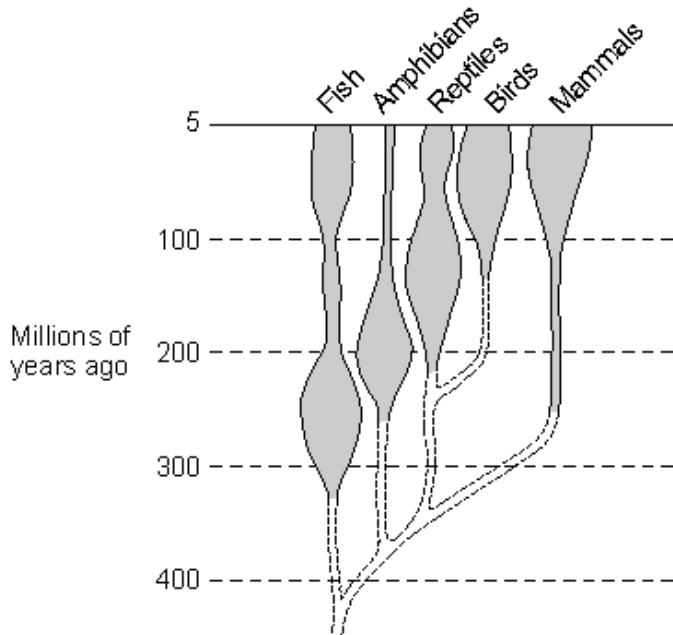


**Q1.** The diagram shows how the number of species in different vertebrate groups changed between 400 million years ago and 5 million years ago.

The wider a block is, the more species there are.



(a) Which group had most species 200 million years ago?

.....

(1)

(b) To which group are birds most closely related?

.....

(1)

(c) Complete the following sentence.

A study of fossils gives evidence for the theory of .....

(1)

**(Total 3 marks)**

**Q2.** The theory of evolution via natural selection was proposed by Darwin.

(a) Explain how evolution occurs via natural selection.

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

(4)

(b) Darwin's theory was only gradually accepted.

Give **two** reasons why.

1 .....

.....

2 .....

.....

(2)

(Total 6 marks)

**Q3.** (a) Explain, as fully as you can, how natural selection leads to evolution.

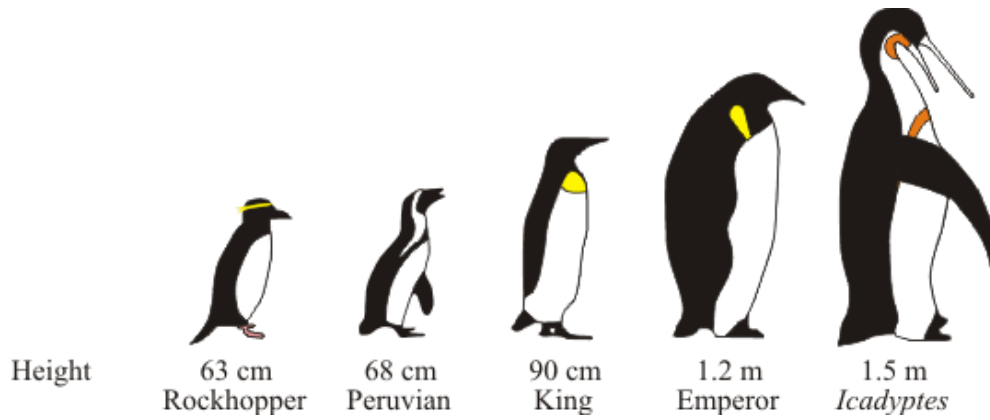
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

(3)

- (b) Most penguins live in cold climates. The modern penguin best adapted for cold conditions is the emperor penguin.

Scientists have found fossils of a 'giant' penguin which they have called *Icadyptes*.

The diagram shows how the size of modern penguins compares with *Icadyptes*.



The scientists were surprised to discover that *Icadyptes* lived in warm seas at a time when the Earth's climate was much warmer than it is now.

Explain why the scientists were surprised that *Icadyptes* lived in warm seas.

.....

.....

.....

.....

.....

.....

.....

(2)  
(Total 5 marks)

**Q4.** The diagram shows an evolutionary tree for a group of animals called primates.

The names of extinct animals are printed in italics e.g. *Nycticeboides*.

The drawings show animals that are alive today.

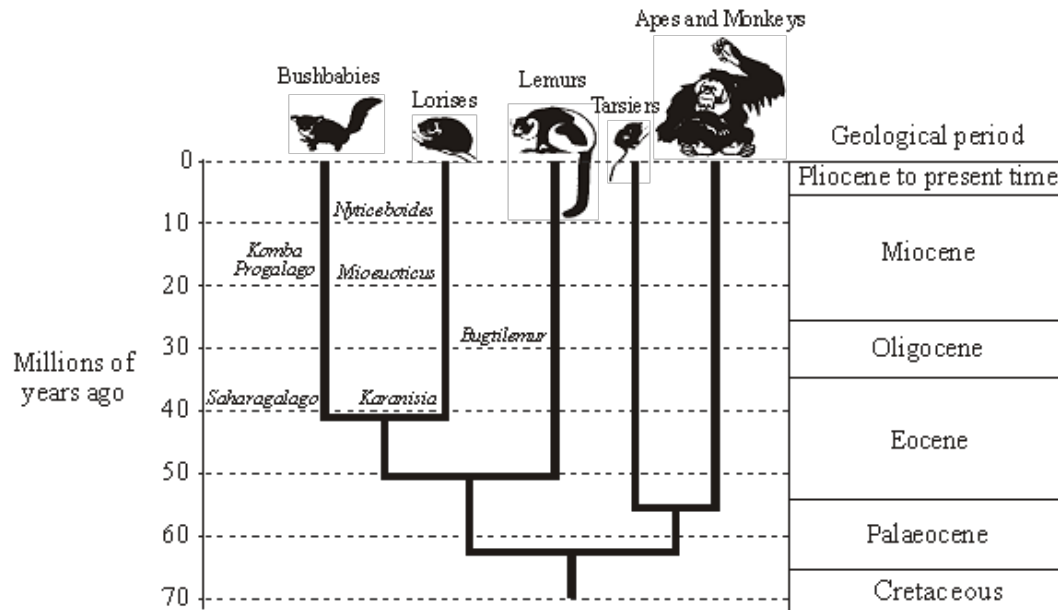


Illustration by Lucrezia Beerli-Bieler

(a) (i) How many million years ago did *Karanisia* first appear?

..... millions of years ago.

(1)

(ii) During which geological period did the Apes and Monkeys begin to evolve?

.....

(1)

(iii) Which group of primates alive today are the closest relatives of the Lorises?

.....

(1)

- (b) Darwin was the first scientist to state that humans and other primates had common ancestors.

Many people were against Darwin's ideas at that time.

Give **two** reasons why they were against his ideas.

1 .....

.....

2 .....

.....

(2)  
(Total 5 marks)

- Q5.** (a) What does the theory of evolution state?

.....

.....

.....

.....

(2)

- (b) *Daphnia* are microscopic water fleas. Midge larvae prey on *Daphnia*. The midge larvae release a hormone into the water. *Daphnia* respond to these hormones by growing larger protective 'helmet'-like structures

Scientists were surprised to observe that the offspring of *Daphnia* females who had been exposed to these hormones always had larger helmets than offspring whose mothers had never been exposed to the hormones. The offspring with the large helmets went on to produce offspring with large helmets.

Explain why the scientists' observations seem to contradict the theory of natural selection.

.....

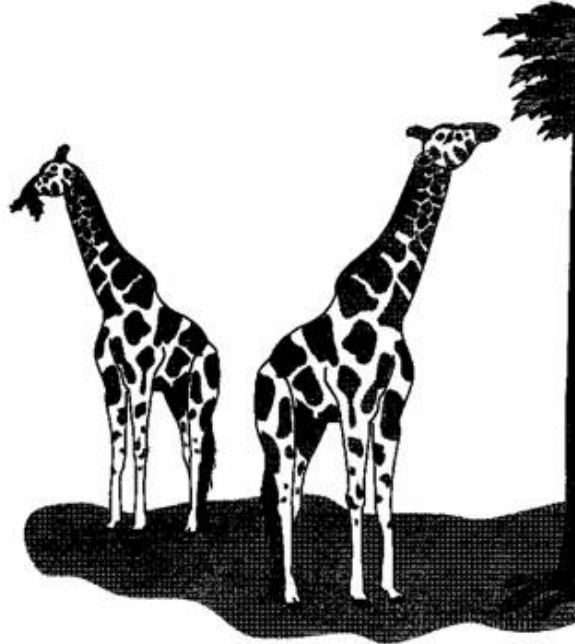
.....

.....

.....

(2)  
(Total 4 marks)

**Q6.** Giraffes feed on the leaves of trees and other plants in areas of Africa. They are adapted, through evolution, to survive in their environment.



(a) Use the information in the picture to give **one** way in which the giraffe is adapted to its environment.

.....

(1)

(b) Explain how Jean-Baptiste Lamarck (1744–1829) accounted for the evolution of the long neck in giraffes.

.....  
.....  
.....  
.....  
.....

(3)

(c) Another scientist, August Weismann (1834 -1914) wanted to check Lamarck's explanation. To do this he cut off the tails of a number of generations of mice and looked at the offspring.

His results did not support Lamarck's theory. Explain why.

.....  
.....  
.....  
.....  
.....

(2)

(d) Explain how Charles Darwin (1809–1882) accounted for the evolution of the long neck in giraffes.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

**(4)**  
**(Total 10 marks)**

**M1.** (a) amphibians 1

(b) reptiles 1

(c) evolution  
*accept natural selection* 1

**[3]**

**M2.** (a) organisms within species may show variation 1

**because** mutation(s) occur in individuals 1

this results in the individuals with characteristics most suited to the environment being more likely to survive / to breed 1

as a consequence the genes that have enabled these individuals to survive are passed on to the next generation 1

(b) any **two** from

- the theory undermined the idea that God made all the animals and plants that live on earth
- there was insufficient evidence at the time
- the mechanism of inheritance / variation was not yet known

2

**[6]**

**M3.** (a) variation / mutation 1

individuals with characteristics most suited to environment survive  
*allow survival of the fittest* 1

genes passed to next generation **or** these individuals reproduce 1



(b) any **two** from:

- similar in size to Emperor penguin **or** bigger than all penguins
- large size is adaptation to cold climate
- since less heat loss per unit of body volume **or** smaller surface area / volume ratio

2

[5]

**M4.** (a) (i) 40 – 42

1

(ii) Palaeocene

1

(iii) bush babies

1

(b) any **two** from:

- religious objections
- insufficient evidence  
*allow 'could not prove'*  
*ignore 'no evidence'*
- mechanism of heredity not known

2

[5]

**M5.** (a) present day organisms have evolved from simpler organisms  
*ignore answers in terms of natural selection*

1

over long periods of time  
**or**  
millions / billions of years

1

- (b) (natural selection operates on successful) characteristics produced by chance / (random) mutation 1
- in this experiment caused by hormones / environment
- allow this example indicates inheritance of acquired characteristics for 2 marks*
- allow this is Lamarckism only for 1 mark* 1

[4]

**M6.** (a) long neck or legs 1

- (b) change in environment **or** reaching for food **or** stretching led to **more use** of neck (and legs) [1]
- use led to **increased** size **or** characteristic acquired during lifetime [1]
- this characteristic was passed to offspring [1] 3

- (c) phenotypic changes do not affect genotype **or** genes [1]
- acquired characteristics are not passed to offspring **or** the offspring were born with tails **or** inheritance has to be genetic [1] 2

- (d) **one** mark awarded for each of the following general points:
- variation exists in all populations **or** mutation occurred [1]
- or if written specific to giraffes:**
- all giraffes are different **or** reference to short necked giraffes[1]* 4

some individuals will have an advantage in certain areas **or** will be better adapted **or** there is survival of fittest [1]

*taller giraffes **or** those with longer necks will have an advantage in being able to reach high vegetation **or** there is survival of fittest [1]*

advantaged individuals breed more **or**  
are more successful [1]

*these giraffes will breed more **or** will be more successful [1]*

the genes **or** units of heredity **or** DNA  
of these individuals are passed on [1] (look for idea of genetic  
information being passed on)

*the genes **or** units of heredity **or** DNA of these giraffes are passed  
on [1]*

[10]

