

10.3 Gene Pools & Speciation

Question Paper

Course	DP IB Biology
Section	10. Genetics & Evolution (HL Only)
Topic	10.3 Gene Pools & Speciation
Difficulty	Medium

Time allowed: 20
Score: /10
Percentage: /100

Question 1

In humans, there are three alleles that determine blood groups, namely I^O , I^A and I^B . The frequency of the I^O allele in a particular population was found to be 0.72. There was an equal abundance of the remaining two alleles.

What would the frequency of the I^B allele be in this population?

- A. 0.44
- B. 0.28
- C. 0.14
- D. 0.07

[1 mark]

Question 2

A game farm in South Africa has a population of about 5 000 large antelope called Kudu. Kudu bulls have large, spiralled horns which draw the attention of trophy hunters that frequently visit the game farm.

The antelope are all kept in a large, fenced-off area consisting of open grassland habitat.

Could this be considered an example of a stable gene pool?

- A. No, since there will be a selective pressure to increase the allele frequency for antelope with large horns
- B. No, since there will be a selective pressure for antelope with smaller horns
- C. Yes, it is a large population of antelope with an equal chance to mate with each other
- D. Yes, it is a large population located in a habitat that enables random matings between antelope of different phenotypes

[1 mark]

Question 3

Which of the following applies to the process of evolution by natural selection?

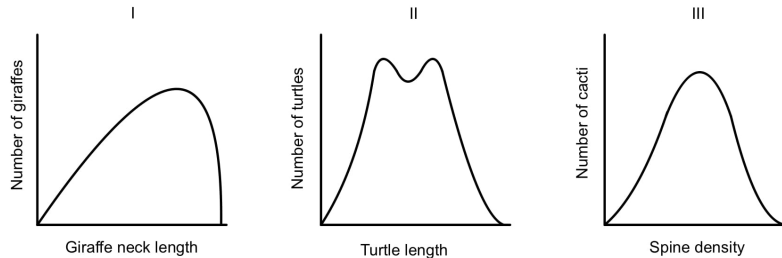
- I. Changes in the phenotype of organisms in a population
- II. Selection pressures favouring certain alleles within a population
- III. Individuals with a certain genetic makeup will not pass on their genes
- IV. Changes in the allele frequencies within a population over time

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

[1 mark]

Question 4

What would be the most accurate description of the following graphs?



	I	II	III
A	Stabilising selection as giraffes with longer necks are selected for	Directional selection as larger and smaller turtles are selected for	Disruptive selection as cacti with a medium spine density are selected for
B	Directional selection as giraffes with longer necks are selected for	Disruptive selection as larger and smaller turtles are selected for	Stabilising selection as cacti with a medium spine density are selected for
C	Stabilising selection as giraffes with medium neck lengths are selected for	Disruptive selection as larger and smaller turtles are selected against	Directional selection as cacti with medium spine density are selected for
D	Directional selection as giraffes with medium neck lengths are selected for	Stabilising selection as larger and smaller turtles are selected against	Disruptive selection as cacti with medium spine density are selected for

[1 mark]

Question 5

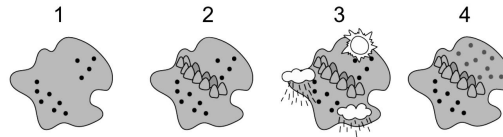
What is the most important requirement for speciation to occur?

- A. A geographical barrier is needed to separate different species from one another so that natural selection can occur
- B. Mutations occurring within a population which brings about slight changes to the phenotype of individuals
- C. Reproductive isolation must occur within a population which can be brought about by a range of different barriers
- D. Organisms must be able to find a suitable mate within their habitat in order to pass on their genetic information

[1 mark]

Question 6

Which of the following would be the best description of the events depicted in the diagram?

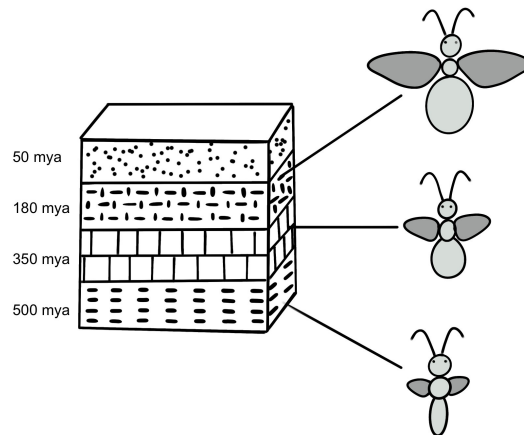


- A. A geographical barrier separated two populations of the same species and over time they adapted to new conditions in their environment
- B. A temporal barrier meant that the two populations were not able to reproduce during the same season anymore and formed new species
- C. A geographical barrier separated two populations of different species and over time they adapted to seasonal differences in their habitat
- D. A temporal barrier separated two populations which led to behavioural changes that resulted in speciation

[1 mark]

Question 7

A team of palaeontologists discovered the remains of an insect-like organism trapped in amber, which was found in rock layers believed to be about 180 million years old. As they dug deeper into the older layers of rock, they made several further discoveries. Their findings are shown in the diagram below.



What conclusion can be drawn from the information given?

- A. The changes observed in these populations occurred gradually from 180 million years ago until 500 million years ago.
- B. The original population changed dramatically over time which led to several different species forming
- C. There were several large speciation events that occurred within a short period of time within these populations
- D. Speciation occurred gradually, with many small changes accumulating over a long period of time

[1 mark]

Question 8

Which of the following would **not** apply to the punctuated equilibrium theory of speciation?

- A. A volcanic eruption on an island wipes out most individuals of a particular species of rodent
- B. A change in vegetation favours field mice with a coat colour that is a deeper shade of brown
- C. A bacterial colony in the human body is treated with antibiotics which kills off all susceptible individuals
- D. A swarm of locusts arrive at a newly planted field containing a wheat variety that requires very robust mouth parts to bite through the leaves and stems

[1 mark]

Question 9

Why can polyploidy be considered an advantage to some plant species?

- A. Meiosis can occur more rapidly, leading to an increase rate of gamete formation
- B. It increases the diversity of alleles within a population and reduces the impact of recessive mutations
- C. The polyploid plant can reproduce more successfully with diploid plants from the same species
- D. It can lead to the occurrence of more purebred individuals within a plant population

[1 mark]

Question 10

Which of the following examples would be a useful application of comparing allele frequencies between populations?

- I. Estimating the number of individuals in a population that may be susceptible to certain diseases
- II. Studying the evolutionary history of populations within a specific species
- III. Investigating the effect of environmental factors on the phenotype within different populations

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

[1 mark]