



Chemistry
Home
learning
project
2020

The Earth's Atmosphere

Project 1 - The Earth's atmosphere

Success criteria

There are 5 sections to this project.

You should aim to spend a minimum of 2 hours on each section.

For each section you should create;

- A word document (no copy and paste) outlining the individual tasks summarised in the **CORE** objectives list,
- or
- A Power point that summarises the **CORE** objectives
- or
- An A4 poster that summarises the **CORE** objectives

You could also add;

- Pictures/diagrams 3-D models, home made videos...

Additional Activities

These are supporting activities that you need to complete alongside your document/poster.

They will include exam questions, quizzes or tasks from Seneca (<https://www.senecalearning.com>)

Supporting Info/Videos/articles

In order to better understand the content you are accessing to complete your project you should watch the videos and read the articles recommended in this section.

Section 1 - The Earth's atmosphere in the past

Project Success criteria

Core

- When was the Earth's Atmosphere formed (1)
- Name the gases, and relative amounts of each that probably made up the Earth's early atmosphere (2)
- Explain how the oceans are thought to have formed (3)
- Describe how Oxygen was formed in the development of the Early atmosphere. (4)
- Explain, using evidence, how scientists know that Oxygen was formed around 2.4 billion years ago. (5)
- The Earth's early atmosphere is said to be similar to that of Venus and Mars' atmosphere today. Research the planets Venus and Mars and find out how true this is (6)

Additional Activities

- Seneca, Combined Science EDEXCEL Chemistry. Unit 8 Fuels & Earth Science – 8.2.1 Earth's Early Atmosphere
- Earth's early atmosphere EXAM QUESTIONS

Supporting Info/Videos/articles

- <https://www.bbc.co.uk/bitesize/guides/zwc6w6f/revision/1>
- http://forces.si.edu/atmosphere/02_02_01.html
- <https://astrobiology.nasa.gov/news/earths-early-atmosphere-an-update/>

Section 1 - The Earth's atmosphere in the past

Exam Questions

Q1. There is limited evidence about the Earth's early atmosphere because of the age of the Earth.

(a) The Earth is 4.6 billion years old.
Which is the correct age of the Earth?

Tick **one** box. **(1)**

A	4.6×10^3 years	
B	4.6×10^6 years	
C	4.6×10^9 years	
D	4.6×10^{12} years	

Scientists think that the Earth's early atmosphere may have been similar to the atmosphere on Mars today. Look at the table below.

Gas	Concentration of gas in the atmosphere today in parts per million	
	Mars	Earth
Nitrogen	27 000	780 000
Oxygen	1 300	210 000
Argon	16 000	9 300
Carbon dioxide	950 000	400
Carbon monoxide	800	trace

(b) Calculate the percentage increase in nitrogen from the Earth's early atmosphere to the atmosphere today.

Assume the Earth's early atmosphere was the same as the atmosphere today on Mars. Give your answer to 2 significant figures.

Percentage increase in nitrogen = _____ % **(3)**

(c) Which process releases carbon monoxide into the Earth's atmosphere?
Tick **one** box. **(1)**

A	Aerobic respiration	
B	Bacterial decomposition	
C	Incomplete combustion	
D	Photosynthesis	

(d) Explain how the oceans were formed in the first billion years of the Earth's existence.

_____ **(2)**

(e) Describe how the increase in greenhouse gases has increased the mass of liquid water in the oceans.

_____ **(1)**
(Total 8 marks)

Section 2 - Our evolving atmosphere

Project Success criteria

Core

- List the names, symbols and percentages of the gases in the air today (2)
- Describe a test to show oxygen is present in the atmosphere (3)
- Describe how the proportion of carbon dioxide in the early atmosphere was reduced. (4)
- Explain how cyanobacteria formed stromatolites and how is this important in the development of our atmosphere today (5)
- Explain why the composition of the Earth's atmosphere has not changed much for 200 million years. (6)

Additional

- Research how pollutant levels are monitored across the world and how satellites are used to track climate change.

Additional Activities

- Seneca, Combined Science EDEXCEL Chemistry. Unit 8 Fuels & Earth Science - 8.2.2 Test for Oxygen
- Evolution of the atmosphere EXAM QUESTIONS

Supporting Info/Videos/Articles

- <https://www.youtube.com/watch?v=Gyn754vw8ZQ>
- <https://www.bbc.co.uk/bitesize/guides/zwc6w6f/revision/2>

Section 2 - Our evolving atmosphere

Exam Questions

Q1. This question is about life, the Earth and its atmosphere.

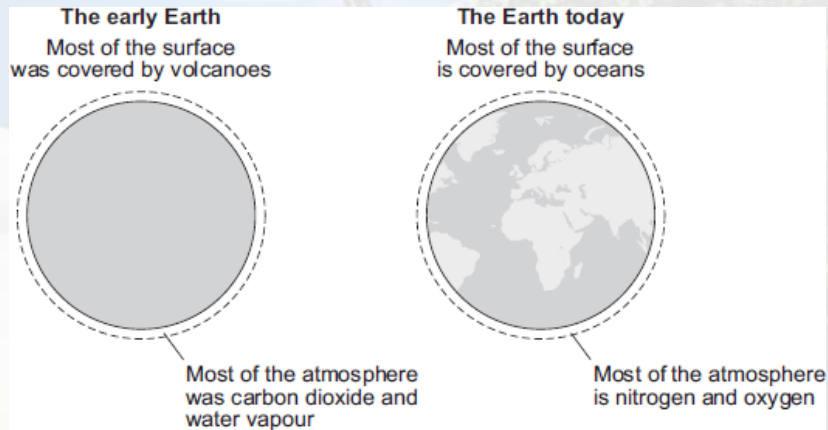
(a) There are many theories about how life was formed on Earth.

Suggest **one** reason why there are many theories.

(1)

b) In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

This Earth and its atmosphere today are not like the early Earth and its atmosphere.



Describe and explain how the surface of the early Earth and its atmosphere have changed to form the surface of the Earth and its atmosphere today.

[illegible]

Section 3 - Greenhouse gases

Success criteria

Core

- Name three greenhouse gases (2)
- State some human activities that affect the proportion of greenhouse gases in the atmosphere. (3)
- Describe the greenhouse effect. (4)
- Explain how greenhouse gases increase the temperature of the atmosphere. (5)
- Explain how human activity can change the proportion of greenhouse gases in the atmosphere. (6)
- Justify why scientists, as well as the public, disagree about the cause of climate change. (7)
- Explain the difference between global warming and the greenhouse effect. (8)

Additional

- Corona virus originated in Wuhan (China) and has spread globally, currently killing over 11,000 and affecting 220,000 people. However the virus has indirectly lead to some interesting changes in pollutant levels. Research this further. Why have pollutant levels changed and what effect will this have in the long term. Do you think this should/will change the way countries regulate pollutant production.

Additional Activities

- Draw a labelled diagram explaining how the green house effect works
- Seneca, Combined Science EDEXCEL Chemistry. Unit 8 Fuels & Earth Science - 8.2.3 Global warming 1
- Greenhouse gases EXAM QUESTIONS

Supporting Info/Videos/Articles

- <https://www.bbc.co.uk/bitesize/guides/zwc6w6f/revision/3>
- <https://www.youtube.com/watch?v=bpa0aFY--pE>
- <https://www.youtube.com/watch?v=K5vXnDGcOE4>

Section 3 - Greenhouse gases

Exam Questions

Q1. Millions of years ago the Earth's atmosphere was probably like the atmosphere of Mars today.

(a) The table below shows percentages of the main gases in the atmospheres of Earth and Mars today.

Gas	Percentage in atmosphere of Mars today	Percentage in atmosphere of Earth today
Carbon dioxide	95.00	0.04
Nitrogen	3.50	78.00
Oxygen	0.50	21.00

For each gas in the table, suggest a reason for the change in the percentage of the gas in Earth's atmosphere.

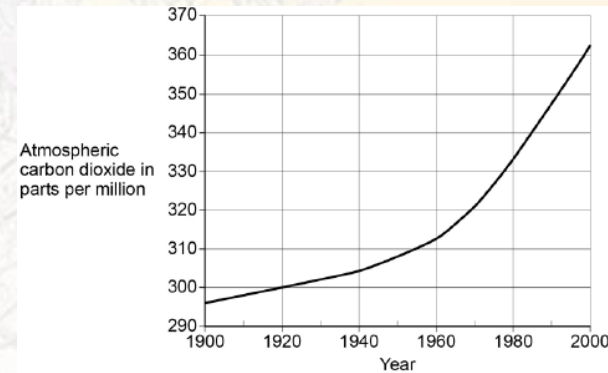
Carbon dioxide _____

Nitrogen _____

Oxygen _____

(3)

(b) The figure below shows how the concentration of carbon dioxide in the Earth's atmosphere changed between 1900 and 2000.



One of the causes of the increase in carbon dioxide between 1900 and 2000 is increased use of fossil fuels. Suggest when use of fossil fuels began to increase. Use data from the figure above to explain your answer.

(2)

(c) What is the percentage increase in carbon dioxide levels between 1970 and 2000?

Increase = _____ %

(3)

Section 3 - Greenhouse gases

Exam Questions

(d) Explain how the changes shown in the figure above can have harmful effects on the environment.

(4)

(Total 12 marks)



Section 4 - Global climate change

Success criteria

Core

- List some of the possible outcomes of climate change. (2)
- Describe how human activity leads to increased carbon dioxide levels. (3)
- Describe how human activity leads to increased methane levels. (3)
- State a definition for carbon footprint. (3)
- List some ways to reduce a carbon footprint. (4)
- Explain the possible effects of global climate change and why they are difficult to predict. (5)
- Explain possible methods to reduce greenhouse gas emissions. (6)
- Explain some of the problems in trying to reduce greenhouse gas emissions. (7)
- Justify why reducing greenhouse gas emissions can be difficult to achieve. (8)

Additional

- Scientists fear that if global warming continues to happen as a consequence of greenhouse gas emission that a climate system tipping point will occur. Research what a global tipping point is. Historically have there been other climate system tipping points and how has the earth responded.

Additional Activities

- <https://www.bbc.co.uk/bitesize/guides/zwc6w6f/test>
- Seneca, Combined Science EDEXCEL Chemistry. Unit 8 Fuels & Earth Science - 8.2.4 Global warming 2
- Greenhouse gases and global warming EXAM QUESTIONS
- Seneca, Combined Science EDEXCEL Chemistry. Unit 8 Fuels & Earth Science - 8.2.5 End of Topic test
- Extension - Seneca, Combined Science EDEXCEL Chemistry. Unit 8 Fuels & Earth Science - 8.2.6 Grade 9 – Fuels & Earth Science

Supporting Info/Videos/Articles

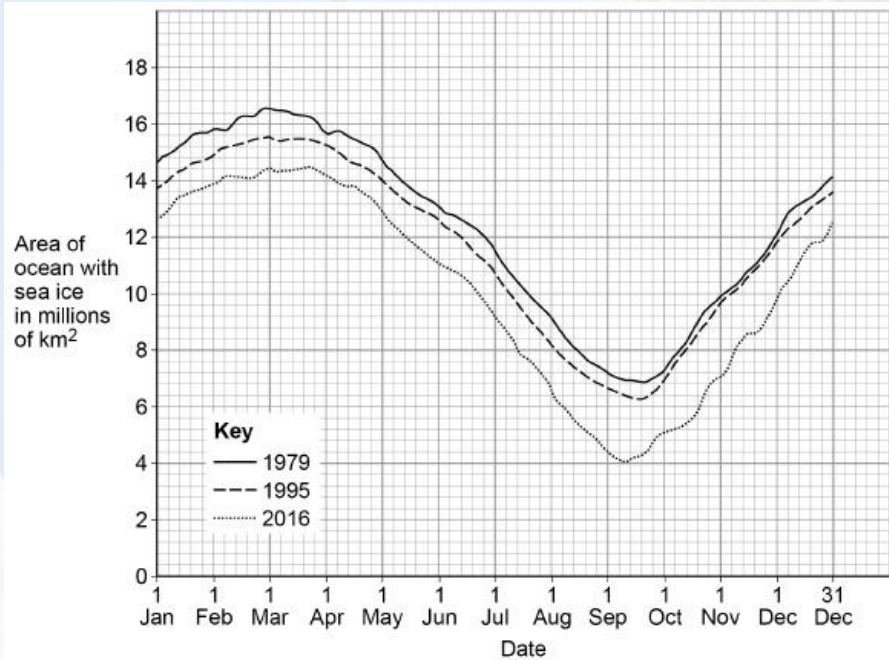
- <https://www.bbc.co.uk/bitesize/guides/zwc6w6f/revision/4>
- <https://www.youtube.com/watch?v=Dwkh46MZulc>
- <https://www.theguardian.com/environment/2018/oct/08/we-must-reduce-greenhouse-gas-emissions-to-net-zero-or-face-more-floods>

Section 4 - Global climate change

Exam Questions

Q1. Human activities can affect our ecosystem.

The graph shows information about how the area of ocean with sea ice in the arctic has changed between 1979 and 2016.



(a) Give **two** conclusions you can make from the data shown in the graph.

1. _____

(2)

b) The area of ocean with sea ice in the arctic has changed.

Most scientists believe this is due to the activities of humans.

Explain the activities of humans that have led to the changes in sea ice from 1979 to 2016.

[illegible]

(6)

(Total 8 marks)

Section 4 - Global climate change

Exam Questions

Q2. There is less carbon dioxide in the Earth's atmosphere now than there was in the Earth's early atmosphere.

(a) The amount of carbon dioxide in the Earth's early atmosphere decreased because it was used by plants and algae for photosynthesis, dissolved in the oceans and formed fossil fuels.

Give **one** other way that the amount of carbon dioxide in the Earth's early atmosphere decreased.

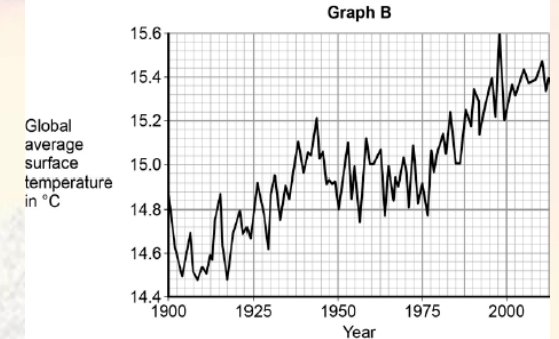
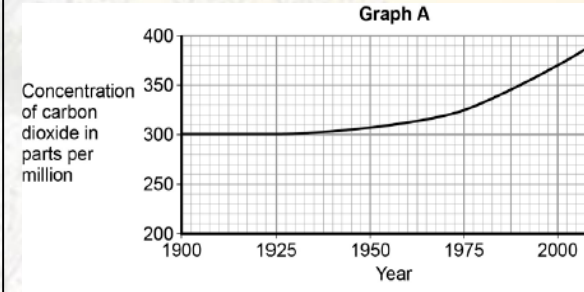
(1)

(b) Carbon dioxide is a greenhouse gas.

Describe the greenhouse effect.

(4)

(c) The graphs in **Figure 1** show the concentration of carbon dioxide in the atmosphere and global average surface temperature since 1900.



Calculate the percentage increase in the concentration of carbon dioxide from 1975 to 2000.

%

(1)

(d) What was the global average surface temperature in 1980? _____ °C (1)

(e) A student stated: 'The graphs show that increasing the concentration of carbon dioxide in the atmosphere causes global temperature increases.' Discuss why this statement is only partially true.

(4)

(Total 11 marks)

Extension - Section 5 - Atmospheric pollutants

Success criteria

Core

- List some atmospheric pollutants. (2)
- Describe how carbon monoxide and soot (carbon) can be made from the incomplete combustion of fossil fuels. (3)
- Explain how sulfur dioxide and nitrogen oxides are made when fossil fuels are combusted. (4)
- Describe the health impacts of atmospheric pollutants. (5)
- Use balanced symbol equations to show how atmospheric pollutants are formed. (6)
- Evaluate the negative social, economic, and environmental consequences of atmospheric pollution. (7)
- Suggest and explain methods to reduce atmospheric pollution. (8)

Additional

- The ozone layer protects the earth from harmful UV rays. CFCs are chemicals that break down ozone leaving “holes”. Find out about the use of CFCs over the last 100 years, their effects and their regulation.

Additional Activities

- Seneca, Combined Science EDEXCEL Chemistry. Unit 8 Fuels & Earth Science - 8.1.4 Hydrocarbons 2
- Atmospheric pollutants EXAM QUESTIONS
- <https://www.bbc.co.uk/bitesize/guides/zq3797h/test>

Supporting Info/Videos/Articles

- <https://www.bbc.co.uk/bitesize/guides/zxshqhv/revision/5>
- <https://www.youtube.com/watch?v=Dwkh46MZulc>
- <https://www.bbc.co.uk/bitesize/guides/zq3797h/revision/1>

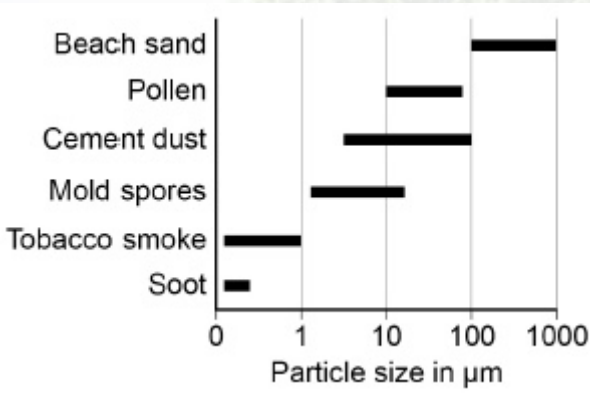
Section 4 - Global climate change

Exam Questions

Q1. Human activity contributes to pollution.

The concentration of particulate matter (PM) in the atmosphere is measured in different places across the world.

Figure 1 shows the diameter of some different particles.



(a) PM_{2.5} are particles which are 2.5×10^{-6} m in diameter or smaller

What is the maximum diameter of PM_{2.5} particles in millimetres?

Tick **one** box. (1)

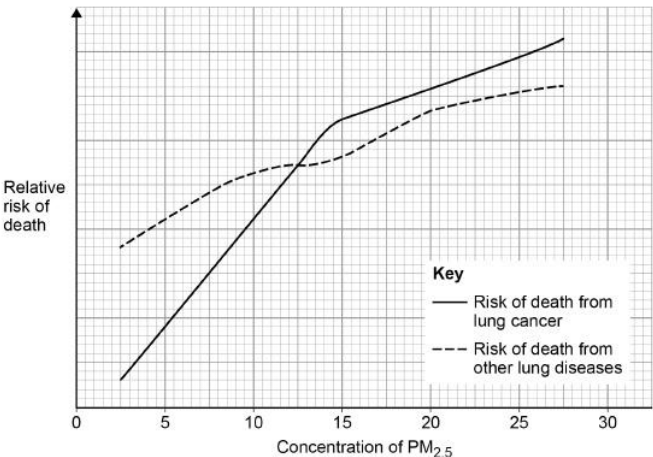
A	0.025	
B	0.0025	
C	0.000025	
D	0.00000025	

(b) Which **two** particles in **Figure 1** are included in the PM_{2.5} measure of air pollution?

Tick **two** boxes. (2)

A	Beach sand	
B	Cement dust	
C	Pollen	
D	Soot	
E	Tobacco smoke	

Figure 2 shows how the concentration of PM_{2.5} affects death rates.



(c) Compare the effect of PM_{2.5} concentration on the death rate from lung cancer with the death rate from other lung diseases. Use data from **Figure 2** in your answer.

(2)

(d) Why do PM_{2.5} particles cause these negative health effects?

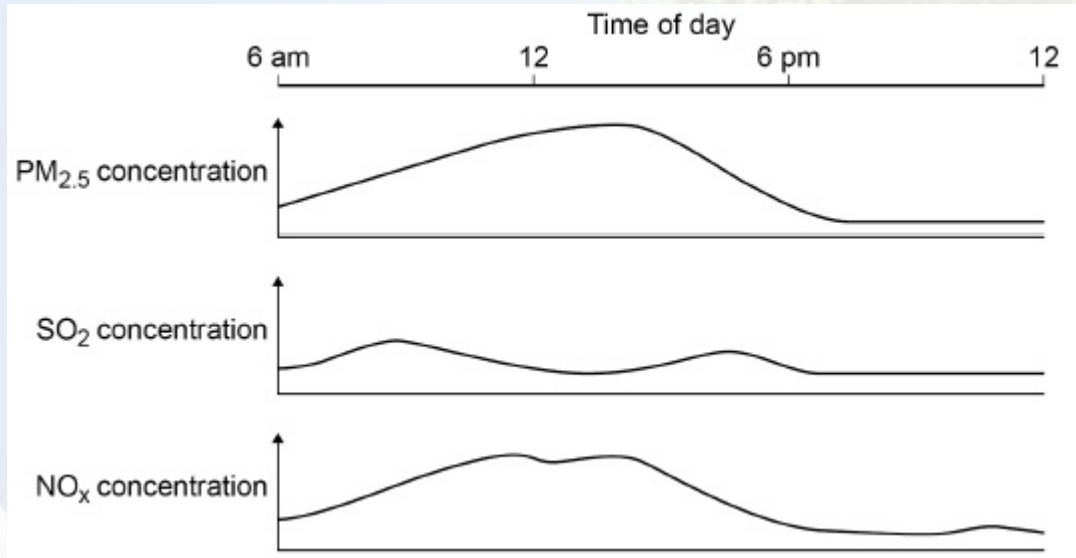
(1)

Section 4 - Global climate change

Exam Questions

(e) **Figure 3** shows air pollution information collected in one city in 18 hours.

Figure 3



Suggest **two** possible reasons for the rise in PM_{2.5} concentration from 6 am to 2 pm.

1. _____
2. _____

(2)

(f) Air Quality Index (AQI) is a measure of pollution in the atmosphere. When the AQI value reaches 201 it is judged to be 'very unhealthy'. Suggest **one** precaution people should take if AQI rises above 201

(1)

(Total 9 marks)

“HOW DID I DO?”

Success criteria

Once you have completed your project let your link teacher know and you will be assigned a test to complete in order to assess what you have learnt.

Please do not cheat as you will gain nothing from the experience!

These tests should be done under time conditions;

- Earth & Atmosphere test – 45min

After you have finished your test attempt to mark it using the markscheme provided.

GOOD LUCK

WWW

Reflect back over your project.

- What did you enjoy?
- What have you learnt?
- How did you do in the test?

EBI

Reflect back over your project.

- What did you NOT enjoy?
- Did you find something tricky?
- If you could do this project again what would you do differently?