SKILLS AND APPLICATIONS TASK

SUMMATIVE ASSESSMENT TASK

TOPIC 4: EVOLUTION TEST

Purpose and Background Information of the Assessment Task: To have the opportunity to show your in-depth knowledge and understanding of the concepts taught in the Topic 4: Evolution.

TASK DESCRIPTION:

The test will be conducted under supervision.

Time: 90 minutes + 5 mins reading time

The test will contain the following questions:

Part A: Multiple Choice Questions

Part B: Short Answer Questions including Science as an Inquiry

Part C: Extended Response

The amount of space is an indicator on how much you should write.

Use of appropriate Biological Terminology will be assessed.

You may use a calculator.

*Note to teacher:*

*This test could be provided to students as an electronic test with text boxes inserted in the spaces for students to insert their answers. Access to the internet and other resources would be disabled.*

| - | Investigation, Analysis, and Evaluation | Knowledge and Application | |
| --- | --- | --- | --- |
| A | Critically deconstructs a problem and designs a logical and coherent biological investigation with detailed justification.  Obtains, records, and represents data, using appropriate conventions and formats accurately and highly effectively.  Systematically analyses and interprets data and evidence to formulate logical conclusions with detailed justification.  Critically and logically evaluates procedures and their effect on data. | | Demonstrates deep and broad knowledge and understanding of a range of biological concepts.  Applies biological concepts highly effectively in new and familiar contexts.  Critically explores and understands in depth the interaction between science and society.  Communicates knowledge and understanding of biology coherently, with highly effective use of appropriate terms, conventions, and representations. | |
| B | Logically deconstructs a problem and designs a well-considered and clear biological investigation with reasonable justification.  Obtains, records, and represents data, using appropriate conventions and formats mostly accurately and effectively.  Logically analyses and interprets data and evidence to formulate suitable conclusions with reasonable justification.  Logically evaluates procedures and their effect on data. | | Demonstrates some depth and breadth of knowledge and understanding of a range of biological concepts.  Applies biological concepts mostly effectively in new and familiar contexts.  Logically explores and understands in some depth the interaction between science and society.  Communicates knowledge and understanding of biology mostly coherently, with effective use of appropriate terms, conventions, and representations. | |
| C | Deconstructs a problem and designs a considered and generally clear biological investigation with some justification.  Obtains, records, and represents data, using generally appropriate conventions and formats, with some errors but generally accurately and effectively.  Undertakes some analysis and interpretation of data and evidence to formulate generally appropriate conclusions with some justification.  Evaluates procedures and some of their effect on data. | | Demonstrates knowledge and understanding of a general range of biological concepts.  Applies biological concepts generally effectively in new or familiar contexts.  Explores and understands aspects of the interaction between science and society.  Communicates knowledge and understanding of biology generally effectively, using some appropriate terms, conventions, and representations. | |
| D | Prepares a basic deconstruction of a problem and an outline of a biological investigation.  Obtains, records, and represents data, using conventions and formats inconsistently, with occasional accuracy and effectiveness.  Describes data and undertakes some basic interpretation to formulate a basic conclusion.  Attempts to evaluate procedures or suggest an effect on data. | | Demonstrates some basic knowledge and partial understanding of biological concepts.  Applies some biological concepts in familiar contexts.  Partially explores and recognises aspects of the interaction between science and society.  Communicates basic biological information, using some appropriate terms, conventions, and/or representations. | |
| E | Attempts a simple deconstruction of a problem and a procedure for a biological investigation.  Attempts to record and represent some data, with limited accuracy or effectiveness.  Attempts to describe results and/or interpret data to formulate a basic conclusion.  Acknowledges that procedures affect data. | | Demonstrates limited recognition and awareness of biological concepts.  Attempts to apply biological concepts in familiar contexts.  Attempts to explore and identify an aspect of the interaction between science and society.  Attempts to communicate information about biology. | |

Part A: Multiple Choice Questions. Put the correct letter corresponding to each question in the answer box provided at the end of the section. Each multiple choice question is worth one mark.

1. A change in the mixture of species in an area over time is called

J. succession.

K. genetic variability.

L. speciation.

M. geographic isolation.

1. Skinks are smooth-scaled lizards that are found in a variety of habitats.

Which one of the following differences is *least likely* to prevent two species of skink from interbreeding?

J. The two species have different-coloured skin.

K. Males of different species have different mating rituals.

L. The two species colonise different parts of a desert community.

M. Females of different species are fertile in different months of the year.

1. Which one of the following statements best describes a gene pool?

J. The sum of all the individuals of a single species

K. All of the genetic information in an interbreeding population.

L. The sum of all the genes of a community.

M. All of the genes in an individual.

1. Which one of the following statements about the fossil record is *not* correct?

J. shows some of the organisms that have lived on Earth.

K. indicates which organisms evolved from other organisms.

L. provides evidence for how long life has existed on Earth.

M. supports the theory that simple prokaryotic organisms existed before eukaryotic organisms.

1. Genetic drift is

J. the result of cross breeding between species.

K. the random change of allele frequency in a population.

L. able to facilitate speciation.

M. responsible for the introduction of mutations to populations.

1. Adaptive radiation

J. occurs in all organisms.

K. causes the evolution of new species.

L. enables organisms to occupy a specific niche.

M. occurs with convergent evolution.

1. Which one of the following statements is *not* supported by current evidence?

J. A mutation may have no effect on future generations.

K. A mutation can be brought about by environmental factors.

L. A mutation is usually of benefit to the organism that inherits it.

M. A mutation may involve a change in gene structure.

1. Refer to the following table, which shows the number of differences in the amino acid sequence of the protein albumin in four species of primate:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Monkey | Gibbon | Gorilla | Human being |
| Human Being | 32 | 14 | 8 | 0 |
| Gorilla | 32 | 14 | 0 |  |
| Gibbon | 32 | 0 |  |  |
| Monkey | 0 |  |  |  |

Which two species are likely to have separated most recently in evolutionary time?

J. Monkey and human being

K. Gibbon and gorilla

L. Gorilla and monkey

M. Human being and gorilla

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Answer |  |  |  |  |  |  |  |  |

Marks: /8

Part B: Short Answer Questions.

Please answer all questions in the space provided.

1. There are a number of theories about why Cheetah numbers are low in the wild. Some scientists consider the reason to be habitat destruction and over-hunting, while other scientists believe it is due to the near extinction of the cheetahs near the end of the last ice age, 10-20,000 years ago. It is believed that the Cheetah species was reduced to one single family group.
2. State the probable outcome and describe the effect this outcome could have had on the population of cheetahs today if their species numbers had been reduced to a single family group. [3]
3. Identify the likely outcome that will follow if species are not able to recover from low population numbers. [1]
4. Give one example of an organism that was **not** able to recover from low population numbers due to human activity. [1]

Human population growth and associated activities such as habitat destruction and overhunting impact ecosystems and the resources contained within those ecosystems.

1. Using examples, describe why humans have an ethical obligation to preserve the biosphere. [4]
2. Refer to the following diagram, which shows a green sulphur bacterium. Green sulphur bacteria are anaerobic photoautotrophic bacteria. Although they have no chloroplasts, they are able to photosynthesis by using infoldings of the cell membrane called ‘chlorosomes”.



1. Explain the role of a highly folded structure such as a chlorosome to maximise the use of low light levels for photosynthesis. [3]
2. Write the chemical equation for photosynthesis. [2]
3. Chloroplasts are specialised photosynthetic organelles found in some eukaryotic cells. Explain the process that is thought to have resulted in the presence of chloroplasts in photosynthetic eukaryotic cells. You may use a labelled diagram in your answer. [4]
4. It is believed that a common ancestor led to the evolution of mammals. Two common features of all mammals are hair and mammary glands. The most primitive group of mammals, known as the Monotremes, are egg-laying. All other mammals give birth to live young rather than hatch eggs. These mammals can be further classified into two groups, the marsupials and eutherians. All mammals in these groups possess a placenta. Eutherians evolved as a distinct group from Marsupial mammals, to give rise to the majority of mammals on Earth today. Only Eutherian mammals have long gestation periods inside the uterus.
   1. Draw a table to summarise the information about the different traits found in each type of mammal as outlined in the passage above.

Include: Presence of Hair, Mammary Glands, and Placenta and the length of gestation. [4]

* 1. Using the information in the table or passage above, construct a phylogenetic tree to show the evolution of the three groups of mammals. [4]

1. There are many hypotheses about the evolution of the first cells. All living cells have common features including the cell membrane and presence of nucleic acids.
   1. Draw a schematic diagram of the cell membrane that is represented by the Fluid Mosaic Model. [4]

Ribozymes, are made from RNA (Ribonucleic Acid). It has been suggested that these molecules played a very important role in the evolution of cells.

* 1. State where in a cell ribozymes may be found. [1]
  2. Describe the possible role of RNA and ribozymes in the evolution of the first simple cells. [3]

1. Scientists at the Universities of Chicago, Wisconsin and Nebraska, using government funding, have created the first genetically modified animals containing reconstructed ancient genes. The research published online in the journal, *Nature Ecology and Evolution*, is important as it contributes to our understanding about the genetic basis of adaptation and evolution. It has potential applications to how genes change, and the effect this has on certain genetic disorders or diseases. The study published used new technologies in digital analysis of genetic sequences and the engineering of transgenic animals.

Using the information provided, explain how this study highlights the interaction between science and society. [6]

Part C: Extended Response Question

1. Evolution can result in new species. A widely used definition of a species is “*a group of actually or potentially interbreeding populations that produce fertile offspring*”

* Explain, using examples, the limitations of the definition above to describe a species.
* Describe the process of allopatric speciation.
* Using examples, describe how similar selective pressures in different environments may lead to convergent evolution.

1¾ pages of lines provided. [15]

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