Science KS4: Blended Learning Booklet

Stewards Academy

B7 Variation & Evolution

Name:

Form:

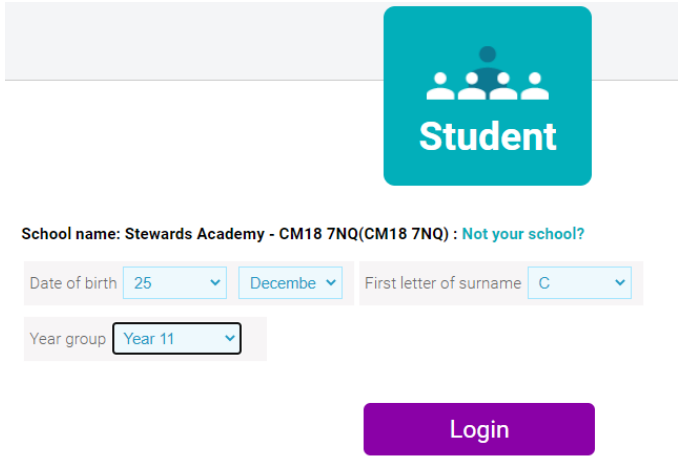
Aim to complete four lessons each week. Watch the videos and follow the four part lesson plan

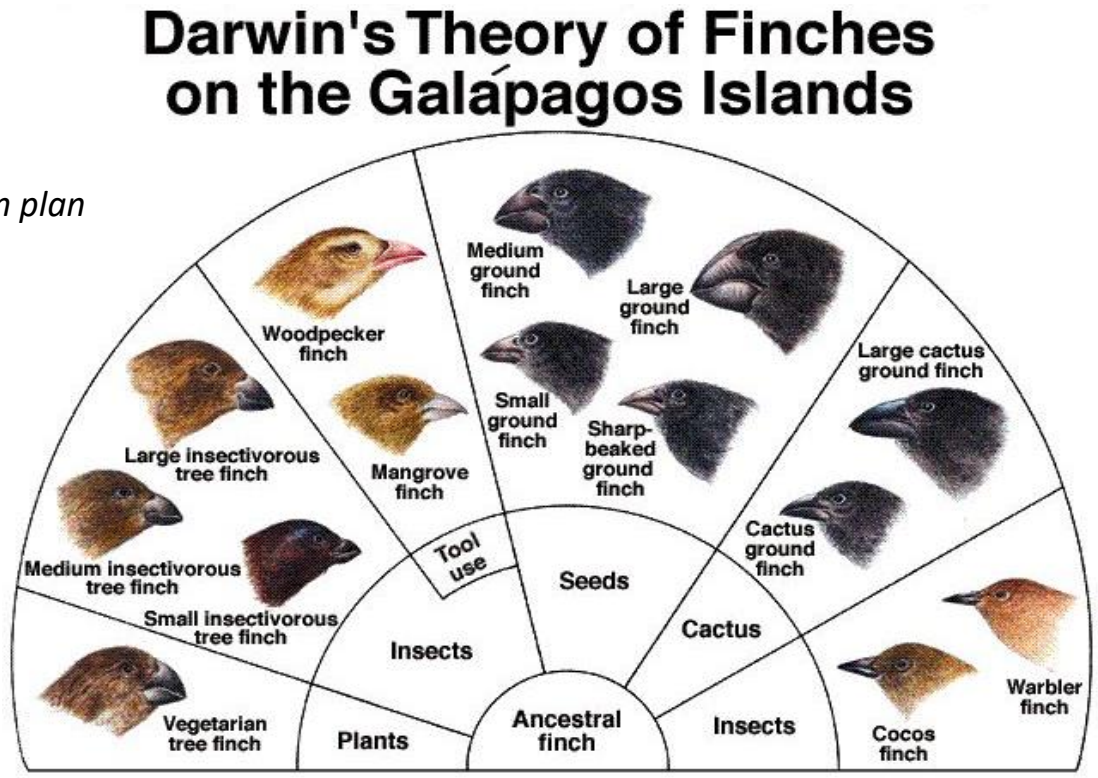
All video clips are online using the ClassCharts link. Upload all work onto ClassCharts for feedback.

The online textbook has all the key information and vocabulary to help you with this unit

To log on to the online textbook:

- https://connect.collins.co.uk/school/portal.aspx
- Type in “stewards” and select Stewards Academy
- Login using your date of birth, initial of your surname and your academic year





Contents

Contents

(T) = Triple scientists only

Big Picture – Year 11 Overview
Science

Next step...

GCSE's Good Luck

End of Unit Test

Gravity (T)

Red-shift (T)

How elements were formed (T)

Life cycle of stars (T)

Moons, planets and artificial satellites (T)

***I will** be able to explain how our solar system is organized and how its existence is affected by the lifecycle of a star (T). **I will** be able to explain how objects move in space and how space itself is ever increasing in size (T). I **will** be able to explain the importance of red-shift as evidence for the Big Bang theory (T). I will be able to describe the importance of the role of gravity in space (T).*

Space

The solar system (T)

UNIT P8 (T)

End of Unit Test

Production and use of fertilisers (T)

Ceramics, polymers and composites (T)

Preventing corrosion and using alloys (T)

Alternative methods of metal extraction

LCA 's and recycling

Sustainability

I will be able to explain how we can sustain resources for future generations. **I will** be able to describe the processes required to make water potable and also process required to treat sewage and waste water. **I will** be able to describe methods for reducing resource waste and lessening the environmental impact of removing resources from the Earth. **I will** be able to describe alternative methods of extracting metals. *Finally, **I will** be able to describe the importance of fertilisers in maintaining food security (T)*

Potable and waste water

Sustainable use of the Earth resources

UNIT C10

End of Unit Test

Food security and biotechnology (T)

Maintaining biodiversity

Waste management and pollution

Land use *and changing environments (T)*

Ecology

I will be able to describe the factors that affect living organisms within a habitat. **I will** be able to explain how plants and animals interact within a habitat. **I will** be able to explain how human activities impact biodiversity. **I will** be able to explain how carbon and water are recycled *and also which factors affect the rate of decay (T)*

Transformers (T)

End of Unit Test

UNIT B8

Investigating ecosystems

Predator prey relationships

Trophic levels and transferring biomass (T)

Water cycle, carbon cycle *and decay (T)*

The generator effect (T)

I will be able to describe the shape of the magnetic field that surrounds a magnet. **I will** be able to explain how an electric current can be used to generate a magnetic field *and give some example of the uses of electromagnets (T)*. **I will** be able to explain how a motor works. ***I will** be able to explain how a transformer works and how this links to supplying electrical energy efficiently.*

Electromagnetism

Loudspeakers (T)

Force on a conductor and electric motors

Electromagnets *and their uses (T)*

Magnetic forces and fields

UNIT P7

End of Unit Test

Atmospheric pollutants and their effects

The Atmosphere

I will be able to describe what the early atmosphere was like and how and why it changed. **I will** be able to explain the consequences of the green house effect, how humans add to the impact of the green house effect and what we can do to reduce this. **I will** be able to describe how various atmospheric pollutants are formed and the effects that they have on the environment.

Carbon footprints

End of Unit Test

UNIT C9

The early atmosphere

Evolution of the atmosphere

Human impact on Greenhouse gases

Global climate change

Survival or extinction

I will be able to explain what causes variation and its effects on the individual. **I will** be able to explain how variation contributes to natural selection *and the evolution of new species.* **I will** be able to describe the causes of extinction.

Variation & Evolution

Classification - The tree of life

Genetic engineering *and cloning (T)*

Natural selection and selective breeding

Darwin and Wallace (T)

Variation and evolution

UNIT B7

Year 11

ZOOM IN...

MY LEARNING JOURNEY:

Subject: Variation & Evolution Year: 11 Unit: B7

AIMS

Students will learn about the scientific discoveries leading to our present ideas of genetics. They will consider the changes humans can cause in the variation within populations through selective breeding, cloning and genetic modification techniques, and debate the ethics of these techniques. Finally, students will study the causes of extinction and explore our role in facilitating these processes.

DEVELOPING COURAGE

C Genetic engineering to ensure food security and treatments for disease

O Evaluate process of genetic modification

U Work togther to protect species from extinction

R Sensible use of antibiotics to prevent microbial resistance

A How Science works to find solutions for the worlds problems

G Share our scientific knowledge

E Debating personal opinions on GMO's

UP NEXT

Ecology

- Ecosystems
- Predator prey relationships
- Adapations
- Recycling & decay
- Waste management
- Land management
- Biodiversity

CAREERS

- Fossil Hunter
- Geneticist
- Genetic Engineer
- Farmer
- Politician.

PREVIOUS LEARNING

Pupils will have some knowledge of there being differences between and within species. They will have been introduced to the idea of variation being important for survival and evolution of a species. They will also be aware that if a species does not adapt it will not survive changes in its environment and will become extinct.

WHAT WE KNOW/ REMEMBER

- .....
- .....
- .....
- .....
- .....

RECOMMENDED READING

1. On The Origin of Species by Sabina Radeva
2. Gmo Sapiens: The Life-Changing Science Of Designer Babies by Paul Knoepfle
3. The Domestic Dog Paperback by Edited by James Serpell

PERSONAL OBJECTIVES

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Lesson 1: B7.1 - Variation

Connection

Have a look at the topic overview and the B7 zoom in.

Populate what you know and your personal objectives.

Activation

LI: Explain that differences in organisms enable them to be adapted to survive in their environment

https://www.youtube.com/watch?v=jUHokSPkzT8

1. Make a note of the title and the LI
2. Read pages 274-275
3. List key words – define those you don't know
4. Make a list of the key words and define those you don't know
5. Copy table on page 274

Demonstration

Attempt questions 1-6.
In 15 mins answer as many questions as you can.
Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Green questions to GCSE Level 3
Blue questions to GCSE Level 6
Purple questions to GCSE Level 9

Consolidation

Complete and self assess the relevant past paper question for this topic - From the B7 DIP file

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Answers: B7.1 - Variation

Connection

1 NA
2 NA
3 NA

Demonstration

1 genetic variation: blood group; eye colour; natural colour of hair; shape of earlobe; other reasonable answers environmental variation: dyed hair colour; hair length; scars; tattoos; other reasonable answers.

2 height; skin colour; weight; sporting achievements.

3 it is adapted/has adaptations that enable it to survive.

4 fur colour/camouflaged, so better able to catch prey; thick fur for insulation; fat for insulation; large paws assist with walking on snow.

5 mutation; sexual reproduction; meiosis.

6 (melanic) peppered moth in polluted areas; antibiotic resistance in bacteria; warfarin (and other poison) resistance in rats.

Lesson 2: B7.2 – The theory of Evolution

1. Connection

Q1. What does phenotype mean?

Q2. List a genetics only and an environmental only characteristic and one that is affected by both.

Q3. List 3x processes of genetic variation.

2. Activation

LI: Recall that all species have evolved by evolution due to natural selection

https://www.youtube.com/watch?v=x73bsC7WIsE

1. Make a note of the title and the LI
2. Read pages 276-277
3. List key words – define those you don't know
4. Draw fig 7.5 to show Larmark's proposal for how giraffs necks evolved to be so long.
5. Draw figure 7.6 to show how the polar bear evolved due to Darwins theory of evolution – survival of the fittest

3. Demonstration

Attempt questions 1-6.
In 15 mins answer as many questions as you can.
Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Green questions to GCSE Level 3
Blue questions to GCSE Level 6
Purple questions to GCSE Level 9

4. Consolidation

Complete and self assess the relevant past paper question for this topic - From the B1 DIP file

5. Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Answers: B7.2 – The theory of Evolution

Connection

1 describes the organisms actual characteristics
2 eye colour, scar, height (any other sensible answer)
3 mutation, meiosis, sexual reproduction

Demonstration

1 characteristics, e.g. a longer neck in giraffes, acquired during an organism's lifetime are passed on to the next generation.

2 inherited characteristics are dependent on genes; the characteristics acquired during an organism's lifetime do not modify genes (though we now know that the environment can affect the genome, though not in the way Lamarck thought).

3 ability to survive harsh environments, e.g. very cold, very hot, low light intensities, flooding, seawater; resistance to disease; attractive flowers to attract insect pollinators; other reasonable answers.

4 in a struggle for existence when organisms best suited to the environment survive and pass on their beneficial genes, while those least-suited will not survive to mate. *People often use the phrase 'survival of the fittest'. It's worth noting that it was used by biologist Herbert Spencer in 1864; don't attribute it to Charles Darwin!*

5 change in climate; geographical isolation, e.g. by mountains, glaciers, valley or water.

6 when the new species is no longer able to produce fertile offspring if it mates with its ancestral species.

Lesson 3: B7.3 – The origin of species by Natural Selection

Connection

Q1. Who came up with the first theory of evolution?

Q2. How did his theory differ from Darwin?

Q3. 3 bullet points on how natural selection occurs

Activation

LI: Describe how Darwin developed his theory of Evolution by Natural Selection

https://www.youtube.com/watch?v=jRmzmYmMTKk

1. Make a note of the title and the LI
2. Read pages 278-279
3. List key words – define those you don't know
4. Write a report that's bullet points Darwin's observations that lead to his conclusion

Demonstration

Attempt questions 1-6.
In 10 mins answer as many questions as you can.
Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Green questions to GCSE Level 3
Blue questions to GCSE Level 6
Purple questions to GCSE Level 9

Consolidation

Complete and self assess the relevant past paper question for this topic - From the B1 DIP file

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Answers: B7.3 – The origin of species by Natural Selection

Connection

1 Lamark
2 the difference between Lamark and Darwin was the differed in their opinion about how variation occure. Lamark thought was through use, Darwin thought was randomly occuring
3 - environmental challenge
- some organisms better adapted / survive
- these animals breed and pass on the adaptation to their offspring

Demonstration

1 in particular, his visit to the Galápagos Islands (though his fossil finds elsewhere were also important).

2 Darwin found different, though similar animals on different islands. As these must have come from mainland South America, originally, it was evidence that showed that species could change, and were not fixed.

3 artificial selection (/selective breeding).

4 rock

5 organisms produced larger numbers of offspring than they need to sustain their numbers.

6 separation and isolation of organisms that had originated from the mainland (birds may have flown or been blown over; animals may have swum, with others being carried over by currents or have floated on rafts of vegetation); different environmental selection pressures on different islands.

7 Darwin and Lamarck both thought that life had changed gradually over time and was still changing, that living things change to be better suited and adapted to their environments, and that all organisms are related. Darwin and Lamarck also agreed that life evolved from fewer, simpler organisms to many, more complex organisms.
Differences:
Lamarck believed theory centred on two ideas:
• the law of use and disuse
• the law of inheritance of acquired characteristics
His theory stipulated that a characteristic which is used more and more by an organism becomes bigger and stronger. One that is not used disappears eventually. Any characteristic of an organism that is improved through use is passed to its offspring. He also believed that one organism developed into another rather than becoming extinct.
In contrast Darwin believed that:
• individuals compete for limited resources
• individuals in a population show natural variation
• individuals with characteristics best suited to their environment are more likely to survive to reproduce
• 'successful' characteristics are inherited & species unable to compete successfully eventually become extinct.

Lesson 4: B7.4 & 5 – Fossil evidence

Connection

Q1. What was the key observation made by Darwin and why was it significant?

Q2. How are natural selection and selective breeding similar and different?

Q3. What 2 processes are required for the evolution of a new species?

Activation

LI: Explain how fossils are evidence for evolution

https://www.youtube.com/watch?v=O21VOcLIb3M
https://www.youtube.com/watch?v=PlIWJ-nC7sg

1. Make a note of the title and the LI
2. Read pages 280-281 & 282-283
3. List key words – define those you don't know
4. Use fig 7.11 to explain how fossils are formed
5. Label printout of fig 7.12 pg 281
6. Label printouts of figs 7.14 and 7.15 on page 283

Demonstration

Attempt questions 2, 5 & 6 pages 280-281
Attempt questions 1, 3, 5 & 6 pages 282-283.
In 10 mins answer as many questions as you can.
Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Green questions to GCSE Level 3
Blue questions to GCSE Level 6
Purple questions to GCSE Level 9

Consolidation

Complete and self assess the relevant past paper question for this topic - From the B1 DIP file

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Answers: B7.4 & 5 – Fossil evidence

Connection

1 That species were similar but different. Was evidence that the characteristics of a species could change and were not fixed.
2 Both cause the characteristics of a species to change over time. Changes initiated by humans in selective breeding and by nature in natural selection
3 geographical isolation and different environmental pressures requiring different adaptations

Demonstration

A B7.4 – Fossil evidence.

1 an organism dies and sinks to the bottom of the water; the organism becomes covered in sediment; soft parts of the body decay; the sediment begins to turn to rock; the sediments are compressed by further layers; an exchange of minerals occurs between the skeleton and the water; the skeleton is turned to rock, or mineralised.

2 hard parts, i.e. the bones, shell or teeth of animals; woody parts of plants.

3 footprints, burrows or spaces left by plant roots.

4 if preserved in amber; when buried in mud or volcanic ash.

5 by their presence in rock sediments/layers. Older species are found in deeper rock sediments.

6 radiometric dating. *Note that radioactive carbon dating is not appropriate because the half-life of 14C is too short. Potassium-argon dating is suitable.*

A B7.5– How much have organisms changed?

1 early life soft-bodied; conditions must be appropriate for fossil formation; most fossils destroyed by geological activity, and the older a fossil is, the more likely this is to have happened.

2 some Archaea and Bacteria.

3 *Hyracotherium*.

4 loss of toes and development of hooves; animals had become larger.

5 bacteria and archaeans.

6 unique chemicals from their cell membranes.

Lesson 6: B7.6 – Darwin and Wallace (Triple)

Connection

Q1. Where are the oldest fossils found?

Q2. 3 bullet points to explain how fossils are formed

Q3. Why is archaeopteryx important to the fossil record?

Activation

LI: Recall how Wallace contributed to the theory of evolution

https://www.youtube.com/watch?v=WJpZLwMIgk4
https://www.youtube.com/watch?v=0MC5OBblol0

1. Make a note of the title and the LO
2. Read pages 284-285
3. List key words – define those you don't know
4. Label printouts of figs 7.17 and 7.18 on page 285

Demonstration

Attempt questions 1-6
In 10 mins answer as many questions as you can.
Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Green questions to GCSE Level 3
Blue questions to GCSE Level 6
Purple questions to GCSE Level 9

Consolidation

Complete and self assess the relevant past paper question for this topic - From the B7 DIP file

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Answers: B7.6 – Darwin & Wallace (Triple)

Connection

1 in the layers of rock furthest under ground
2 organism dies/ sinks to the bottom of the ocean & is covered by sediment/ repeated layers of sediment form which compress to form sedimentary rock
3 missing link between reptiles and birds

Demonstration

1 he was accumulating evidence for the theory.

2 Charles Darwin and Alfred Russell Wallace.

3 warning colouration warns predators that an organism is distasteful. Predators learn to avoid it, so the genes giving warning colouration are passed on. Organisms not having the warning colouration are likely to be eaten.

4 wasp, cinnabar moth larva/caterpillar; other named examples.

5 predators will avoid the mimic as well as the distasteful organism; forms of certain organism, e.g. certain butterflies; have developed (/evolved) to resemble distasteful butterflies.

6 the predator will ‘take a chance’ and eat an organism (the mimic or the ‘model’) if there is a low probability of finding that it is distasteful.

Lesson 7 B7.7 – A new species (Triple)

Connection

Q1. What colours do you associate with warning colours?

Q2. What is mimicry

Q3. Why are warning colours and mimicry important?

Activation

LI: Understand the process of natural selection and how it can result in the formation of a new species

https://www.youtube.com/watch?v=11iYk0Yrx3g

1. Make a note of the title and the LI
2. Read pages 286-287
3. List key words – define those you don't know
4. 6x bullet points to explain how speciation occurs
5. Label printouts of figs 7.21 on page 287 – explain why the different species of finches evolved.

Consolidation

Complete and self assess the relevant past paper question for this topic - From the B7 DIP file

Extension

Make a note of one thing you think you understand well and one thing that you would like to ask your teacher

Demonstration

Attempt questions 1-4
In 10 mins answer as many questions as you can.
Self mark the questions you have done making any necessary corrections in blue pen

Challenge yourself to answer as many as you can:
Green questions to GCSE Level 3
Blue questions to GCSE Level 6
Purple questions to GCSE Level 9

Answers: B7.7 – A new species (Triple)

Connection

1 bright colours and conspicuous patterns
2 an organism that has adapted to have an identical appearance to a toxic animal even though it is not itself toxic
3 the colours warn other animals not to eat them

Demonstration

1 an organism that is unable to interbreed successfully and produce fertile offspring.

2 because of the odd number of chromosomes, chromosomes cannot pair up for meiosis to occur (to produce gametes).

3 evolution is slow, occurring over millennia.

4 a short life cycle/rapid reproductive rate.