

Science KS4: Blended Learning Booklet

C9 The atmosphere

Name:

Form:

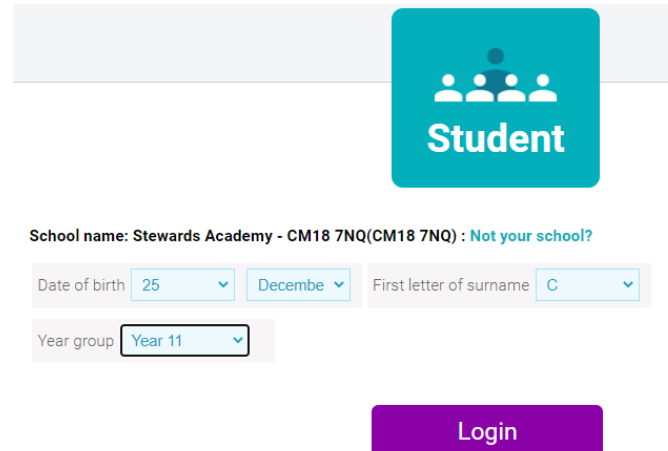
Aim to complete four lessons each week. Watch the videos and follow the four part lesson plan

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

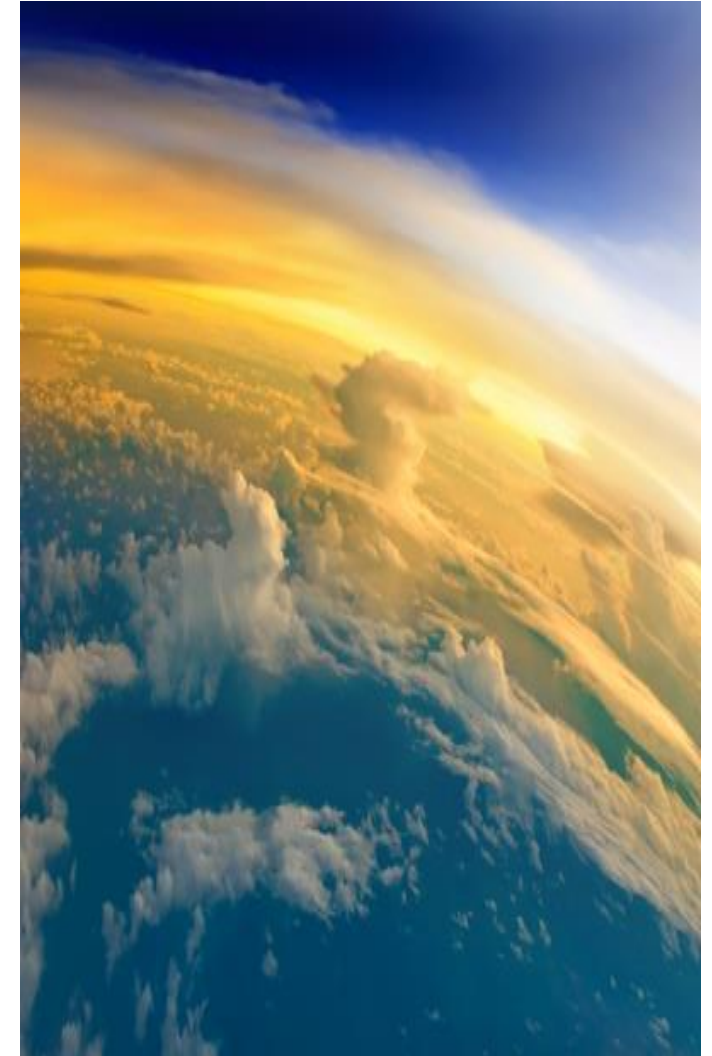


School name: Stewards Academy - CM18 7NQ(CM18 7NQ) : [Not your school?](#)

Date of birth First letter of surname

Year group

Login



Contents

Title page

Contents

Big picture - Overview

Zoom in – My learning journey

Lesson 1

Lesson 2

Lesson 3

Lesson 4

Lesson 5

Lesson 6

Contents

Lesson 7

Lesson 8

Lesson 9

Lesson 10

Lesson 11

Lesson – Revision

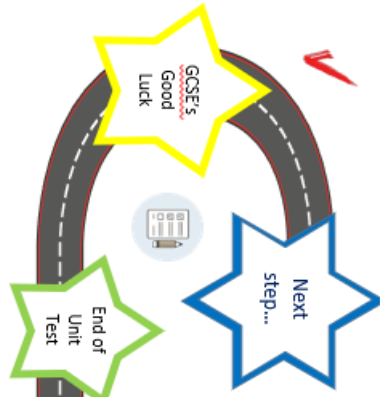
Knowledge organiser

SAL



Big Picture – Year 11 Overview Science

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



Alternative methods of metal extraction

Preventing corrosion and using alloys (T)

Ceramics, polymers and composites (T)

Production and use of fertilisers (T)

End of Unit Test

UNIT P8 (T)

The solar system (T)



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)

Portable 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



Ecology

I will be able to describe the factors that affect living organisms 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 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)

Land use and changing environments (T)

The generator effect (T)

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.

UNIT C9

The early atmosphere

Evolution of the atmosphere

Human impact on greenhouse gases

Global climate change

Carbon footprints

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

Survival or extinction

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: The Atmosphere Year: 11 Unit: C9

AIMS

Students will learn about the composition of the atmosphere past and present. They will explore the way the atmosphere has changed over geological time and evaluate the environmental implications of greenhouse gas emissions and other pollutants. They will explore the use of computer models to make predictions about global climate change and learn how peer review works. Students will consider how greenhouse gas emissions could theoretically be reduced. Students will also explore how pollutants released from burning fuels have a role in damaging human health.

DEVELOPING COURAGE

- C The future of the planet is in your hands
- O Investigate issues regarding climate change
- U We need to work together to manage climate change
- R Make responsible well researched choices as a consumer
- A What a special and unique place the Earth is
- G Aim to leave the world a better place for future generations
- E Knowing that if we take action now climate change can be reversed

PREVIOUS LEARNING

Pupils will have some knowledge of how volcanos affect the composition of the atmosphere and that plants remove CO₂ from the atmosphere by photosynthesis. They will have been introduced to the idea of global warming and the fact that it is important to use less fossil fuels to reduce atmospheric pollution.

WHAT WE KNOW/ REMEMBER

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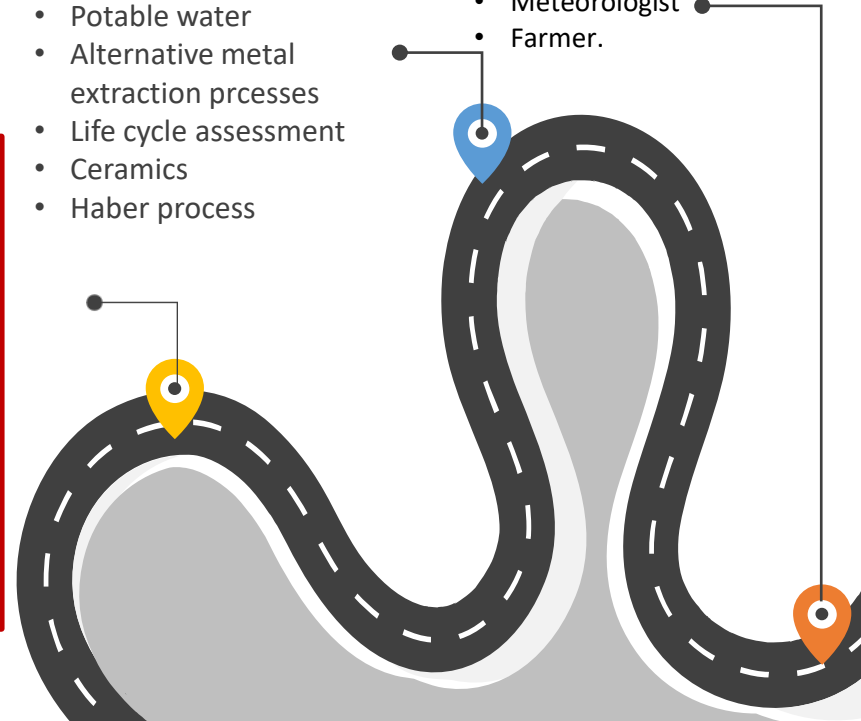
UP NEXT

Sustainable development

- Earth resources
- Potable water
- Alternative metal extraction processes
- Life cycle assessment
- Ceramics
- Haber process

CAREERS

- Environmental Chemist
- Parents
- Meteorologist
- Farmer.



PERSONAL OBJECTIVES

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RECOMMENDED READING

1. Are Humans Damaging the Atmosphere? (Earth Debates) by Catherine Chambers
2. The Uninhabitable Earth: A Story of the Future by David Wallace-Wells,
3. Every Breath You Take: A User's Guide to the Atmosphere by Mark Broomfield

Connection

Have a look at the topic overview and the C9 zoom in.

Populate what you know and your personal objectives.



Lesson 1: C9.1- Proportion of Gases in the Atmosphere

Activation

LI: Recall the proportions of gases in the atmosphere and explain how these are maintained.

1. <https://www.youtube.com/watch?v=Jl34dmbtmnU>
2. Make a note of the title and the LI
3. Read pages 294-295
4. Define Atmosphere
5. Draw and label figure 9.1



Consolidation

Complete and self-assess the relevant past paper question for this topic - From the C9 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 1-6.

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

Answers: C9.1 Proportion of Gases in the Atmosphere

Connection

- 1 NA
- 2 NA
- 3 NA

Demonstration

- 1 Plants release oxygen during photosynthesis.
- 2a Very small proportion of water vapour.
- 2b Large proportion of water vapour (very humid).
- 2c Fairly humid (lots of rainfall and presence of oceans and seas).
- 3 There are no life forms (algae, plants, cyanobacteria etc.) on Mars that produce oxygen.
- 4 Breathing is the process of gases traveling in and out of the lungs. Oxygen is taken in and carbon dioxide breathed out. Respiration is the release of energy in cells from the breakdown of glucose. Oxygen is used for this process.
- 5 Glucose molecules contain 6 carbons. Each of these is oxidised to carbon dioxide.
- 6 Plants photosynthesise. In doing so they produce glucose and oxygen and remove carbon dioxide. Animals and plants respire, consuming glucose and oxygen and producing carbon dioxide. So glucose has a key role in maintaining the balance of carbon dioxide and oxygen in the atmosphere.

Lesson 2: C9.2 – The Earths Early Atmosphere

Connection

Q1. Which process do plants carry out that uses carbon dioxide from the atmosphere?

Q2. How is oxygen used from the atmosphere?

Q3. What percentage of the air is nitrogen?



Activation

LI: Use ideas and evidence about the Earth's early atmosphere to evaluate theories about its composition.

1. https://www.youtube.com/watch?v=l0h_-3MOPso
2. Make a note of the title and the LI
3. Read pages 296 - 297
4. Define 'Oceans, Sediments, Volcanic'

Consolidation

Complete and self assess the relevant past paper question for this topic -
From the C9 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 1-6.

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



Answers: C9.2 – Earth's Early Atmosphere

Connection

- 1 Photosynthesis
- 2 Respiration
- 3 **Around 80%**

Demonstration

- 1 Volcanic activity released gases - mainly carbon dioxide and some nitrogen. There was very little oxygen. Small proportions of methane and ammonia may also have been present. Water vapour was present.
- 2 There were no plants or bacteria that could produce oxygen (no photosynthesis).
- 3 There is a lack of direct evidence. Therefore different theories can fit the evidence available.
- 4 It is known that there was intense volcanic activity during the first billion years of Earth. It is assumed that the same composition of gases is given out by volcanoes today and those of early Earth.
- 5 The volcanic model of early Earth assumes that the composition of gases emitted by volcanoes is the same as it is now. This cannot be proved since there is no direct evidence. The number of stomata is known to be related to level of carbon dioxide in plants of today. So counting stomata on fossil leaves should give a better indication of the levels of carbon dioxide in the early atmosphere than volcanoes. However, it is still an indirect measurement (a proxy) and assumptions have to be made that cannot be easily tested.
- 6 High carbon dioxide levels: fewer stomata (each stomata allows more gas in). Low carbon dioxide: more stomata.

Lesson 3: C9.3 – How Oxygen Increased

Connection

Q1. What is the percentage of oxygen the earth's atmosphere?

Q2. Why was there no oxygen in the early atmosphere?

Q3. Which activity created the early atmosphere filled with Carbon Dioxide and Methane??

Activation

LI: Explore the processes that allowed the percentage of oxygen in the atmosphere to rise to its present value.

1. <https://www.youtube.com/watch?v=l7BMQAoB8IM>
2. Make a note of the title and the LI
3. Read pages 298-299
4. Define "Algae, Evolve and Photosynthesis"

Consolidation

Complete and self assess the relevant past paper question for this topic - From the C9 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 1-6.

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



Answers: C9.3 – How Oxygen Increased

Connection

- 1 Approximately 20%
- 2 No plants or bacteria to photosynthesise
- 3 Volcanic Activity

Demonstration

- 1 2.7 billion years ago.
- 2 Anaerobic organisms live (produce energy) without oxygen. Aerobic organisms need oxygen to produce energy.
- 3 Glucose, which provides the plants with an energy source.
- 4 Plants (and algae / cyanobacteria) produce oxygen during photosynthesis. As the number of plants and number of new species grew, more oxygen was produced and more carbon dioxide was used up.
- 5 Algae can photosynthesise and started producing oxygen 2.7 billion years ago. Therefore algae, along with plants and cyanobacteria, helped to increase the percentage of oxygen in the early atmosphere.
- 6 The oxygen produced by plants and other organisms first reacted with iron in the Earth's oceans (and Earth's crust) producing iron(III) oxide. So little oxygen ended up in the Earth's atmosphere initially. This is the time lag where organisms that photosynthesised existed but there was no oxygen build up. Eventually, there was an excess of oxygen which started to build up in the atmosphere

Lesson 4: C9.4 – How Carbon Dioxide Decreased

Connection

Q1. Write down the word equation for photosynthesis.

Q2. Which lifeforms started to photosynthesise to increase oxygen levels in the atmosphere?

Q3. What did oxygen initially react with that limited the oxygen in the atmosphere early on?



Activation

LI: Explore the processes that allowed the percentage of oxygen in the atmosphere to rise to its present value.

1. <https://www.youtube.com/watch?v=Gyn754vw8ZQ>
2. Make a note of the title and the LI
3. Read pages 300-301
4. Define “Fossil Fuels & Sedimentary”

Consolidation

Complete and self assess the relevant past paper question for this topic -
From the C9 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 1-6.

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



Answers: C9.4 – How Carbon Dioxide Decreased

Connection

- 1 Carbon Dioxide + Water \longrightarrow Oxygen + Glucose
- 2 Plants, Algae and cyanobacteria
- 3 Iron

Demonstration

- 1 Coal formed millions of years ago. Plants grew, died and decayed. The weight of the layers compressed the plant deposits. Heat and pressure produced chemical and physical changes. Oxygen was forced out and left rich carbon deposits. Over millions of years, coal formed.
- 2 Photosynthesis by plants and algae reduced the percentage of carbon dioxide in the atmosphere. These organisms trapped carbon by using carbon dioxide. Plankton also used up carbon dioxide.
- 3 Some marine animals have shells and skeletons made of calcium carbonate. This reduced the carbon dioxide concentration in the atmosphere (it formed carbonate ions). When these animals died, their shells and skeletons were compressed together over millions of years. This formed limestone.
- 4 Plants (as well as algae and cyanobacteria) produced oxygen during photosynthesis. Eventually the oxygen built up in the atmosphere to sufficient levels to allow animals to evolve. Animals used the oxygen to oxidise glucose during respiration and produce energy. Without oxygen, complex animals would not exist. Plants also helped to reduce carbon dioxide levels, which helped animal life to proliferate.
- 5 Ice traps bubbles of air as it forms. By drilling through ice, cores can be taken. The deeper the sample, the older the trapped air. The trapped air at different depths can be analysed and the concentration of carbon dioxide determined. This is direct evidence but data is only available for the last 800,000 years.
- 6 $((400 - 280)/280) \times 100 = 42.9 \%$

Lesson 5: C9.5 – Key Concept – Greenhouse Gases

Connection

Q1. Name a type of fossil fuel

Q2. How were large quantities of CO₂ removed from the early atmosphere

Q3. How can Early atmospheric air be analysed today?

Activation

LI: Evaluate the quality of evidence in reports about global climate change and understand how peer review systems work.

1. <https://www.youtube.com/watch?v=ykqOnV6FXD0>
2. Make a note of the title and the LI
3. Read pages 302-303
4. Define “Greenhouse Gases”
5. Draw and label figure 9.16



Consolidation

Complete and self assess the relevant past paper question for this topic -
From the C9 DIP file

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



Extension

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

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: C9.5 – Key Concept - Greenhouse Gases

Connection

1 Coal or Oil

2 Oceans and rock formations absorbed a lot of the CO₂, more was photosynthesised and continues to do so to sustain CO₂ levels

3 Air trapped in ice – the deeper the ice the earlier the atmosphere

Demonstration

1 Carbon dioxide / methane.

2 Greenhouse gases effectively trap heat (like an insulating blanket). They keep the temperature at a level where plant and animal life can flourish. Without these gases, the average temperature would be considerably less and detrimental to life.

3 Short wavelength radiation from the Sun enters the Earth's atmosphere. Long wavelength radiation is radiated back from the Earth. See Figure 9.16.

4 Venus is closer to the Sun than Earth. This in itself would make the average temperature higher than on Earth. It also has an atmosphere with a large proportion of carbon dioxide. Since carbon dioxide is a greenhouse gas that traps heat energy, this would also raise the average temperature. So Venus has a much higher average temperature than Earth.

5 It is reflected back into space by clouds, dust, bright surfaces like snow etc.

6 It would be significantly cooler (by about 33 °C). This would make it difficult for life to exist since water would mostly freeze. Also, without carbon dioxide, plants (as well as algae and cyanobacteria) would not exist. So animals would not exist either.

Lesson 6: C9.6 – Human Activities

Connection

- Q1. Name a greenhouse gas
- Q2. What would happen to the earth's average temperature without the 'greenhouse effect'?
- Q3. What activity contributes to the greenhouse effect?



Activation

LI: Discuss the environmental implications of climate change.

1. <https://www.youtube.com/watch?v=Ic-J6hcSKa8>
2. Make a note of the title and the LI
3. Read pages 304-305
4. Define "Pollution & Pollutants"
5. What do the graphs show in figure 9.18?
6. State two reasons why levels of methane have increased

Consolidation

Complete and self assess the relevant past paper question for this topic -
From the C9 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 1-6
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



Answers: C9.6 – Human Activities

Connection

- 1 Carbon Dioxide or Methane
- 2 Considerably lower and detrimental to life
- 3 **Burning Fossil Fuels**

Demonstration

- 1 Deforestation / combustion of fossil fuels.
- 2 Trees (and other photosynthesising plants in the forest) use carbon dioxide from the atmosphere during photosynthesis. So if there are less trees, the carbon dioxide levels are likely to rise.
- 3 So that other experts in the field can check the validity of the data and reproducibility of the results. Much of the evidence is open to interpretation. When the evidence is peer reviewed, the validity of any conclusion can be assessed.
- 4 Decrease in crop yields / increase in desertification / flooding / sea level rising / glaciers melting / changing weather patterns etc.
- 5 Use the climate models to test the effect of different methane concentrations on the average Earth temperature. Look for evidence of increase in methane concentration in the past and relate to temperature changes e.g. ice cores and volcanic activity.
- 6 The data available is not clear cut and comes from indirect sources. There are different interpretations of the same data. The data is also very complex. It cannot be reduced to a 2 minute news item since this is not enough time to discuss a very complex subject