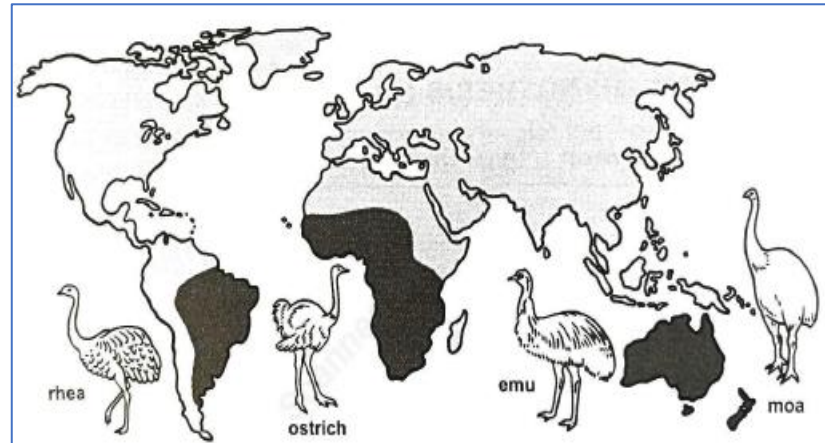




SUBJECT and GRADE	Life Sciences Grade 12	
TERM 2	Term 2 (Week 1 and 2)	
TOPIC	Evolution (evidence for evolution, variation, theories of evolution)	
AIMS OF LESSON	At the end of this lesson you should be able to: <ul style="list-style-type: none">• Define terminology such as biological evolution, biological species, population etc.• Differentiate between a hypothesis and a theory and continuous and discontinuous variation• Identify the different types of evidence for evolution• Know the sources of variation in a population• Understand and apply the different theories of evolution	
RESOURCES	Paper based resources	Digital resources
	Refer to: <ul style="list-style-type: none">• Your textbook sections on different kinds of evidence for evolution i.e. fossil record, biogeography, modification by descent and genetics• Your textbook sections on the difference between a hypothesis and a theory• Your textbook sections on sources of variation• Your textbook sections on continuous and discontinuous variation• Your textbook sections on the different theories of evolution• Pages 65 to 69 in your Mind the Gap Study Guide	Click on links below to download online resources on this topic/s: Refer to pages 14 – 16 in the Grade 12 Telematics learner workbook 2016: https://drive.google.com/file/d/17qzbJGZXTm7VNDzAfe59wpkj-WGN2wAc/view?usp=sharing Refer to PowerPoint slides of theories of Evolution: https://drive.google.com/file/d/14UWPpdBUIMaFs02g56W2HzhKqjhYK4Nq/view?usp=sharing Watch Telematics videos on natural selection, punctuated equilibrium and speciation at: https://bit.ly/2lq6Lzl
INTRODUCTION	<ul style="list-style-type: none">• You have studied some of the types of evidence for evolution in Grade 10 e.g. fossil evidence and biogeography. Remember that a fossil is an organism or the remains, imprints or footprints of an organism, usually preserved in rock. Fossils provide evidence of the history of extinct organisms on earth. The term 'biogeography' refers to the study of the distribution of existing and extinct organisms across the continents e.g. flightless birds such as the ostrich in Africa, the emu in Australia and the rhea in South America show great similarities although they live on different landmasses and belong to separate species (refer to distribution map of flightless birds below).	



- In your study of plants and animals in Grade 11, you learnt about **descent with modification** i.e. the basic body plans of different plant and animal groups were modified and these modifications provide evidence of evolutionary change. For example, the forelimbs of various vertebrates like amphibians, reptiles, birds and mammals perform different functions, but show the same basic body plan. These similar structures with the same body plan that perform different functions are known as **homologous structures**.
- In your study of the topic 'Genetics' in Grade 12 in term 1 you have learnt that **closely related organisms have more similarities in their DNA** which also serves as evidence for evolution
- In your study of the topic 'Meiosis' in Grade 12 in term 1 you have learnt that **crossing over and random arrangement** of chromosomes lead to genetic variation in a population. Remember that crossing over involves the exchange of genetic material during Prophase I of meiosis. Random arrangement of chromosomes during Metaphase I and Metaphase II takes place when chromosomes arrange at the equator randomly/in different combinations and this will result in genetic variation in the gametes produced at the end of meiosis.
- In your study of the topic 'Genetics' in Grade 12 in term 1 you have learnt that **mutations** are changes in the sequence of nucleotides in the DNA which may lead to changes in the amino acid sequence of a protein. Mutations are therefore also sources of variation.



CONCEPTS AND SKILLS

Study the following definitions. (Note that at least 2 marks are awarded if you can define a term correctly in the examination)

Biological evolution – genetic changes in a population that are inherited over successive generations due to natural selection. This can ultimately result in the formation of a new species

Hypothesis - A tentative explanation of a phenomenon that can be tested.

Theory - An explanation for something that has been observed in nature and which can be supported by facts, laws and tested hypotheses.

Biogeography - The distribution of species in different parts of the world.

Population - a group of organisms of the same species found in the same habitat at the same time

Species - a group of organisms with similar characteristics that are able to interbreed to produce fertile offspring

Continuous variation – Type of variation within a population in which there is a range of intermediate phenotypes e.g. height and skin colour in humans

Discontinuous variation - The type of variation in a population with no intermediate phenotypes e.g. bloodgroups.

Study the generic account of the following theories of evolution:

- Lamarck’s theory of evolution:
- Darwin’s theory of evolution by natural selection

Know the meaning of instructional verbs in test and examination questions e.g.

Instructional verb	Meaning
Name	Give the name of something
Differentiate	Use differences to qualify between two or more categories
Tabulate	Draw a table and indicate the answers as direct pairs.
Describe	State in sentences the main points of a process
Explain	Give your answer in a cause-effect or statement and reason sequence
Compare	Give similarities and differences between concepts

Answer the following questions:

Question 1

Name FOUR sources of variation in a population.

Question 2

Study the list below.

- a. Fossils
- b. Homologous structures
- c. Biogeography
- d. Species

Which combinations of the above can be used as evidence for evolution?



- **Punctuated equilibrium** explaining the speed at which evolution takes place

Make sure that you know the generic account of the theories of Darwin and Lamarck

You should also be able to apply the theories of Lamarck and Darwin on given examples in an examination.

Generic accounts of the theories of Darwin and Lamarck and punctuated equilibrium:

Lamarck explained evolution using the following two 'laws':

- **The inheritance of acquired characteristics:** Characteristics developed during the life of an individual (acquired characteristics) can be passed on to their offspring.
- **The law of use and disuse:** As an organism uses a structure or organ more regularly, it becomes better developed or enlarged. If an organism does not use a structure or organ frequently, it becomes less developed or reduced in size and may disappear altogether.

Darwin's theory of evolution by natural selection:

- There is a great deal of **variation** amongst the offspring.
- Some have favourable characteristics and some do not.

Question 3

Differentiate between continuous variation and discontinuous variation

Question 4

Differentiate between random arrangement and random assortment of chromosomes

Question 5

Tabulate THREE differences between Lamarckism and Darwinism (Remember 1 mark is allocated to the drawing of a table in the examination)

Question 6

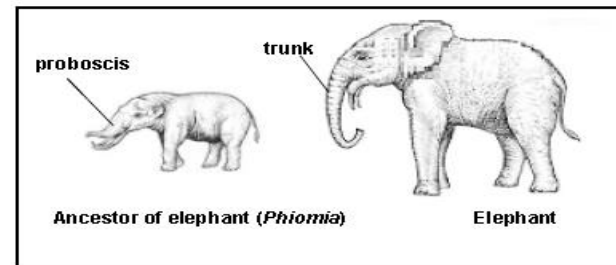
Describe how Lamarck explained evolution.

Question 7

Describe how Darwin explained evolution.

Question 8

An ancestor of the elephant, *Phiomia*, had a long nose-like structure called a proboscis which evolved into the trunk of the elephant. The proboscis was used to gather leaves as food. The proboscis of *Phiomia* and the trunk of the elephant are shown below.





- When there is a change in the environmental conditions or if there is competition,
- then organisms with characteristics, which make them more suited, survive
- whilst organisms with unfavourable characteristics, which make them less suited, die.
- The organisms that survive, reproduce and thus pass on the **allele** for the favourable characteristic to their offspring.
- The next generation will therefore have a higher proportion of individuals with the favourable characteristic.

Punctuated equilibrium:

- Evolution involves long periods of time where species do not change or change gradually through natural selection (known as equilibrium).
- This alternates with (is punctuated by) short periods of time where rapid changes occur through natural selection
- during which new species may form in a short period of time.

Common errors made by learners in examinations:

- The naming of meiosis, crossing over and random arrangement of chromosomes as different sources of variation. Note that crossing over and random arrangement of chromosomes are processes taking place during meiosis. Note that meiosis is only accepted as a source of variation if you do not

Explain the evolution of the elephant's trunk in terms of Lamarckism and Darwinism. (Please note that you have to apply your knowledge of the two theories)

Question 9

Compare Darwin's ideas of evolution to the ideas of Punctuated Equilibrium.

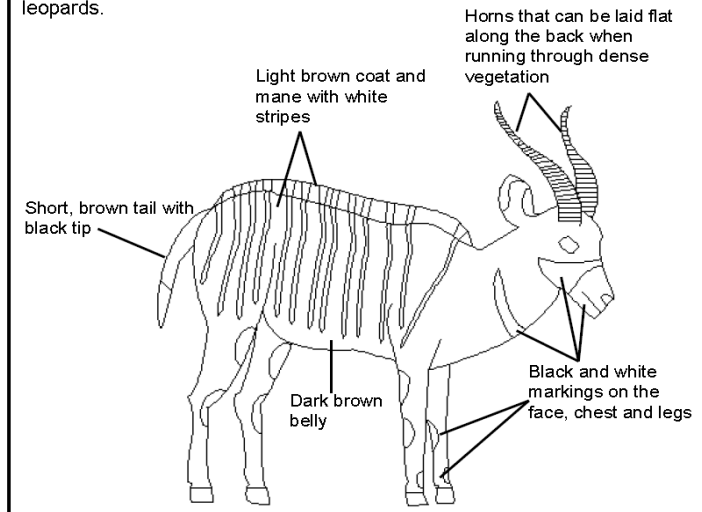
Question 10

Give TWO reasons why Lamarck's ideas are not accepted in the science community today.

Question 11

The extract and the diagram below provide information about a type of antelope called a Bongo.

The Bongo is a large antelope species that is active at night and found in the dense jungles and forests of Africa. The dense forests have very little ground vegetation so the Bongo feeds in forest openings where new herbs and shrubs grow closer to the ground. They are preyed on by lions and leopards.





	<p>mention crossing over and random arrangement of chromosomes.</p> <ul style="list-style-type: none">• Random assortment of chromosomes is not synonymous with random arrangement of chromosomes.• Giving a generic descriptions of evolutionary theories when an application of the theories is required.• Not describing the variation as it applies to the given example in the question when describing Darwin's theory.	<p>Use your knowledge of natural selection and <i>explain</i> how the Bongo's ability to lay its horns along its back could have developed over the years. <i>(Please note that you have to apply your knowledge of the two theories)</i></p>
ACTIVITIES/ASSESSMENT	Complete the activities/questions on the section of evolutionary theories in your textbook. Alternatively work through the questions and activities on page 68 of your Mind the Gap Study Guide	
CONSOLIDATION	<ul style="list-style-type: none">• Define all the terminology relevant to the topic/s covered in this lesson• Write a general explanation of the different theories of evolution• Apply your general knowledge of the different theories of evolution on any other examples/scenarios <p>Note: The knowledge and skills gained in this section will help you to have a better understanding of the following sections of evolution that you still need to deal with i.e.</p> <ul style="list-style-type: none">• Speciation• Evolution in present times and• Human evolution <p>Expanded activity: Conduct research on the following real life-scenarios linked to the topic of natural selection:</p> <ul style="list-style-type: none">• HIV resistance to antiretroviral medication• Resistance of TB bacteria to antibiotics• Resistance of insects to insecticides	
VALUES	I hope that you have noticed that scientific knowledge and understanding has been developed over time by people who were curious and who persevered with their quest for knowledge. Scientific knowledge is dynamic and can change over time.	