Student Name: _____

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BIOLOGY 2017

Unit 4
Key Topic Test 2 – Changes in biodiversity over time

Recommended writing time*: 45 minutes
Total number of marks available: 45 marks

QUESTION BOOK

* The recommended writing time is a guide to the time students should take to complete this test. Teachers may wish to alter this time and can do so at their own discretion.

Conditions and restrictions

- Students are permitted to bring into the room for this test: pens, pencils, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring into the room for this test: blank sheets of paper and/or white out liquid/tape.
- No calculator is permitted in this test.

Materials supplied

- Question and answer book of 15 pages.

Instructions

- Print your name in the space provided on the top of the front page.
- All written responses must be in English.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic communication devices into the room for this test.

SECTION A – Multiple-choice questions

Instructions for Section A

Select the response that is most correct for the question. A correct answer scores 1, an incorrect answer scores 0. Marks are not deducted for incorrect answers. If more than 1 answer is completed for any question, no mark will be given.

Question 1
The first group of organisms to evolve on earth were the bacteria. Fossils of these organisms are extremely rare. Which of the following reasons best accounts for this?

A. They decomposed readily
B. They are too small to fossilise
C. They were extremely uncommon.
D. They lived in unfavourable environments for fossilization.

Question 2
Birds are descended from dinosaurs and modern reptiles have evolved from an ancestor of the dinosuars. As a result, the feathers of birds and the scales of reptiles are considered to be homologous structures. Which of the following is the best reason for this opinion?

A. Birds and reptiles share common ancestors.
B. Feathers and scales are both used for the same purpose.
C. Birds and reptiles have both been subjected to the same selection pressures.
D. Feathers and scales occupy similar locations of the bodies of birds and reptiles.

Question 3
Data gained from comparative embryology is one of the pieces of evidence used to support the theory of evolution. Which of the following information could be obtained from this study?

A. The DNA sequence of the organisms.
B. The presence and position of gill slits.
C. The diploid chromosome number of the species.
D. The number of fingers and toes possessed by the organisms.

Question 4
Evidence to support the theory of evolution may also be established by studying the past and present distribution of plants and animals. This is referred to as:

A. Biogeography.
B. Tolerance range.
C. Geological range.
D. Geographical distribution

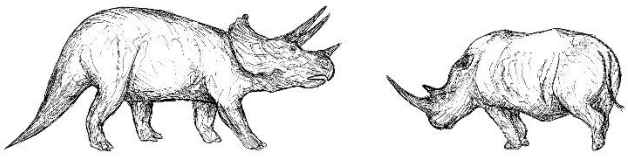
Question 5

Which of the following is the best definition of the term "geological time scale"?

- **A.** A method of determining the age of fossils.
- **B.** A dating method for determining the age of rocks.
- **C.** A time scale used for major events that have occurred in the Earth's history
- **D.** A method used to describe the timing and relationship between major geological events

Question 6

The diagram below shows an example of an extinct species, triceratops, a dinosaur, compared to a modern rhinoceros.



Both of these organisms were large herbivores with horns. The development of similar characteristics in these two organisms would be due to the fact that:

- **A.** These two species share a common ancestor.
- **B.** They were exposed to similar environmental conditions
- **C.** Members of the rhinoceros species are descended from triceratops.
- **D.** The development of horns occurred due to a random mutation in both species.

Question 7

Fossils are commonly divided up into two categories: trace fossils and body fossils. Which of the following provides a correct statement and example of one of these types of fossil?

- **A.** Trace fossils show evidence of an organism's activity or behaviour, such as teeth.
- **B.** Body fossils show evidence of an organism's activity or behaviour, such as amber.
- **C.** Trace fossils show evidence of an organism's activity or behaviour, such as footprints.
- **D.** Body fossils show evidence of the environment an organism lived in, such as petrified wood.

Question 8

In 1978 a fossil of what appeared to be a snake with legs was discovered. The species was later named *Pachyrhachis problematicus.* The organism resembled a snake in shape and jaw structure, however, it also resembled a lizard because it had a pelvis and 2 fully formed rear legs. The term used to describe this type of fossil is

- **A.** Index fossil
- **B.** Indicator fossil
- **C.** Temporary fossil
- **D.** Transitional fossil

Question 9
In biology, the study of structural morphology refers to:

- **A.** Comparing the structures observed in different species.
- **B.** The impact that the environment plays on an organism's phenotype.
- **C.** The number of different phenotypes observed in a single population.
- **D.** The changes that occur within an organism over the course of its lifetime.

Question 10
A researcher is establishing evolutionary information using a technique associated with developmental biology. Which of the following might they be doing?

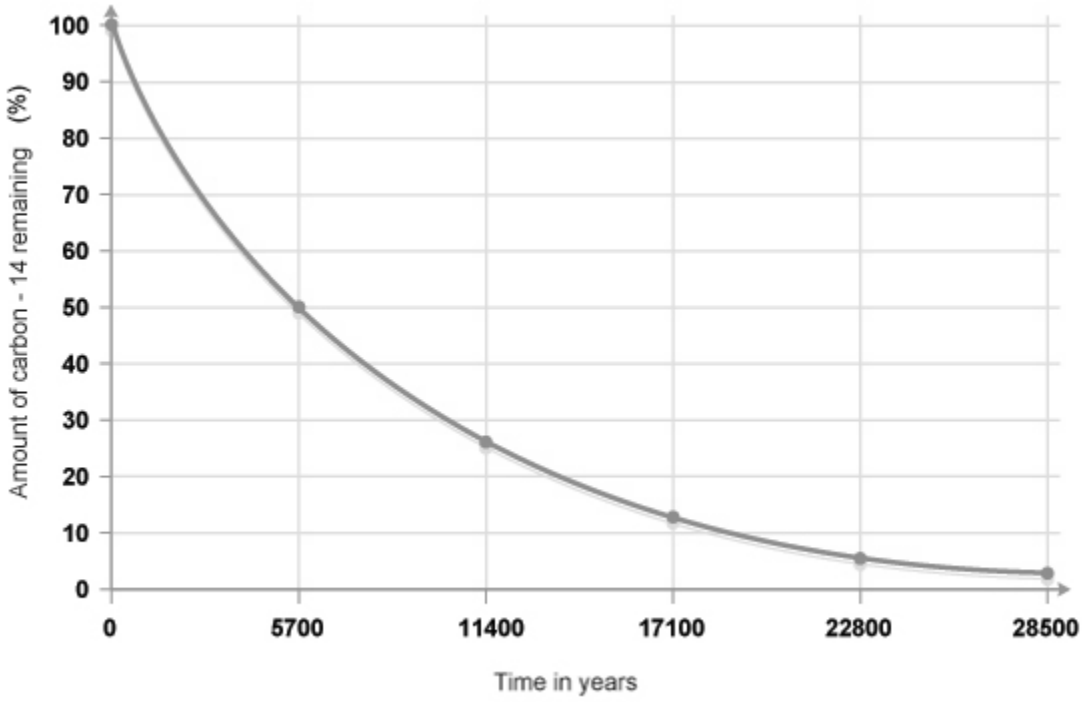
- **A.** Collecting and analysing DNA
- **B.** Comparing fossils from similar species
- **C.** Comparing embryos from different species.
- **D.** Observing the formation of similar structures in similar species

SECTION B - Short-answer questions

Instructions for Section B
Answer all questions in the spaces provided.

Question 1 (8 marks)

Radioisotopes, such as carbon-14, may be used to establish the age of fossils. The diagram below shows the percentage of carbon-14 remaining in a sample over a period of years.



a. What is the term used to describe dating methods that make use of radioisotopes, such as carbon-14?

1 mark

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b. A fossil was found with approximately 45% of carbon-14 remaining. What is the approximate age of the fossil?

1 mark

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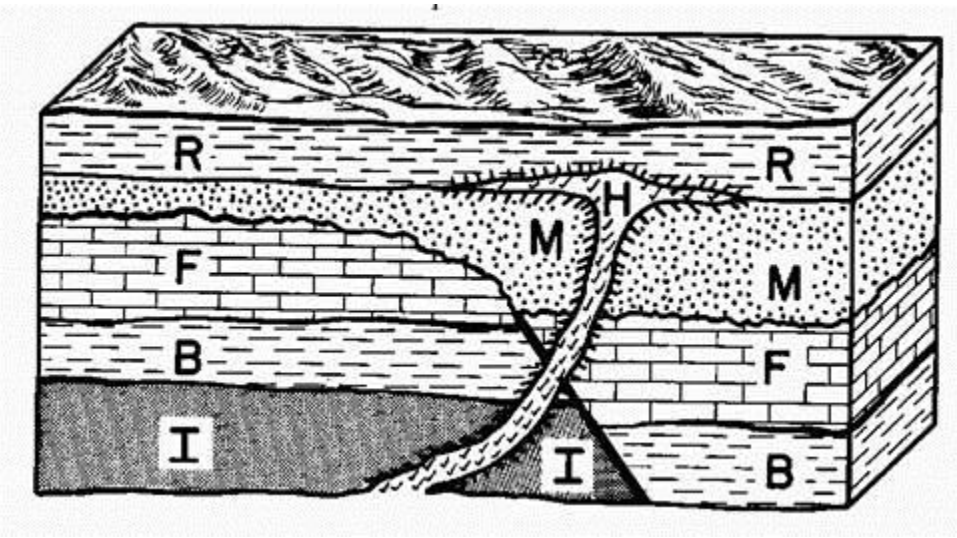
c. A fossil was located which was believed to be approximately 4.5 million years old. Would it be possible to establish the age of the fossil using carbon-14 dating? Use the data to provide a reason to support your answer.

1 mark

d. An alternative method of dating involves the use of stratigraphy, such as in the diagram shown below. Different strata and formations are indicated with different letters.



Assuming it is possible for fossils to be located in each section, which section would have the oldest fossil? Provide a reason to support your answer.

2 marks

e. Layer I was determined to be a type of volcanic rock. A scientist stated that there would not be any fossils found in this layer. Is this opinion correct? Provide a reason to support your answer.

1 mark

f. Layer F was determined to be a sedimentary rock, limestone. Identify two reasons to explain why fossils are most commonly found in sedimentary rocks.

2 marks

Question 2 (8 marks)

The table below contains an overview of the geologic time scale. Use this information to assist you to answer the following questions.

Geologic Time Scale

Era	System & Period	Series & Epoch	Some Distinctive Features	Years Before Present
CENOZOIC	Quaternary	Recent	Modern man.	11,000
		Pleistocene	Early man; northern glaciation.	1/2 to 2 million
	Tertiary	Pliocene	Large carnivores.	13 + 1 million
		Miocene	First abundant grazing mammals.	25 + 1 million
		Oligocene	Large running mammals.	36 + 2 million
		Eocene	Many modern types of mammals.	58 + 2 million
		Paleocene	First placental mammals.	63 + 2 million
MESOZOIC	Cretaceous		First flowering plants; climax of dinosaurs and ammonites, followed by Cretaceous-Tertiary extinction.	135 + 5 million
	Jurassic		First birds, first mammals dinosaurs and ammonites abundant.	181 + 5 million
	Triassic		First dinosaurs. Abundant cycads and conifers.	230 + 10 million
PALEOZOIC	Permian		Extinction of most kinds of marine animals, including trilobites. Southern glaciation.	280 + 10 million
	Carboniferous	Pennsylvanian	Great coal forests, conifers. First reptiles.	310 + 10 million
		Mississippian	Sharks and amphibians abundant. Large and numerous scale trees and seed ferns.	345 + 10 million
	Devonian		First amphibians; ammonites; fishes abundant.	405 + 10 million
	Silurian		First terrestrial plants and animals.	425 + 10 million
	Ordovician		First fishes; invertebrates dominant.	500 + 10 million
	Cambrian		First abundant record of marine life; trilobites dominant.	600 + 50 million
	Precambrian		Fossils extremely rare, consisting of primitive aquatic plants. Evidence of glaciation. Oldest dated algae, over 2,600 million years; oldest dated meteorites 4,500 million years.	

a. It is believed that the first multicellular organisms developed during the Precambrian era. Explain why the development of these species was significant.

1 mark

b. Photosynthetic bacteria are believed to have developed approximately one billion years before the appearance of multicellular organisms. Explain the impact that the evolution of these bacteria would have had on the future development of other organisms.

1 mark

c. The occurrence of endosymbiosis is a significant event, occurring approximately 2.1 billion years ago. Explain what endosymbiosis is and then discuss why it is considered to be a major event in evolution.

2 marks

d. The Cambrian period began with what is called the "Cambrian explosion". What seems to have occurred at this period in time?

1 mark

e. At specific points in the Earth's history certain species were said to be diversifying. Explain what this means.

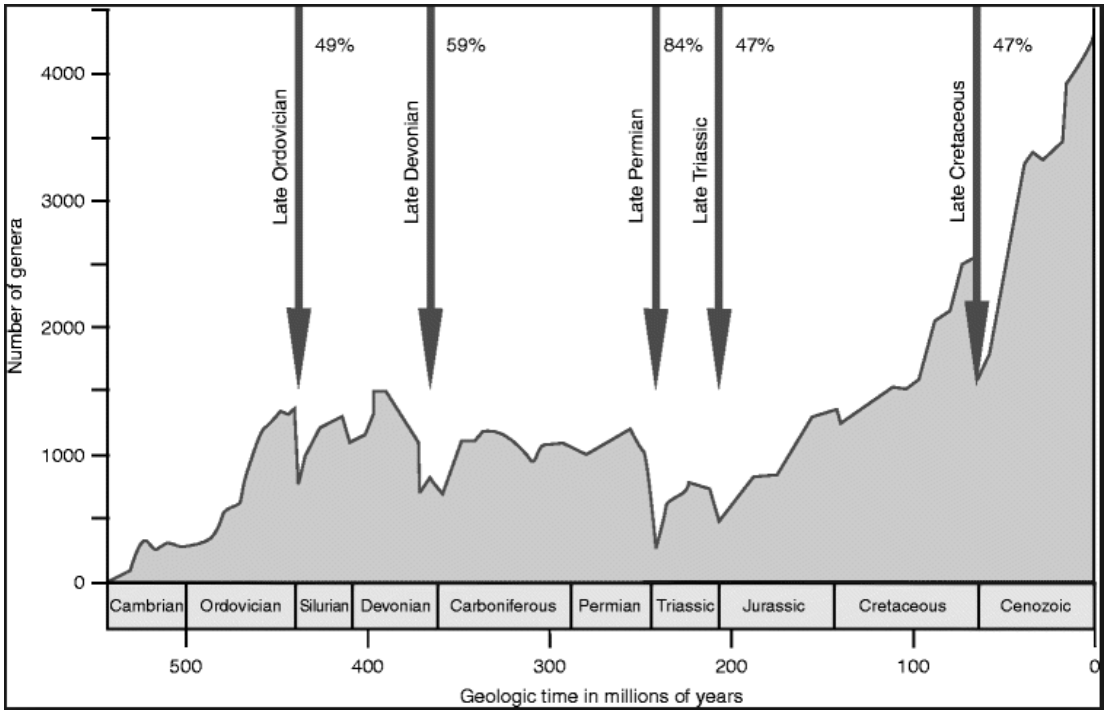
1 mark

f. Certain periods are referred to as being the "age of" specific organisms. What does the term "age of" mean in this context? Based upon the data, which time frame would have been the age of fishes?

2 marks

Question 3 (7 marks)

The diagram below shows five major events that occurred during the Earth's history.



a. Based on the information provided, identify what has occurred to the number of genera present at each of the points indicated by arrows. Identify the term that is used to describe the type of event occurring at these points in time.

2 marks

b. Some organisms, such as trilobites were found all over the world. State what would cause all trilobites to disappear within a relatively short time frame.

1 mark

c. In the late Devonian period it is believed that global cooling lead to a lack of oxygen in the oceans. This is referred to as anoxia. What effect would anoxic oceans have on marine species? Why would this effect occur?

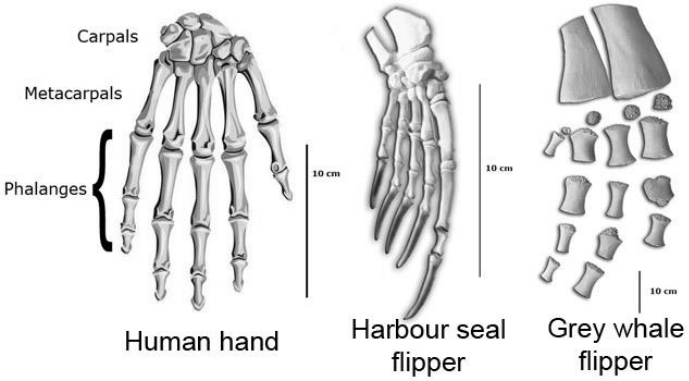
2 marks

d. Extensive glaciation is believed to have occurred at the end of the Ordovician period. As a result, a significant amount of the earth's water was locked in ice. Would this event have had a greater impact on marine organisms or terrestrial organisms? Provide a reason to support your answer.

2 marks

Question 4 (4 marks)

The following diagram shows an anatomical comparison between a human hand, a seal flipper and a whale flipper. All of these organisms are members of the Mammalia class.



a. Describe the similarities between these three structures.

1 mark

b. What term is applied to these common features?

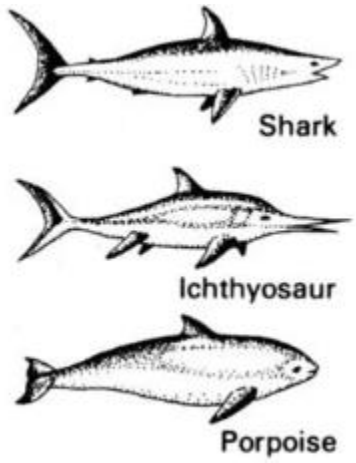
1 mark

c. Identify a plausible conclusion that could be drawn based on these similarities. Explain the mechanism that results in this similarity.

2 marks

Question 5 (8 marks)

The diagram below shows a comparison between a shark, a porpoise and an extinct species, the ichthyosaur.



a. Identify a conclusion that could be made based only upon the appearance of these three organisms, and no other information. Explain why this conclusion might be made.

2 marks

b. Upon further analysis, it has been determined that a shark is a type of fish, an ichthyosaur is a type of reptile and a porpoise is a kind of mammal. Identify the term that is used to describe the similar features that these organisms possess.

1 mark

c. Explain why these organisms all have similar features.

1 mark

d. Identify the type of evolutionary pattern that has occurred in this example. Provide a reason to support your answer.

2 marks

e. The ichthyosaur species has been extinct for millions of years, however, diagrams and models of ichthyosaurs are still produced. Identify two pieces of information that can be used to recreate images of what ichthyosaurs looked like.

2 marks

END OF KEY TOPIC TEST