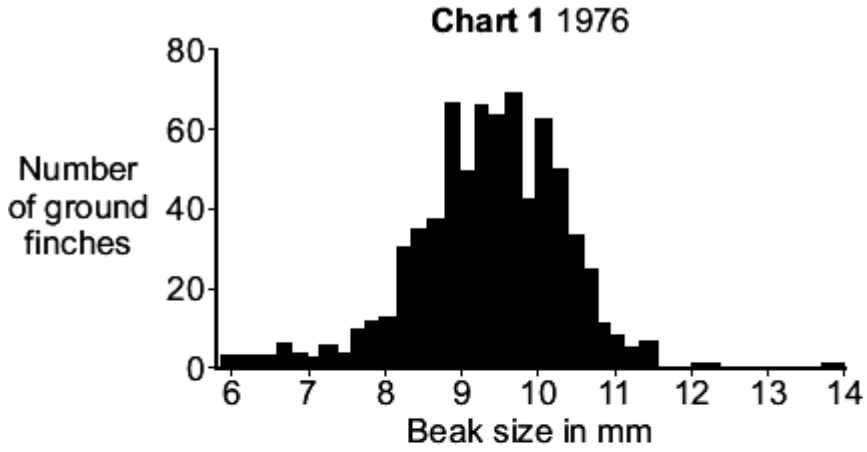
(2)

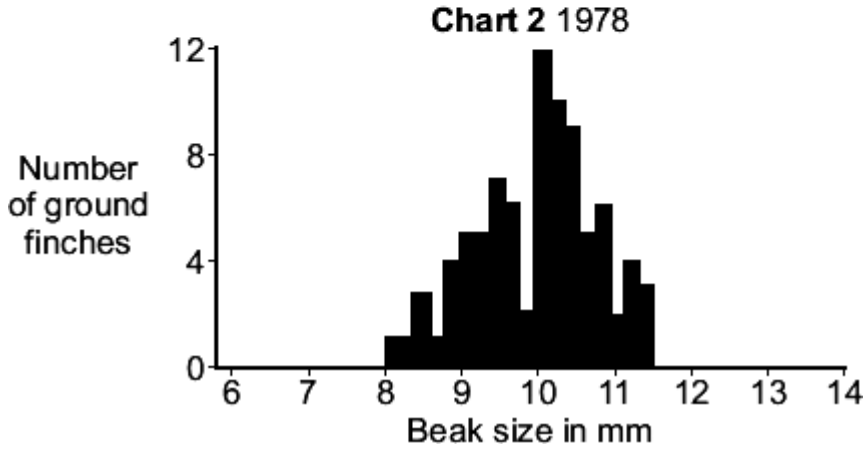
(Total 7 marks)

4 The Galapagos Islands are in the Pacific Ocean, 1400 km from South America.
A type of bird called a ground finch lives on the islands.
The picture shows a ground finch.

By Charlesjsharp (Own work) [CC-BY-SA-3.0], via Wikimedia Commons

The size of the seeds the ground finch can eat depends upon the size of the beak.
To eat large seeds, a large beak is needed.
The bar charts show the sizes of the beaks of ground finches on **one** island, in 1976 and in 1978.





(a) The population of the ground finches and their beak sizes changed between 1976 and 1978.

Describe these changes.

(3)

(b) In 1977 there was very little rain on the island. The lack of rain affected the seeds that the finches ate.
The table shows how the seeds were affected.

Year	Mean number of seeds per m^2	Mean mass of each seed in mg
1976	8.5	3.5
1978	2.8	4.2

Suggest an explanation for the changes in beak sizes between 1976 and 1978.

(4)

(Total 7 marks)

5 Soay sheep live wild on an island off the north coast of Scotland. No people live on the island.

By Owen Jones = Jonesor [CC-BY-SA-2.5], via Wikimedia Commons

Over the last 25 years, the average height and mass of the wild Soay sheep have decreased.

The scientists think that climate change might have affected the size of the sheep.

Suggest an explanation for the evolution of the wild Soay sheep over the last 25 years.

(Total 4 marks)

1 (a) deforestation reduces numbers the most or poaching the least

allow use of figures

1

protected areas only increasing numbers

1

overall human activities reduce wildebeest numbers

1

(b) (populations became) geographically isolated

allow described

1

genetic variation within populations

allow wide range of alleles or mutations

1

alleles/genes/characteristics which help the organism to survive are selected

***do not** allow 'adapt to survive'*

allow same idea described in natural selection

1

these alleles/genes are passed onto offspring

allow mutations passed on

1

populations so different that breeding to produce fertile offspring is no longer possible

allow cannot successfully interbreed

1

[8]

2 (a) <u>mutation</u>

correct spelling only

ignore other adjectives eg random / spontaneous

1

(b) *ignore references to X / Y chromosomes*

idea of mutant gene / new form / this allows <u>hatching</u> (of males)

1

(individual with advantage) (more) survive / (more) live / (more) don't die

allow immunity rather than resistance throughout

1

(so survivors) breed / reproduce

1

mutation / gene passed (from survivors) to offspring / next generation

allow resistance / characteristic for gene
'gene passed on' is insufficient

1

[5]

3 (a) variation (between organisms within species)

allow described example
*allow mutation – but **not** if caused by change in conditions*

1

those most suited / fittest survive

1

genes / alleles passed on (to offspring / next generation)

allow mutation passed on

1

(b) (i) any **two** from:

allow converse

- increase in latitude reduces number of (living) species
  ignore references to severity of conditions
- increase in latitude reduces time for evolution (of new species)
- the less the time to evolve the fewer the number of (living) species

2

(ii) any **two** from:

*do **not** accept intention or need to evolve*

- (increase in latitude reduces number of (living) species because) less food / habitats / more competition <u>at high latitude</u>
  allow only extremophiles / well-adapted species can survive
- (increase in latitude reduces time for evolution (of new species) because) severe conditions act more quickly / to a greater extent on the weakest
- (the less the time to evolve the fewer the number of (living) species because) species that evolve slowly don't survive

2

[7]

4 (a) in 1978
fewer finches **or** population smaller

1

any **two** from:

- no beaks less than 8mm
- no beaks greater than 11.5 / 12mm

  *if these points not given allow smaller range of beak sizes for **1** mark*

- mean / average beak size higher

2

(b) variation or range or mutation of beak sizes

*do **not** accept idea that drought / seed size caused mutation*

1

birds with larg(er) beaks are better adapted for feeding

accept idea of competition for food / seeds amongst finches

1

birds with larg(er) beaks survive

accept (only / more) birds with large beaks were better competitors

1

birds with larg(er) beaks breed **or** gene / allele for large beak passed on

*do **not** accept large beak passed on*

1

[7]

5 mutation **or** variation **or** range of sizes

*do **not** accept deliberate mutation **or** factor caused mutation*

1

warm(er) / dry(er) now

allow global warming

1

if warmer more smaller lambs / sheep survive winter

award 'survival' point only if linked to warmer / dryer conditions

1

or if warmer sheep do not need fat / wool / fur to keep warm
or if warmer smaller sheep can lose heat more readily / do not overheat / keep cool (so survive)

*do **not** accept smaller sheep retain more heat*

or if warmer smaller sheep have larger SA / V ratio (so survive)

*do **not** accept smaller sheep have smaller SA / V ratio*

or if dryer smaller lambs / sheep need less grass (to survive)

ignore small sheep feed easier on grass

small sheep breed / pass genes / mutations / characteristics to next generation

*do **not** accept if Lamarckian*

ignore competition / predation / human influence

1

[4]