

**GRADE 12 LIFE SCIENCES 2022**

**Assignment Term 3: Evolution TOTAL: 50**

**TIME: 60 minutes**

**INSTRUCTIONS AND INFORMATION**

**Read the following instructions carefully before answering the questions.**

1. This is a formal SBA task and needs to be done under supervised conditions in the classroom.
2. Each learner completes this task on his/her own (under test conditions).
3. Present your answers per the instructions of each question.
4. Draw all diagrams in pencil and labels in blue ink.
5. The diagrams in this task may NOT be drawn to scale.

**BACKGROUND INFORMATION**

The theory of evolution has been developed over many years by many different scientists and is regarded as a scientific theory. The word evolution simply means change over time.

**QUESTION 1**

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| The diagrams below represent three ideas proposed to explain evolution. | | |  |
|  |  | |  |
| 1.1 | | What does MYA stand for? | (1) |
| 1.2 | | Give the LETTER of the diagram (**A**, **B** or **C**) that would best represent:  (a) Punctuated equilibrium  (b) Lamarck’s explanation of evolution if there was an environmental change  10mya  (c) Charles Darwin’s explanation of evolution | (1)  (1)  (1) |
| 1.3 | | State a reason why the ‘theory of evolution’ is regarded as a scientific theory. | (1) |
| 1.4 | | Name THREE lines of evidence used to support the theory of evolution. | (3) |
|  | |  | **(8)** |

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| **QUESTION 2** | |  |
| The breeding of three species of distantly related leopard frog (*Rana* spp.) was studied. The different populations of frog species are geographically isolated from each other and have different ecological niches as shown in the diagram below. The graph shows the number of times researchers observed frogs mating during field trips. | |  |
|  | **Three populations of leopard frog species.A picture containing text, frog  Description automatically generated** |  |
|  | |  |
| |  | | --- | | A picture containing table  Description automatically generated | | |  |
|  | [Adapted:<https://www.ets.org/s/gre/pdf/practice\_book\_biology.pdf> ; <https://slideplayer.com>] |  |
| 2.1 | The four statements in the table below refer to the information in the diagram and graph above. For each statement decide whether: |  |
|  | **A** the statement is supported by the information in the graph/diagram  **B** thestatement is contradicted by the information in the graph/diagram  **C** thestatement is neither supported nor contradicted by the information in  the graph/diagram  Write only A, B or C next to the question number. |  |
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| |  |  | | --- | --- | |  | **Statement** | | (a) | *Rana berlandieri* is observed to breed all year round. | | (b) | All three species of leopard frog live in the same ecological niche. | | (c) | Over 20 mating events were observed for *Rana blairi.* | | (d) | *Rana sphenocephala* only mates from January to March every year. | | | (4) |
| 2.2 | Identify the mechanism of reproductive isolation illustrated by the *Rana* spp. | (1) |
|  |  | **(5)** |
| **QUESTION 3** | |  |
| Read the following information on natural selection in mice. | |  |
| |  | | --- | | Researchers have studied aspects of natural selection in fur colour variation in populations of mice of the same species where they occur on the coast and adjacent inland areas. Over the last 60 years, they have noted a change in fur coat colour in the mice populations. Most of the mice living inland have brown fur, while the mice living on the sand dunes of coastal regions have lighter brown or white fur.  A picture containing text, mammal, squirrel, rodent  Description automatically generated  **Sand colour**  **Sand colour**  Researchers tested a hypothesis that predators drove the natural selection of mouse fur colour. They made plasticine models of white and brown mice. They placed the mice models in fields inland and on sand dunes at the coast. They recorded the percentage of the models that were attacked by predators. The results are shown in the following graph:  Chart, bar chart  Description automatically generated**Graph showing percentage of attacks on mouse models inland and on sand dunes on the coast.** | | | |
| [Source: Vignieri, S.N., J.G. Larson, and H. E. Hoekstra. 2010 Evolution 64: 2153–2158; <<https://www.pearson.com>>] | |  |
| 3.1 | 1. Identify the dependent variable in the investigation. | (1) |
|  | 1. What percentage of white mice models were attacked in the sand dunes? | (1) |
|  | 1. What is the difference in the percentage of brown mice models that were attacked in the sand dunes and in the inland fields? Show all working. 2. Explain how the results support the researchers' hypothesis that predation drove the natural selection of mouse fur colour. | (2)  (4) |
| 3.2 | Use Darwin's theory of natural selection to explain how the population of mice on the coast evolved white fur. | (5) |
|  |  |  |
| 3.3 | Tabulate THREE differences between natural selection and artificial selection. | (7) |
|  |  | **(20)** |

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| **QUESTION 4** | |  |
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| Study the phylogenetic tree of nine elephant species over six epochs along geologic time from 55 mya to the present. | |  |
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| 4.1 | According to the phylogenetic tree above, which is the common ancestor of ALL the named species? Provide the NAME. | (1) |
| 4.2 | Provide the names of TWO species of elephants that exist today. | (2) |
| 4.3 | Name the recent ancestor of the two species mentioned in QUESTION 4.2. | (1) |
| 4.4 | In which epoch did the: |  |
|  | a) *Anancus* species start its own course of evolution? | (1) |
|  | b) *Stegodon* species become extinct? | (1) |
| 4.5 | How long did the Oligocene epoch last? Show all workings. | (3) |
|  |  | **(9)** |
| **QUESTION 5** | |  |
| Female gallflies lay eggs on the stems of plants. The eggs hatch to form larvae that secrete a substance into the plant tissue. The secretions cause the plant cells to grow and form ball-like structures, called galls, which are high in nutrients. Predatory birds feed on the larvae in the galls. The size of the galls produced actually depends on genetic variation in the gallfly. The diagram below shows the gallfly and a gall on a plant stem. | | |
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| Scientists wanted to investigate whether the size of the galls had an effect on the percentage of gallfly larvae killed by predatory birds. The table below shows the results of their investigation. | | |
| 5.1 | State the independent variable. | (1) |
| 5.2 | State why the size of the galls produced is an example of continuous variation. | (1) |
| 5.3 | Draw a line graph to represent the information in the table. | (6) |
|  |  | **(8)** |
|  |  | **[50]** |