
BIOLOGY VCE UNITS 3&4 DIAGNOSTIC TOPIC TESTS 2017

TEST 7: CHANGES IN THE GENETIC MAKEUP OF A POPULATION AND CHANGES IN BIODIVERSITY OVER TIME

TOTAL 40 MARKS (45 MINUTES)

Student's Name: _____ Teacher's Name: _____

Directions to students

Write your name and your teacher's name in the spaces provided above.
Answer all questions in the spaces provided.

SECTION A – MULTIPLE-CHOICE QUESTIONS

Instructions for Section A

Choose the response that is **correct** or that **best answers** the question.

A correct answer scores 1; an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Unless otherwise indicated, the diagrams in this booklet are **not** drawn to scale.

Question 1

An example of a structural variation is

- A. some people (*Homo sapiens*) are polydactyl, having six digits on each hand.
- B. the eastern quoll (*Dasyurus viverrinus*) with different coat colours.
- C. different responses of varieties of dog (*Canis lupus familiaris*) to obedience training.
- D. the green python (*Chondropython viridis*); the adult pythons are lime green, while juveniles are bright yellow.

Question 2

An example of a continuous variation is the

- A. uniform pink and grey plumage colour of wild populations of the Australian galah (*Cacatua roseicapilla*).
- B. flower colour in the population of lupins (*Lupinus*) where plants fall into two groups, purple and pink.
- C. height of the Australian human male population.
- D. number of cattle (*Bos Taurus*) on a Hereford farm.

Question 3

Which of the following can cause deformed limbs in a newborn baby?

- A. thalidomide, the teratogenic drug formerly used for treating morning sickness in pregnant women.
- B. a genetic condition called Phocomelia syndrome.
- C. an interaction between environment and genetics.
- D. all of the above

Question 4

The ABO gene for blood type has variations due to

- A. polygenic traits.
- B. the actions of different alleles of several genes.
- C. the actions of different alleles of one gene.
- D. traits showing continuous variation.

Question 5

Which of the following traits in the human population is polygenic?

- A. skin colour
- B. colour blindness
- C. blood type
- D. lactose intolerance

Question 6

The process that produces new alleles of genes in various species and so generates new genetic variation is due to

- A. loss of chromosomes during cell division.
- B. genetic mutation.
- C. the low number of genes that affect a trait.
- D. low numbers of new generations.

Question 7

When defining the gene pool of a population,

- A. a maximum of three alleles only can be present at any one gene locus.
- B. the genetic information is normally represented by two alleles of each individual in that population.
- C. the total number of alleles is equal to the number of individuals in that population.
- D. the genetic information is normally represented by one individual.

Question 8

The most correct definition that describes organisms belonging to the same species is if

- A. they retain their ability to interbreed and produce viable and fertile offspring.
- B. subspecies from different populations mate.
- C. subspecies from different populations mate and their offspring survive.
- D. subspecies from different populations mate and produce infertile offspring.

Question 9

Ancient buried linen can be subjected to absolute radiometric dating because

- A. the sample to be dated is irradiated with neutron particles and this converts the stable K-39 to Ar-39 ready for measurement.
- B. once the surrounding rock has cooled and solidified, the 'rock clock' starts and the Ar-40 begins to accumulate.
- C. the element potassium is present in minerals, such as feldspars, that are found in the surrounding rocks.
- D. the linen was once a plant and the proportion of carbon isotopes was constant in the atmosphere.

Question 10

The different expression of master genes found across the different species has led to

- A. different beak formation in Galapagos finches and jaw formation of cichlid fish in Africa.
- B. Galapagos finches having identical beaks and cichlid fish having identical jaws.
- C. different beak formation in Galapagos finches and the same jaw formation in cichlid fish in Africa.
- D. Galapagos finches having identical beaks and cichlid fish having different jaws.

Question 11

Which of the following describes comparative genomics?

- A. helps predict mass extinction of species
- B. is typically used to compare the DNA of related species
- C. provides strong evidence for punctuated evolution
- D. all of the above

Question 12

When closely related species become more dissimilar over time, usually in response to different environmental conditions and different selection pressures, this is known as

- A. parallel evolution.
- B. convergent evolution.
- C. divergent evolution.
- D. special creation.

Question 13

A result of artificial selection is that

- A. production traits such as milk, meat, wool and eggs may decline.
- B. genetic information increases.
- C. the offspring of the parents may not have a high fitness value in a genetic sense.
- D. speciation is less likely to occur.

Question 14

The reason why identical twins can show differences in appearance is due to

- A. biochemical differences.
- B. genetic differences.
- C. physiological differences.
- D. environmental differences.

Question 15

The finches on the different islands that make up the Galapagos group occupy different niches.

The finches have a high degree of variation because

- A. all the species flew over from the mainland at one time in the past.
- B. they all evolved from a common ancestor finch which flew over from the mainland.
- C. they evolved due to adaptive convergence.
- D. they evolved due to coevolution.

SECTION B – SHORT-ANSWER QUESTIONS

Instructions for Section B

Answer **all** questions in the spaces provided. Write using blue or black pen.
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Question 1 (7 marks)

One of the most extensive and complete fossil records is that of the horse. The horse family has existed on earth over the last 60 million years. Over 200 fossil species of horse have been identified and found in a variety of habitats. These fossil species can be traced back to a common ancestor that existed 60 million years ago. These fossils range in size from a dog to that of a rhinoceros. Today, only a small number of different horse species exist, for example the zebra and donkey.

- a. How do scientists determine different fossil species of horse? 1 mark

- b. Why is the classification of fossilised horse remains into different species difficult? 1 mark

- c. Why are the zebra and donkey regarded as different species? 1 mark

- d. Briefly explain why so many different horse species have existed over the last 60 million years. 2 marks

- e. Explain why a student looking at the fossil record of the horse suggested this was an example of divergent evolution. 1 mark

- f. What is another term that can mean the same as divergent evolution? 1 mark

Question 2 (2 marks)

In some countries, antibiotics are given regularly to intensively farmed animals to prevent, rather than cure, disease. The aim is to enhance production.

- a. What problems may arise as a result of this practice? 1 mark

- b. Could this practice influence the effectiveness of the control of bacterial infections in other animals, including humans? 1 mark

Question 3 (1 mark)

When are geneticists interested in gene pools?

Question 4 (1 mark)

A mutation is the only event that can create new genes.

True or false? Explain.

Question 5 (4 marks)

Over the last 40 years, with the increase in the human population, large areas of agricultural land have been set aside to grow crops. Unfortunately, these large crop areas not only provide food for humans, but also for insect pests. As a result, humans have developed many insecticides and pesticides over the years to control insect pests so that crops are not destroyed. However the short-term benefits of insecticides have not resulted in the elimination of the insect pests.

- a.** Why does the number of insect pests usually decline after insecticides are first applied? 1 mark

- b.** After pesticides are applied, although insect pest numbers are usually greatly reduced, all of the pests are killed. Explain. 1 mark

- c.** Discuss why many pesticides which were effective in reducing insect pests 20 years ago have now been replaced by new and different pesticides. 1 mark

- d.** Some scientists believe that by using insecticides all the time, eventually insect pests will become extinct.
Explain whether you agree or disagree. 1 mark

Question 6 (5 marks)

Many species are distributed over a wide geographical range; the same species can often be found in a number of somewhat different habitats. When the same plant species are found at different altitudes, there are often noticeable differences between the plants from different altitudes. Gradations in characteristics from one geographical area to another are called clines. Clines can be observed in Snow Gums where those trees growing around 1000 metres are much taller than those trees growing around 2000 metres where the conditions are colder and snow is present in winter.

- a.** Define what a species is. 1 mark

- b.** Explain the meaning of genetic variation. 1 mark

- c.** Describe **one** environmental factor that is present at high altitudes that could result in Snow Gums being short. 1 mark

- d.** Describe what results you would expect in tree size if seeds taken from Snow Gums at 1000 metres and 2000 metres are grown under identical conditions at 1000 metres. 1 mark

- e.** Explain why seeds which are taken from Snow Gums at 2000 metres and planted in soil at 1000 metres grow into tall plants. 1 mark

Question 7 (2 marks)

The introduction of antibiotics caused bacteria to mutate which explains why some bacteria are resistant to antibiotics today.

Is this statement correct? Justify your answer.

Question 8 (3 marks)

Define bottleneck and the founder effect.

Are these cases of genetic drift? Explain your answer.
