

5.1 Evolution & Natural Selection

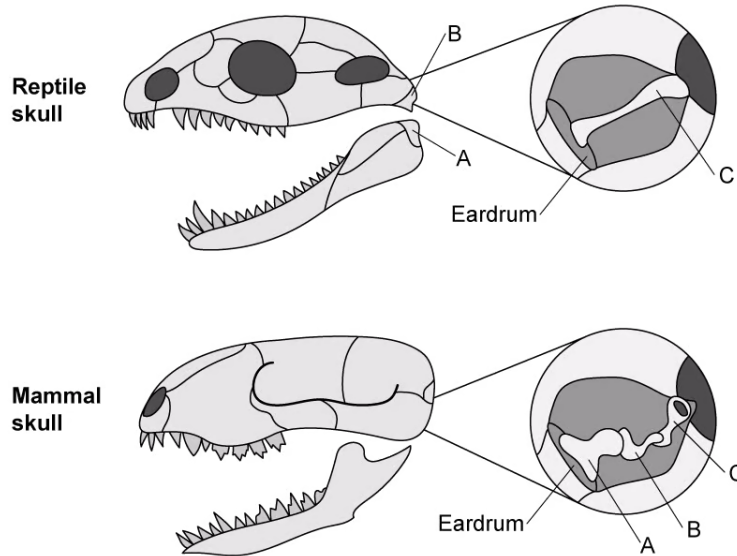
Question Paper

Course	DP IB Biology
Section	5. Evolution & Biodiversity
Topic	5.1 Evolution & Natural Selection
Difficulty	Hard

Time allowed: 10
Score: /5
Percentage: /100

Question 1

The image shows the general skull structure of reptiles and mammals, as well as details of the structures inside their ears. The labels **A–C** indicates structures that evolutionary biologists think are equivalent to each other in both reptiles and mammals.



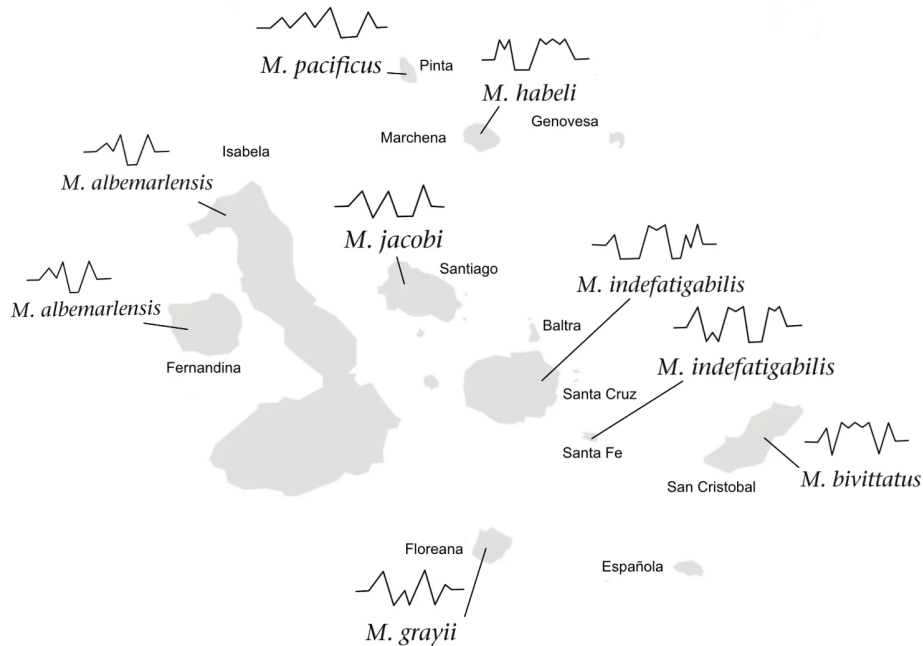
Which is the most likely explanation for the structures shown in the image?

- A. Mammals and reptiles evolved by adaptive radiation
- B. Mammals evolved from reptiles
- C. Reptiles evolved from mammals
- D. The jaws and ears of mammals and reptiles have evolved to be similar to each other

[1 mark]

Question 2

Several species of lava lizard of the genus *Microlophus* are found only in the islands of the Galapagos. A group of scientists recorded the mating displays of male lava lizards in different parts of the Galapagos, using the amplitude of a wave to represent the height and length of head bobbing behaviour. The map shows the mating displays of some male lava lizards currently living on different islands of the Galapagos.



Which of the following statements about mating displays in Galapagos lava lizards are correct?

- I. Mating displays are the same between members of the same species of lava lizard
- II. Mating displays show continuous variation across the geographical range of the Galapagos lava lizards
- III. The mating displays suggest that lava lizards evolved by gradual divergence from a common ancestor
- IV. The mating displays recorded show all the stages of lava lizard divergence

- A. I, II, and III only
- B. I, II, III, and IV
- C. II and III only
- D. II, III, and IV only

[1 mark]

Question 3

In adult humans, the ability to digest the lactose sugar in milk depends on the presence of an allele known as -13910*T. Individuals with this allele continue to produce the enzyme lactase into adulthood; this is known as lactase persistence. Individuals without this allele are not able to produce lactase after infancy and cannot digest lactose as adults. The table below shows the frequency of the -13910*T allele in European Neolithic hunter-gatherers who lived around 5 000 years ago and in modern Europeans.

	European Neolithic hunter-gatherers	Modern Europeans
Frequency of -13910*T allele	0.03 (+/- 0.11)	0.74 (+/- 0.06)

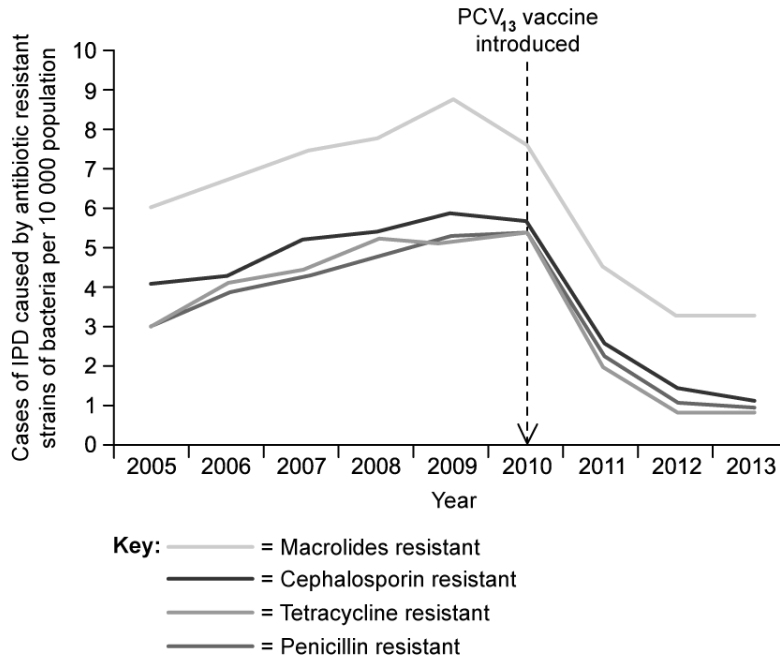
Which of the following can be concluded from the table?

- A. There is no significant difference in the frequency of the -13910*T allele between Neolithic hunter-gatherers and modern day humans in Europe
- B. Lactase persistence gave a survival advantage to humans at some stage between Neolithic and modern-day times
- C. Lactase persistence gave a survival advantage to European Neolithic hunter-gatherers
- D. Adult European Neolithic hunter-gatherers did not consume milk

[1 mark]

Question 4

The pneumococcal conjugate vaccine (PCV13) provides protection against infection caused by the bacterium *Streptococcus pneumoniae*. The graph shows the number of cases of invasive pneumococcal disease (IPD) caused by antibiotic resistant *S. pneumoniae* before and after the introduction of PCV13.



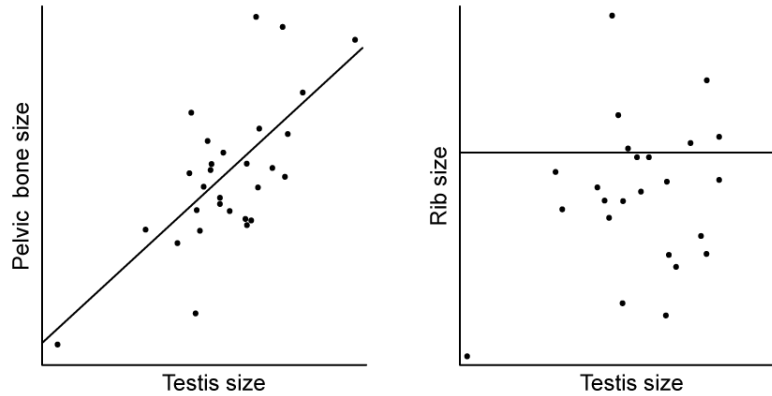
Which statement correctly explains the number of cases of IPD caused by antibiotic resistant *S. pneumoniae* after the introduction of PCV13?

- A. The vaccine is killing the bacteria that cause the infections.
- B. The vaccine has reduced the use of antibiotics, meaning that resistance alleles are no longer advantageous.
- C. The vaccine has reduced the use of antibiotics and the bacteria respond by becoming less resistant.
- D. The vaccine has reduced the use of antibiotics, preventing resistance alleles from being passed on when bacteria divide.

[1 mark]

Question 5

The pelvic bones of whales are located in the equivalent position to the hip bones of land mammals, though they are not attached to the rest of the skeleton. These bones have long been thought of as vestigial structures leftover from the process of evolutionary change. Scientists researched the relationship between the size of whale pelvic bones and the size of whale testes. The graphs show some of the results of the study.



Which of the following statements relating to whale pelvic bones are correct?

- I. Whale pelvic bones are homologous to the pelvic bones of land mammals.
 - II. There is no relationship between the body size of a whale, as represented by rib size, and the size of a whale's testes.
 - III. The pelvic bones of whales are vestigial structures with no function.
 - IV. The pelvic bones of whales are not vestigial but are involved in reproduction.
- A. I and II only
 B. I, II, and III only
 C. I, II, and IV only
 D. II and IV only

[1 mark]