



VCE BIOLOGY 2016

YEAR 12 UNIT 4

Topic Test 2 – Change Over Time

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Time allowed: 50 minutes

Total marks: 40

14 Multiple Choice Questions

4 Short Answer Questions

An Answer Sheet is provided for Section A.

Answer all questions in Section B in the space provided.

Learning Materials by Lisachem

PO Box 2018, Hampton East, Victoria, 3188

Ph: (03) 9598 4564 Fax: (03) 8677 1725

Email: orders@learningmaterials.com.au or orders@lisachem.com.au

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STUDENT NUMBER

Letter

Figures								
Words								

Student Name.....

VCE Biology 2016 Year 12 Topic Test 2 Unit 4**Change Over Time****Student Answer Sheet**

There are **14 Multiple Choice** questions to be answered by circling the correct letter in the table below. Use only a 2B pencil. If you make a mistake, erase and enter the correct answer. Marks will not be deducted for incorrect answers.

Question 1	A	B	C	D	Question 2	A	B	C	D
Question 3	A	B	C	D	Question 4	A	B	C	D
Question 5	A	B	C	D	Question 6	A	B	C	D
Question 7	A	B	C	D	Question 8	A	B	C	D
Question 9	A	B	C	D	Question 10	A	B	C	D
Question 11	A	B	C	D	Question 12	A	B	C	D
Question 13	A	B	C	D	Question 14	A	B	C	D

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SECTION A – Multiple Choice Questions

Question 1

A small colony of frogs had **two** distinct phenotypes for body colour: green and brown. Due to selection pressures, the percentage of the allele that coded for the green body colour over time became 0% and the allele for brown body colour became 100%.

The alleles for brown and green body colour in this colony are said to be

	Brown	Green
A.	Fixed	Extinct
B.	Complete	Lost
C.	Monogenic	Extinct
D.	Entire	Removed

Question 2

Which population would remain the most stable in terms of allele frequencies?

- A. A large population with gene flow.
- B. A small population with random mating.
- C. A small population with low levels of mutation.
- D. A large population with no selection pressures.

Question 3

When the amino acid sequences for insulin produced by three different species of animals were compared, the following results were found.

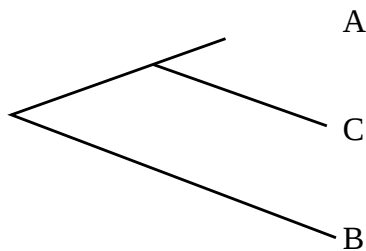
Species A + B = 85% identical sequence.

Species A + C = 92% identical sequence.

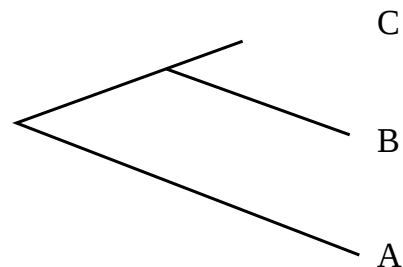
Species B + C = 89% identical sequence.

The cladogram that would best represent this sequence would be

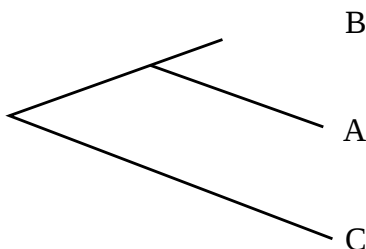
A.



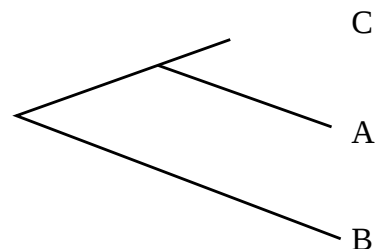
B.



C.



D.



Use the information shown in **Figure 1** to answer Questions 4 and 5.

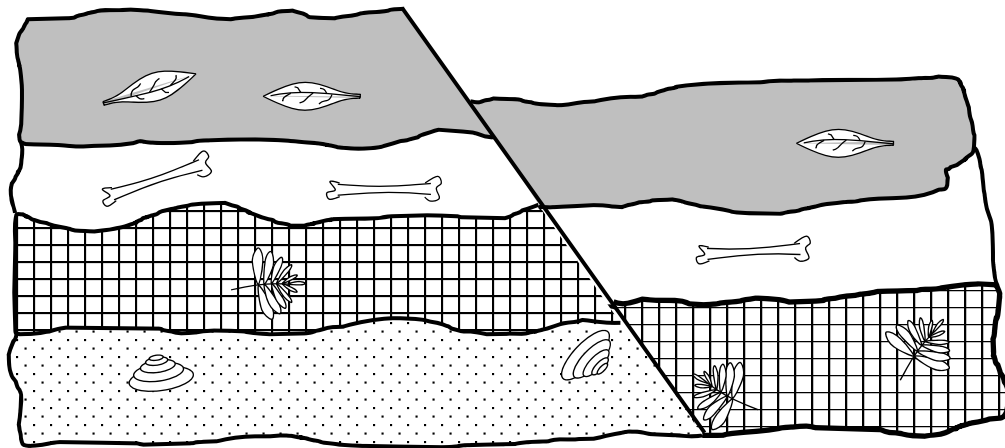
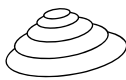


Figure 1

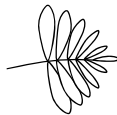
Question 4

According to **Figure 1** which fossil would be the oldest?

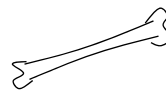
A.



B.



C.



D.



Question 5

The leg bone shown in **Figure 1** is believed to come from a dinosaur from the Mesozoic period which was over 65 million years ago. What would be the best way to determine its precise age?

- A. Carbon-14 dating.
- B. Argon/Potassium dating.
- C. Comparison to index fossils.
- D. Measuring its depth in the soil.

Question 6

What properties must a fossil possess to be considered useful as an index fossil?

- A. Very common but only for a short period of time.
- B. Very common for a long period of time.
- C. Rare and only existed during a short period of time.
- D. Rare but existed over a long period of time.

Question 7

Radioactive isotopes are useful for dating fossils since they decay at a defined rate.

Carbon-14 has a half-life of 5500 years. If a wooden spear believed to be approximately 22,000 years old was compared to a modern wooden spear the amount of carbon -14 would be approximately

- A. $\frac{1}{4}$
- B. $\frac{1}{8}$
- C. $\frac{1}{16}$
- D. $\frac{1}{32}$

Question 8

In a population of birds there are three distinct phenotypes with regard to check colour: yellow, white and red. This population of birds would be showing

- A. a monomorphic trait.
- B. discrete variation.
- C. continuous variation.
- D. sexual dimorphism.

Question 9

Which one of the following is an example of a germ line cell?

- A. A cell from a cow udder.
- B. Pollen from a daisy.
- C. A petal cell from a rose.
- D. A root cell from a pine tree.

Question 10

Birds and bats are both capable of flight even though their common ancestor did not have this ability. The development of the ability to fly is an example of

- A. divergent evolution.
- B. convergent evolution.
- C. allopatric speciation.
- D. punctuated equilibrium.

Use the information in **Figure 2** to answer Questions 11 and 12.

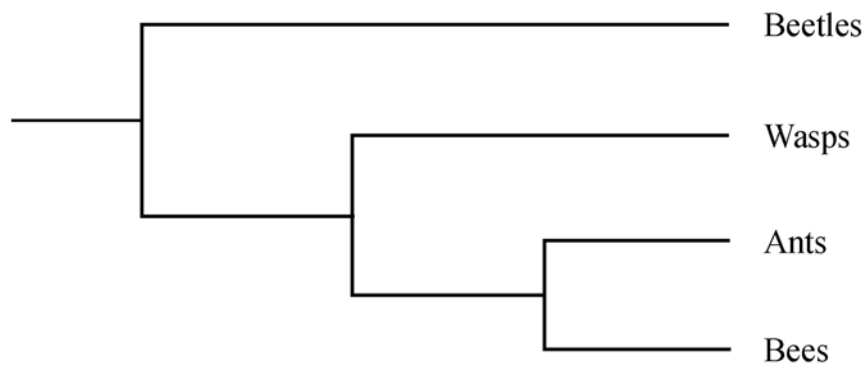


Figure 2: An insect cladogram

Question 11

According to the cladogram in **Figure 2**, which two groups of insects are the most closely related?

- A. Beetles and wasps.
- B. Wasps and ants.
- C. Ants and bees.
- D. Bees and wasps.

Question 12

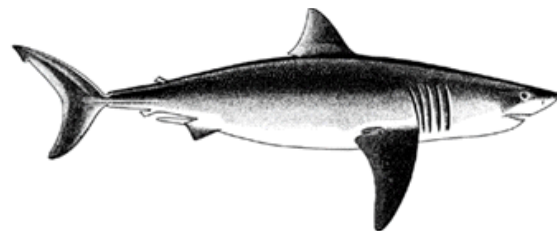
The most accurate method of determining the evolutionary relationship between the insects shown in the **Figure 2** cladogram would be by conducting a comparison of their

- A. embryos.
- B. analogous structures.
- C. amino acid sequences in their proteins.
- D. DNA sequences.

Question 13



Ichthyosaur



Shark

Figure 3

An ichthyosaur was a marine reptile that hunted fish in prehistoric oceans. Its shape is remarkably similar to that of a shark, as shown in **Figure 3**. This similarity of shape is due to

- A. both species adapting to a similar environment.
- B. both species having a common ancestor with the same shape.
- C. both species converging over time into one species.
- D. ichthyosaurs adapting over time and evolving into sharks.

Question 14

Which one of the following is **not** an example of cultural evolution?

- A. Speaking a language.
- B. Being able to walk on two legs.
- C. Use of clothing.
- D. Burying the dead.

End of Section A

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SECTION B – Short Answer Questions

Question 1 (13 marks)

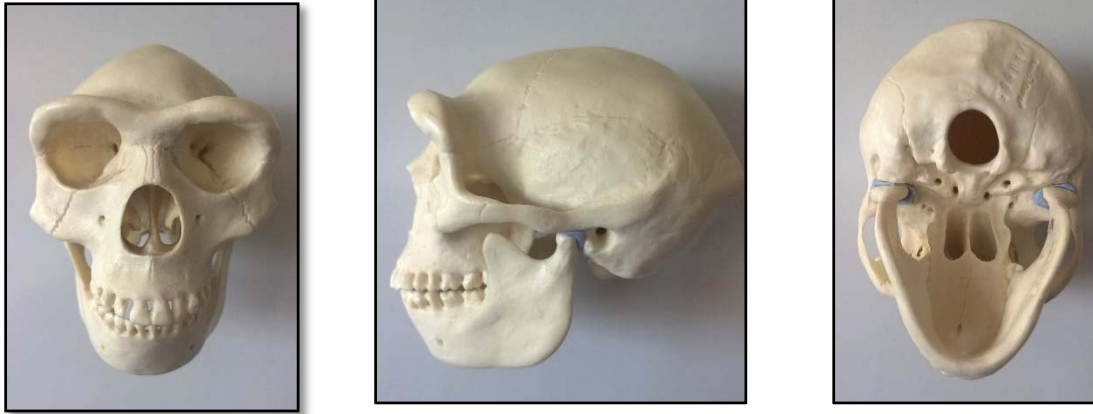


Figure 4: Model of *Homo erectus*

- a. **Figure 4** shows a full model skull of *Homo erectus*, an ancestor of modern humans. Name a feature of the skull that led scientists to suggest that *Homo erectus* walked upright and explain its significance.

2 marks

- b. What term is given to describe the ability to walk on two legs?

1 mark

- c. State and describe **two** other structural features that could be found elsewhere on the skeleton of *Homo erectus* that would support the idea that *Homo erectus* was capable of walking on two legs.

4 marks

Homo erectus is believed to be the first human ancestor to have used fire in a controlled way.

- d. Is the use of fire considered to be an example of biological or cultural evolution? Justify the answer given. **2 marks**

- e. Name **two** ways the use of fire could have benefitted *Homo erectus*. **1 mark**

- f. *Homo erectus* was also the first human ancestor to leave Africa and populate other continents like Europe and Asia. Explain how the use of tools meant that *Homo erectus* was now less limited by Darwin's concept of survival of the fittest, compared to other species of animals and plants that existed at that time. Include a specific example of the use of a tool other than fire in the answer provided. **3 marks**

Question 2 (4 marks)

Plants that live in nitrogen poor soil often struggle to survive. Some plants like the Venus flytrap manage to obtain their nitrogen needs from insects. Another plant that lives in a nitrogen deficient environment is the Bird Catcher tree. When the Bird Catcher tree is fully grown it produces fruit that is incredibly sticky. When feeding on the fruit of the Bird Catcher tree, birds and even small rodents can sometimes become trapped and die.

- a. Describe how the trait of producing sticky fruit has evolved from other closely related trees that do not produce sticky fruit and explain why trapping birds and insects would be beneficial to the plant. **3 marks**

- b. How would scientists determine whether the Bird Catcher tree is a separate species to other closely related trees? **1 mark**

Question 3 (4 marks)

Humans can be classified in a phylogenetic tree based on a variety of features. For each level of the tree shown in **Figure 5** state a feature that is specific to each level of classification.

MAMMALS



PRIMATES

a. _____ **1 mark**



HOMINOID

b. _____ **1 mark**

(Greater and Lesser Apes)



HOMININ

c. _____ **1 mark**



Homo

d. _____ **1 mark**

Figure 5

Question 4 (5 marks)

Some species of oranges are naturally seedless. This makes them popular amongst fruit growers and home gardeners. As a result, seedless orange trees now exist throughout the world.

- a. Is this spread of seedless orange trees throughout the world an example of natural or artificial selection?

1 mark

- b. Explain how the seedless orange tree developed and increased in numbers despite the tree's inability to produce seeds of its own.

2 marks

- c. What would you expect to see if the DNA of a seedless orange from Australia was compared to the DNA of a seedless orange from America? Explain why.

2 marks

End of Section B

End of Topic Test

Suggested Answers

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SECTION A – Multiple Choice Answers

- | | | | | | | |
|------|------|-------|-------|-------|-------|-------|
| 1. A | 2. D | 3. D | 4. A | 5. B | 6. A | 7. C |
| 8. B | 9. B | 10. B | 11. C | 12. D | 13. A | 14. B |

SECTION B – Short Answer (Answers)

Question 1 (13 marks)

- a. Foramen magnum **(1 mark)** is the hole at the base of the skull. This is close to the centre of the skull to allow the skull to balance on top of the spine when upright **(1 mark)**.
or
Sloping face **(1 mark)** features of the face are more vertical than predecessors which allowed *Homo erectus* to look forward when standing upright **(1 mark)**.
- b. Bipedalism **(1 mark)**.
- c. Any **two** of the following:
- Big toe in line with other toes **(1 mark)** allows the foot to roll when walking **(1 mark)**.
 - Flared Hips **(1 mark)** which support a large gluteus maximus required for upright walking **(1 mark)**.
 - Angled femur **(1 mark)** places the legs under the body, allowing greater balance **(1 mark)**.
 - S shaped spine **(1 mark)** acts as a shock absorber against the spine jarring when walking upright **(1 mark)**.
- d. The use of fire is evidence of cultural evolution **(1 mark)** since it needs to be taught to be passed on from one generation to the next **(1 mark)**.
- e. Any **two** of the following for **(1 mark)**.
- Cooking food
 - Warmth
 - Light at night
 - Protection
- f. Survival of the fittest meant that only those individuals most suited to the environment survived and produced offspring **(1 mark)**. Tools allowed *Homo erectus* to alter its environment to suit itself and increase its chances of survival **(1 mark)** e.g. cooking food gave *Homo erectus* more nutrients from the food which gave a greater chance of survival when food was scarce **(1 mark)** (Any other reasonable example is allowed).

Question 2 (4 marks)

- a. There was variation within the original population of trees, with some producing stickier fruit than others **(1 mark)**.
Producing sticky fruit became a trait which was selectively advantageous since when the fruit and bird or rodent fell and rotted it provided nitrogen for the next generation of seeds that were in the fruit **(1 mark)**.
These trees thrived and passed the sticky fruit gene to their offspring **(1 mark)**.
- b. If enough changes have occurred in the DNA of the Bird Catcher trees over time that they cannot produce viable offspring when crossed with non-sticky fruit trees, then they are considered to be a separate species **(1 mark)**.

Question 3 (4 marks)

PRIMATE	Opposable thumb (1 mark) .
HOMINOID	Lack of a tail or flattened chest (1 mark) .
HOMININ	Upright walking (1 mark) .
Homo	Large brain to body ratio (1 mark) .

Question 4 (5 marks)

- a. Artificial selection **(1 mark)**.
- b. Seedless orange was originally a natural mutation **(1 mark)**. This was selected by man by taking cuttings and planting them, in effect creating clones of the original sterile plant **(1 mark)**.
- c. The DNA of both oranges should be the same or near identical **(1 mark)** since they are reproduced asexually **(1 mark)**.

End of Suggested Answers