Revision Pack Topic 9 - Chemistry of the Atmosphere

Topic	R/A/G
The composition and evolution of the Earth's atmosphere	
The proportions of different gases in the atmosphere	
For 200 million years, the proportions of different gases in the atmosphere have been much the same as they are today: • about four-fifths (approximately 80%) nitrogen • about one-fifth (approximately 20%) oxygen • small proportions of various other gases, including carbon dioxide, water vapour and noble gases.	
The Earth's early atmosphere	
Theories about what was in the Earth's early atmosphere and how the atmosphere was formed have changed and developed over time. Evidence for the early atmosphere is limited because of the time scale of 4.6 billion years.	
One theory suggests that during the first billion years of the Earth's existence there was intense volcanic activity that released gases that formed the early atmosphere and water vapour that condensed to form the oceans. At the start of this period the Earth's atmosphere may have been like the atmospheres of Mars and Venus today, consisting of mainly carbon dioxide with little or no oxygen gas.	
Volcanoes also produced nitrogen which gradually built up in the atmosphere and there may have been small proportions of methane and ammonia	
When the oceans formed carbon dioxide dissolved in the water and carbonates were precipitated producing sediments, reducing the amount of carbon dioxide in the atmosphere. No knowledge of other theories is required.	
Be able to, given appropriate information, interpret evidence and evaluate different theories about the Earth's early atmosphere.	
How oxygen increased	
Algae and plants produced the oxygen that is now in the atmosphere by photosynthesis, which can be represented by the equation: $6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$ carbon dioxide + water $\xrightarrow{\text{light}}$ glucose + oxygen	
Algae first produced oxygen about 2.7 billion years ago and soon after this oxygen appeared in the atmosphere. Over the next billion years plants evolved and the percentage of oxygen gradually increased to a level that enabled animals to evolve.	
How carbon dioxide decreased	
Algae and plants decreased the percentage of carbon dioxide in the atmosphere by photosynthesis.	
Carbon dioxide was also decreased by the formation of sedimentary rocks and fossil fuels that contain carbon.	
• Describe the main changes in the atmosphere over time and some of the likely causes of these changes • Describe and explain the formation of deposits of limestone, coal, crude oil and natural gas.	
Carbon dioxide and methane as greenhouse gases	

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Greenhouse gases	
Greenhouse gases in the atmosphere maintain temperatures on Earth high enough to support life. Water vapour, carbon dioxide and methane are greenhouse gases.	
Be able to describe the greenhouse effect in terms of the interaction of short and long wavelength radiation with matter.	
Human activities which contribute to an increase in greenhouse gases in the atmosphere	
Some human activities increase the amounts of greenhouse gases in the atmosphere. These include: • carbon dioxide • methane.	
Recall two human activities that increase the amounts of each of the greenhouse gases carbon dioxide and methane.	
Based on peer-reviewed evidence, many scientists believe that human activities will cause the temperature of the Earth's atmosphere to increase at the surface and that this will result in global climate change	
However, it is difficult to model such complex systems as global climate change. This leads to simplified models, speculation and opinions presented in the media that may be based on only parts of the evidence and which may be biased.	
Evaluate the quality of evidence in a report about global climate change given appropriate information • Describe uncertainties in the evidence base • Recognise the importance of peer review of results and of communicating results to a wide range of audiences.	
Global climate change	
An increase in average global temperature is a major cause of climate change. There are several potential effects of global climate change.	
• Describe briefly four potential effects of global climate change • Discuss the scale, risk and environmental implications of global climate change.	
The carbon footprint and its reduction	
The carbon footprint is the total amount of carbon dioxide and other greenhouse gases emitted over the full life cycle of a product, service or event.	
The carbon footprint can be reduced by reducing emissions of carbon dioxide and methane.	
• Describe actions to reduce emissions of carbon dioxide and methane • Give reasons why actions may be limited.	
Common atmospheric pollutants and their sources	
Atmospheric pollutants from fuels	
The combustion of fuels is a major source of atmospheric pollutants.	
Most fuels, including coal, contain carbon and/or hydrogen and may also contain some sulfur.	
The gases released into the atmosphere when a fuel is burned may include carbon dioxide, water vapour, carbon monoxide, sulfur dioxide and oxides of nitrogen. Solid particles and unburned hydrocarbons may also be released that form particulates in the atmosphere	
Describe how carbon monoxide, soot (carbon particles), sulphur dioxide and oxides of nitrogen are produced by burning fuels	

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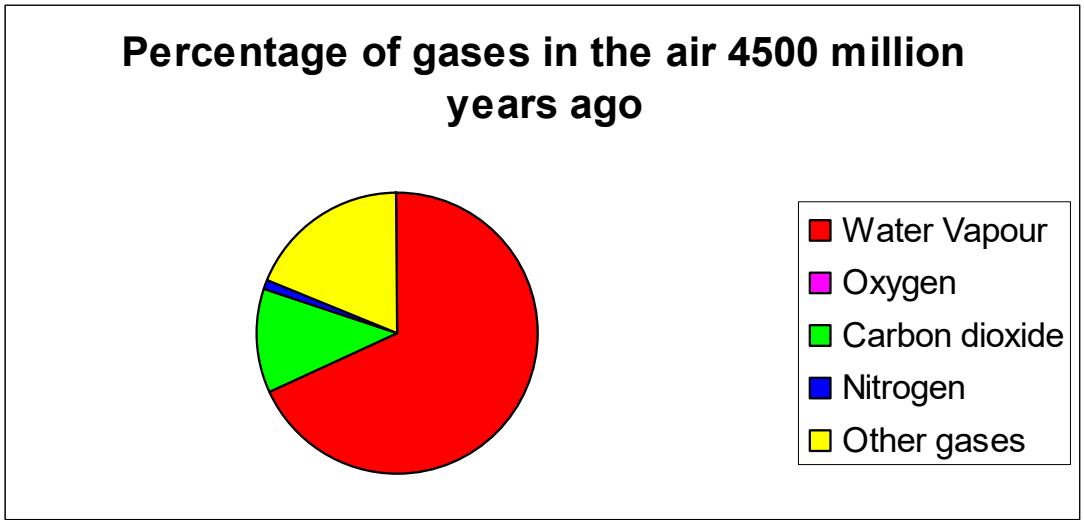
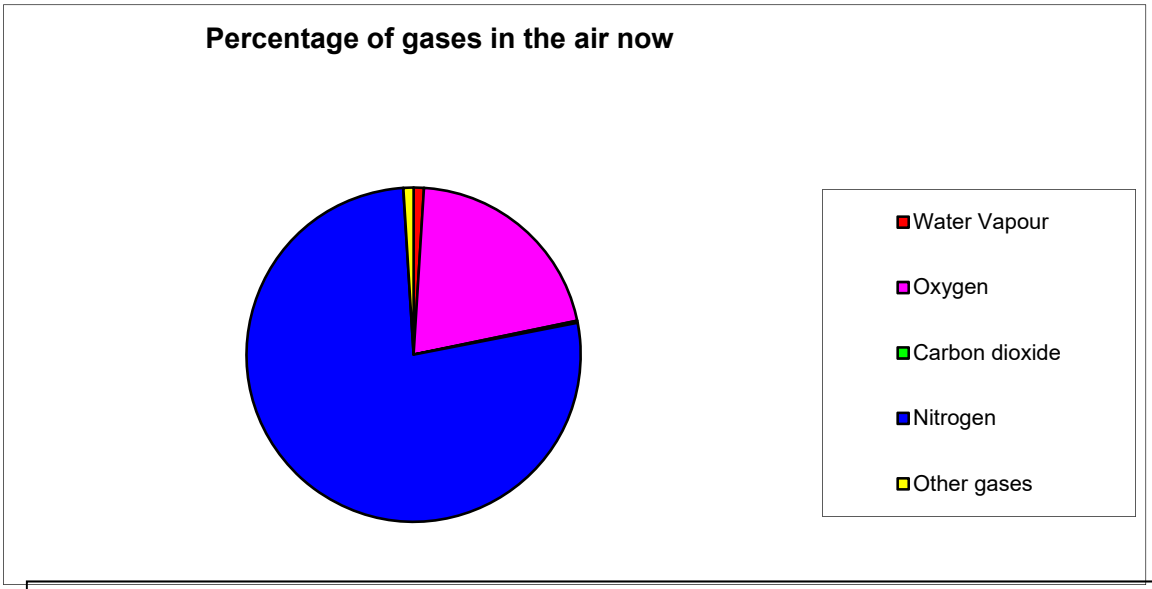
Predict the products of combustion of a fuel given appropriate information about the composition of the fuel and the conditions in which it is used.	
Properties and effects of atmospheric pollutants	
Carbon monoxide is a toxic gas. It is colourless and odourless and so is not easily detected.	
Sulfur dioxide and oxides of nitrogen cause respiratory problems in humans and cause acid rain.	
Particulates cause global dimming and health problems for humans	
Students should be able to describe and explain the problems caused by increased amounts of these pollutants in the air.	

Revision Pack Topic 9 - Chemistry of the Atmosphere

Task 1: Study the chart and fill in the missing words



When the Earth was newly formed most of the air was …… ……. There was no ……..



Now most of the air on Earth is …….. Because there is now ……., life can exist on Earth.

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Task 2: Answer the following questions

a) **What was the major source of the gases in the early atmosphere?**

b) **What caused the reduction in the amount of water vapour?**

c) **Which organisms reduced the amount of carbon dioxide and increase the amount of oxygen in the air? How did they do this?**

d) **Carbon dioxide can also dissolve into the sea. How was this carbon dioxide 'locked up'? (see page 197)**

e) **The modern atmosphere contains a lot of nitrogen. Where did this come from?**

f) **In modern times, the amount of carbon dioxide in the atmosphere is increasing. Why?**

g) **What is this causing and why is it a problem?**

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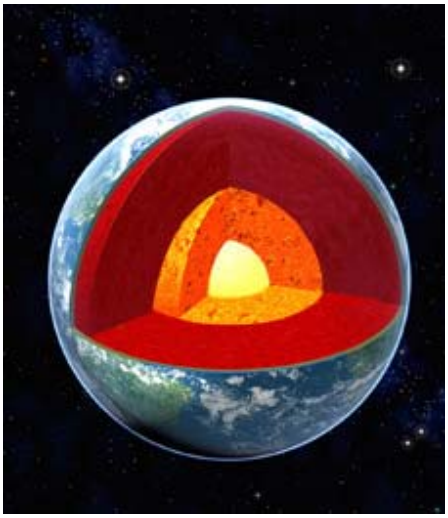
Earth and Atmosphere

The Earth is almost a sphere. These are its main layers, starting with the outermost:



Draw lines to label this diagram of the Earth

1. **crust** - relatively thin and rocky
2. **mantle** -- has the properties of a solid, but can flow very slowly
3. **outer core** -made from liquid n_____ and i_____
4. **inner core** - made from solid n_____ and i_____.

Plate tectonics

The Earth's crust and upper part of the m_____ are broken into large pieces called t_____ p_____ These are constantly moving at a few c_____ each year. Although this doesn't sound like very much, over millions of years the movement allows whole continents to shift thousands of kilometres apart. This process is called c_____ d_____.

The plates move because of c _____ c_____ in the Earth's mantle. These are driven by the heat produced by the decay of r_____ elements and heat left over from the formation of the Earth.

Where tectonic plates meet, the Earth's crust becomes unstable as the plates push against each other, or ride under or over each other. E_____ and v_____ e_____ happen at the boundaries between plates, and the crust may 'crumple' to form m_____ ranges.

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Evolution of the atmosphere – As you complete this you should also be highlighting.

The early atmosphere

Scientists believe that the Earth was formed about 4.5 billion years ago. Its early atmosphere was probably formed from the gases given out by v_____. It is believed that there was intense volcanic activity for the first billion years of the Earth's existence.

The early atmosphere was probably mostly c_____ d_____, with little or no o_____. There were smaller proportions of w_____ v_____, a_____ and m_____. As the Earth cooled down, most of the water vapour c_____ and formed the o_____.

It is thought that the atmospheres of Mars and Venus today, which contain mostly carbon dioxide, are similar to the early atmosphere of the Earth.

Changes in the atmosphere

So how did the proportion of carbon dioxide in the atmosphere go down, and the proportion of oxygen go up?

The proportion of oxygen went up because of p_____ by p_____.

The proportion of carbon dioxide went down because:

- It was locked up in sedimentary r_____, such as l_____, and in f_____ f_____.
- It was absorbed by p_____ for p_____.
- It dissolved in the o_____.

The burning of f_____ f_____ is adding c_____ d_____ to the atmosphere faster than it can be r_____. This means that the level of carbon dioxide in the atmosphere is i_____.

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Test Bite (you can review answers on BBC bitesize)

1. Starting with the centre of the Earth, what is the correct order for the layers of the Earth?
   - ☐ Core, mantle, crust
   - ☐ Mantle, core, core
   - ☐ Core, crust, mantle

2. What causes tectonic plates to move?
   - ☐ Convection currents in the mantle
   - ☐ Strong winds in the tropics
   - ☐ Sea water currents in the oceans

3. At what rates do tectonic plates move?
   - ☐ A few centimetres per year
   - ☐ A few metres per year
   - ☐ A few kilometres per year

4. Which is the most common gas in the atmosphere?
   - ☐ Oxygen
   - ☐ Nitrogen
   - ☐ Carbon dioxide

5. Which was the most common gas in the early atmosphere?
   - ☐ Oxygen
   - ☐ Nitrogen
   - ☐ Carbon dioxide

6. What is the approximate percentage of oxygen in the atmosphere today?
   - ☐ 100 per cent
   - ☐ 80 per cent
   - ☐ 20 per cent

7. What caused the proportion of oxygen in the atmosphere to increase?
   - ☐ Respiration
   - ☐ Photosynthesis
   - ☐ Volcanic activity

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8. Which of the following is a reason for the decrease in carbon dioxide in the Earth's atmosphere?

- ☐ Its reaction with oxygen
- ☐ It condensed to form the oceans
- ☐ It became locked up in fossil fuels and sedimentary rocks

9. Why is helium used in balloons?

- ☐ It is less dense than air
- ☐ It is more dense than air
- ☐ It has the same density as air

10. Why is neon used in neon lights?

- ☐ It is coloured
- ☐ It gives off light when electricity passes through it
- ☐ It burns in air with a red flame

11. Why are the noble gases used in light bulbs?

- ☐ They stop the filament burning
- ☐ They make the bulb lighter to carry
- ☐ They are cheap

Greenhouse gases and human activities – Complete the chart

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What is the "ATMOSPHERE"?

What do the suns rays do to the earth?

What happens to the heat from the sun?

Why is this linked to a greenhouse?

Why is the greenhouse effect a good thing for the earth?

Name 5 greenhouse gases.
1.
2.
3.
4.
5.

Where does carbon dioxide naturally come from?

Where does methane naturally come from?

Where does nitrous oxide naturally come from?

Name 3 things humans do that add to the greenhouse effect.
1.
2.
3.

Why are these extra gases causing a problem?

What do we call it when the earth gets hotter?

How will global warming affect the weather?

How will global warming affect sea levels?

How will global warming affect farming?

How will global warming affect water?

How will seals and polar bears be affected?

How else might animals and plats be affected?

How will people who live on the coast be affected?

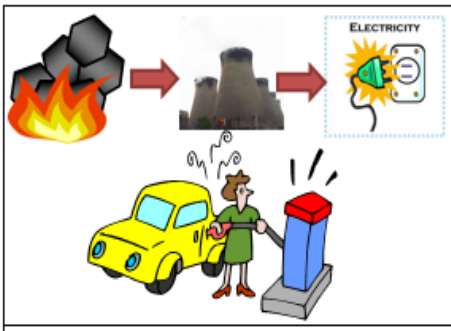
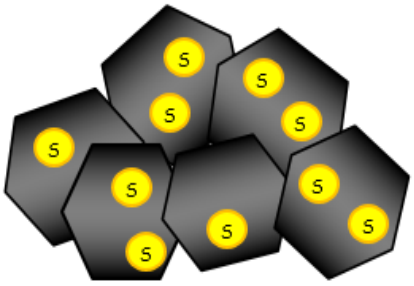
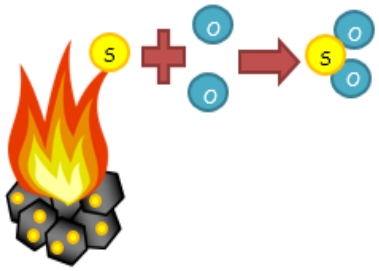
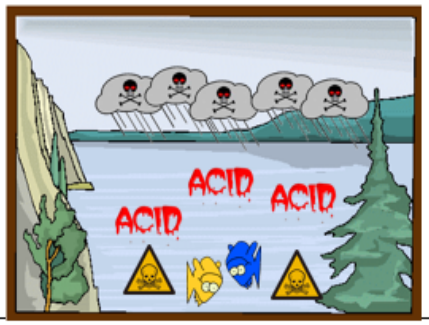
What will people have to do if the climate does change?

What does the word climate mean?

Revision Pack Topic 9 - Chemistry of the Atmosphere

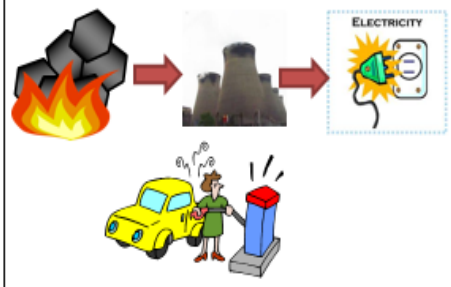
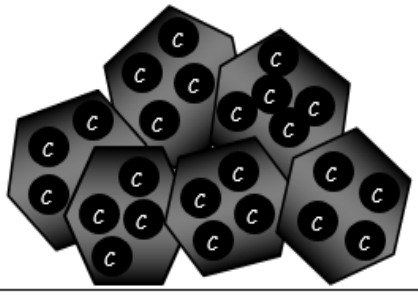
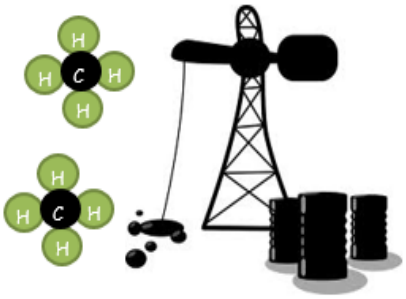
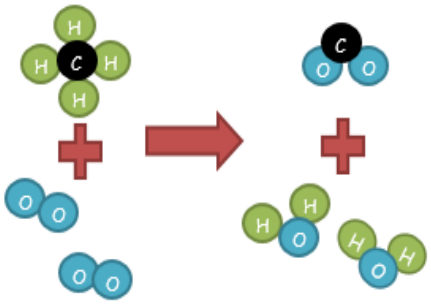
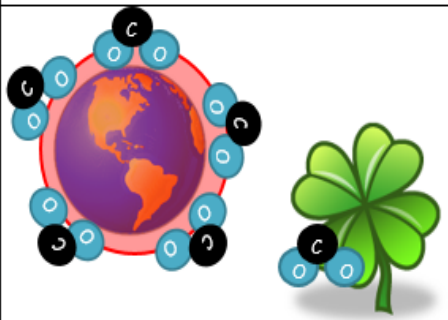
Task: Read through the storyboard and then complete the summary sheet

Sulfur Dioxide and Acid Rain

		
Fossil fuels are burnt in power stations to make electricity.	Fossil fuels (like coal) contain impurities. One of those impurities is sulphur.	When the fuel is burnt, the sulphur combines with oxygen to make sulphur dioxide.
		
Sulfur dioxide dissolves in rain water to make acid rain.	Acid rain falls. It makes soil acidic, killing trees. It also makes lakes acidic, killing fish.	We can reduce this type of pollution by using low sulphur fuels and burning less fossil fuels (in cars and to make electricity).

Revision Pack Topic 9 - Chemistry of the Atmosphere

Carbon Dioxide and Global Warming

		
Fossil fuels are burnt in power stations to make electricity and used to power cars.	Coal is a fossil fuel. It's made mostly of carbon.	Gas and oil are also fossil fuels. They are hydrocarbons, chemicals made of only hydrogen and carbon.
		
When coal or hydrocarbons burn in air they combine with oxygen to make carbon dioxide and water.	We need some carbon dioxide because plants use it for photosynthesis, but too much causes global warming.	We can reduce this type of pollution by burning fewer fossil fuels. This means less electricity, car journeys and flights.

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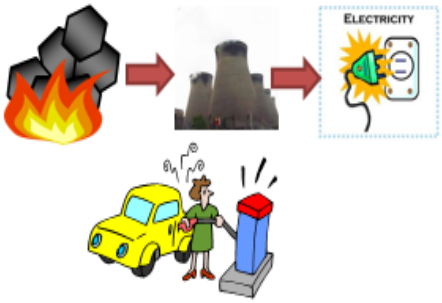
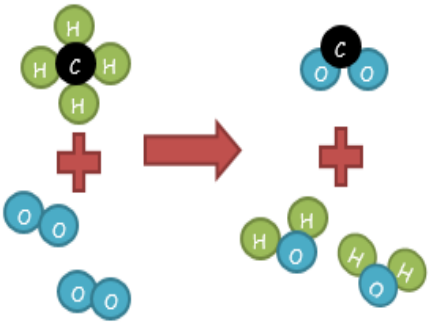
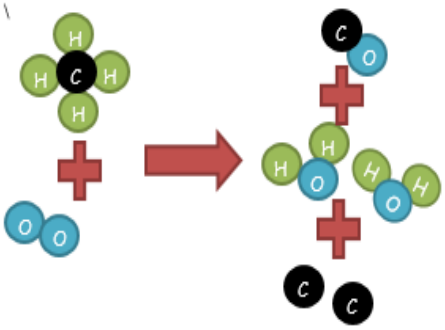
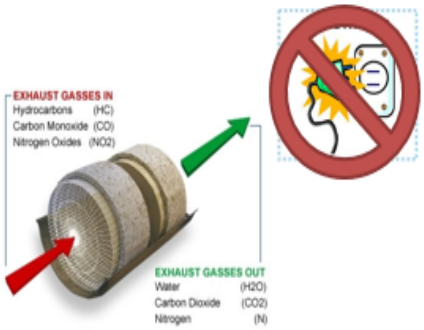
Incomplete Burning – Carbon Monoxide and Particulates

		
Fossil fuels are burnt in power stations to make electricity and used to power cars. Fossil fuels are hydrocarbons.	When hydrocarbons burn in air they make carbon dioxide and water.	When there is not enough oxygen, carbon monoxide is made instead of carbon dioxide. Sometimes particulates (solid carbon) are made too.
		
Carbon monoxide means your blood can carry less oxygen. You can die from carbon monoxide poisoning.	Particulates make building dirty.	We can reduce this type of pollution using catalytic converters and burning less fossil fuel.

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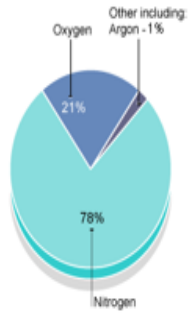
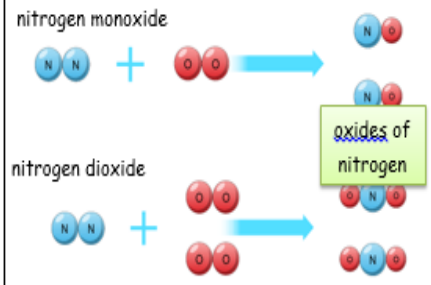
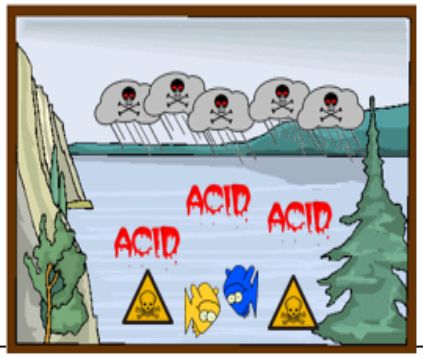
Oxides of Nitrogen and Acid Rain

		
Air is mostly nitrogen.	When fuel is burned in engines the air gets hot.	Nitrogen from the air reacts with oxygen to make nitrogen monoxide and dioxide. Because both chemicals are made, we call them oxides of nitrogen.
		
Oxides of nitrogen dissolves in rain water to make acid rain.	Acid rain falls. It makes soil acidic, killing trees. It also makes lakes acidic, killing fish.	We can reduce this type of pollution by using catalytic converters and driving less

End of storyboard – Go back over your storyboard with a highlighter and do some self-quizzing before doing the Summary sheet on the next page.

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Air Pollution Summary

What is it?	Why is it bad?	How can we reduce it?
Carbon Dioxide Carbon dioxide is made when _____ _____ Equation: _____	**Carbon Dioxide** Carbon dioxide is useful because _____ _____ Too much carbon dioxide is bad because _____ _____	**Carbon Dioxide** We can reduce this by: _____ _____
Carbon Monoxide and Particulate Carbon These are made when _____ _____ Equation: _____	**Carbon Monoxide and Particulate Carbon** Particulate carbon is also called _____. When it lands it _____ _____ Carbon monoxide is bad because it _____ _____	**Carbon Monoxide and Particulate Carbon** We can reduce these by: _____
Sulfur Dioxide This is made when _____ _____ Equation: _____	**Sulfur Dioxide** Sulfur dioxide dissolves in water to make _____. The negative effects of this are _____ _____ _____	**Sulfur Dioxide** We can reduce this by: _____ _____
Nitrogen oxides This is made when _____ _____ Equation: _____	**Nitrogen Oxides** Nitrogen oxides dissolve in water to make _____. The negative effects of this are _____ _____ _____	**Nitrogen Oxides** We can reduce this by: _____ _____

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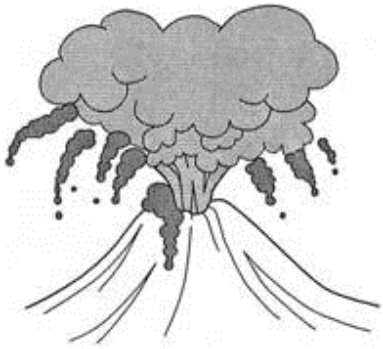
Task: Give yourself 30 minutes and try these exam-style questions.

Q1. (a) During the first billion years of the Earth's existence, there were many active volcanoes. The volcanoes released the gases that formed the early atmosphere.



Describe how volcanoes caused the oceans to be formed.

.....

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.....

.....

(2)

(b) The atmosphere on Earth today is very different from the early atmosphere.

The pie chart shows the amounts of different gases in the air today. Choose gases from the box to label the pie chart.

argon	**carbon dioxide**	**hydrogen**	**nitrogen**	**oxygen**

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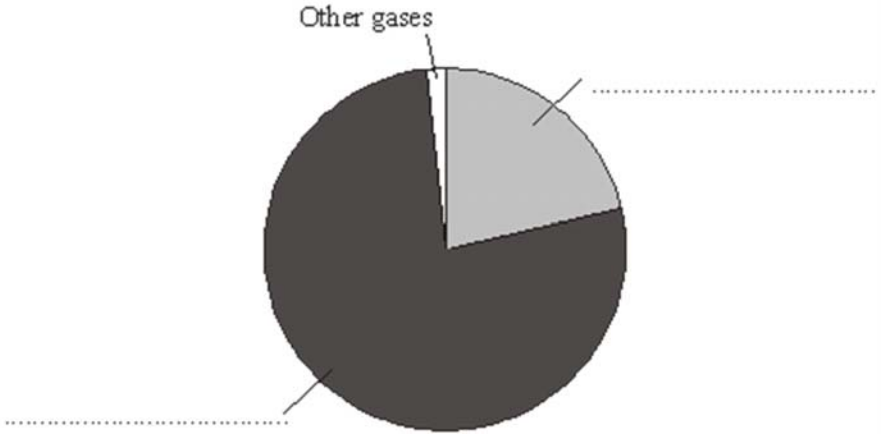
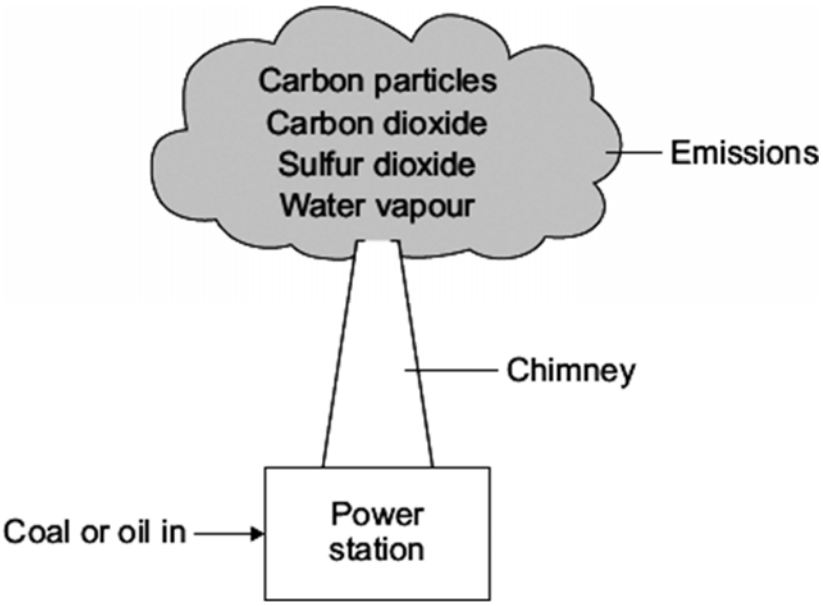


(2)
(Total 4 marks)

Q2. In the future more coal-fired and fewer oil-fired power stations will be used to generate electricity.
When coal and oil are burned they produce the same types of emissions which can cause environmental problems.



(a) Emissions from the chimney can cause acid rain, global dimming and global warming. Draw **one** straight line from each possible environmental problem to the emission that causes it.

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Possible environmental problem	Emission that causes it
acid rain	carbon particles
global warming	carbon dioxide
global dimming	sulfur dioxide
	water vapour

.....

(3)

(b) Draw a ring around the correct word in the box to complete each sentence.

(i) Incomplete combustion of coal or oil is caused by too little

carbon dioxide.
nitrogen.
oxygen.

(1)

(ii) A gas formed by the incomplete combustion of coal or oil is

carbon monoxide.
hydrogen.
oxygen.

(1)

(c) The table shows the world production for both coal and oil in 2000.

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The world production figures after 2000 are predicted.

Year	World production of coal (billions of tonnes per year)	World production of oil (billions of barrels per year)
2000	3.5	12.5
2050	4.5	5.6
2100	5.0	1.7
2150	5.5	0.5
2200	6.0	0.0

(i) How is the world production of oil predicted to change from 2000 to 2200?

.....

.....

(1)

(ii) Suggest **two** reasons why the world production of coal is predicted to increase.

1 .....

.....

2 .....

.....

(2)
(Total 8 marks)

Q3. Many human activities result in carbon dioxide emissions.
Our carbon footprint is a measure of how much carbon dioxide we each cause to be produced.

(a) Why should we be concerned about our carbon footprint?

.....

.....

.....

(1)

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(b) Most power stations in the UK burn coal.
Coal was formed from tree-like plants over millions of years.

Suggest why burning wood instead of coal would help to reduce our carbon footprint.

.....

.....

.....

.....

.....

.....

.....

.....

(3)
(Total 4 marks)

Q4. The table gives some data about four fuels, **A**, **B**, **C** and **D**.

Fuel	Cost in pence per 100 g	Energy in kJ per 100 g	Energy per penny in kJ	Gas (✓) formed on burning		
				Carbon dioxide	Sulphur dioxide	Water vapour
A	6.0	4 800	800	✓		✓
B	4.0	1 200	300	✓		✓
C	3.5	2 800	800	✓	✓	✓
D	18.0	14 400	800			✓

A student was asked to use the data in the table to compare these four fuels, and then place the fuels in an order.

The order that the student chose was:

D best fuel
A ↑
C
B worst fuel

Use the information in the table to suggest reasons why the student chose this order.

To gain full marks in this question you should write down your ideas in good English. Put them into a sensible order and use the correct scientific words.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(Total 4 marks)

Q5. The table shows how much carbon dioxide is produced when you transfer the same amount of energy by burning coal, gas and oil.

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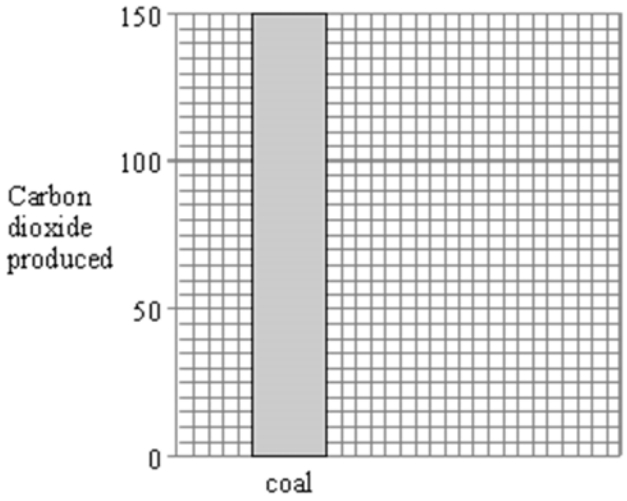
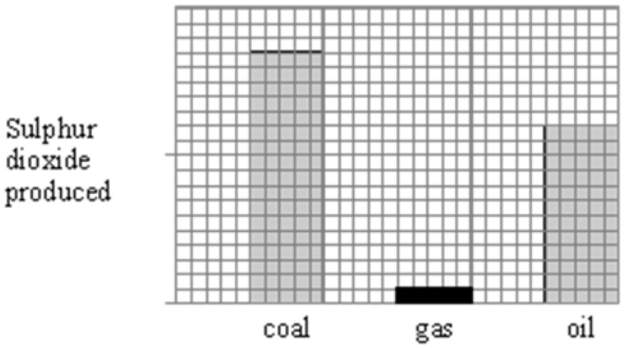
	Carbon dioxide (based on oil = 100)
coal	150
gas	75
oil	100



(a) Use the information from the table to complete the bar-chart.

(3)

(b) The second bar-chart shows how much sulphur dioxide is produced by burning the same three fuels.



Compare the amount of sulphur produced by burning gas with the amount produced by burning coal.

.....

.....

(2)

(c) (i) Coal and oil produce carbon dioxide and sulphur dioxide when they burn.

What elements must they contain?

.....

.....

(2)

(ii) Burning fuels also produce nitrogen oxides, even though the fuels contain no nitrogen. Explain why this happens.

.....

.....

(2)

(Total 9 marks)

Revision Pack Topic 9 - Chemistry of the Atmosphere

M1. (a) (i) water <u>vapour</u> given out from volcano

accept steam
not hydrogen and oxygen combining
to form water

1

condensed

accept rain / clouds formed just 'cools' is insufficient

1

(b) nitrogen (left) N_2

*do **not** accept N*

1

oxygen (right) O_2

*do **not** accept O*

1

[4]

M2. (a) acid rain → sulfur dioxide

1

global warming → carbon dioxide

1

global dimming → carbon particles

1

(b) (i) oxygen

1

(ii) carbon monoxide

1

(c) (i) decreasing

accept running out / none left

1

(ii) any **two** from:

it = coal

- world needs (more) energy
  accept population is increasing
  allow (greater) demand for coal / fuels / energy
- plentiful supply
  accept readily available
  allow coal will 'last longer'
- (many) countries have coal
- easy to find / extract
- oil / gas is running out
  accept need to use less oil / gas
  accept need to use it to replace oil / gas
- cheap **or** cheaper than oil

2

[8]

M3. (a) (thought to cause) global warming / green house (effect) / climate change

ignore other consequences of global warming

*do **not** accept acid rain / ozone layer / global dimming*

1

(b) any **three** from:

- replant trees / renewable / sustainable
  ignore reusable
- carbon (dioxide) used by trees / photosynthesis
  accept trees absorb carbon (dioxide) as they grow
  ignore respiration
- it is a (continuous / carbon) cycle
  accept burning wood is carbon neutral

  or
  carbon (dioxide) goes back into the air
  *for the **second** and **third** bullet points: accept trees use carbon dioxide which is released when (trees / wood are / is) burnt for **2** marks*
- no new carbon (dioxide) is produced

  or
  no locked up carbon (dioxide) is released

  or
  the carbon (dioxide) was absorbed millions of years ago

3

[4]

M4. Quality of written communication:

*for correct sequencing or linking of **two** ideas or **two** points*
annotate Q ✓ or Q ✗

1

any **three** from:

ignore superfluous statements

- **B** is least energy efficient in terms of cost (kJ per p), so **A** = **C** = **D** in terms of cost **or B** is the most expensive in terms of energy

efficiency
owtte

*accept **B** is poor value for money / **B** is most expensive*
one is insufficient for mark

- **D** is 1st, since gives only water as product **or** gives no harmful products / gases **or** there are no pollutants
owtte
- **A** is 2nd best, since produces CO_2 owtte
- **C** is 3rd, since gives SO_2 owtte

*if no other marks, then **D A C B** – based on energy per kJ per 100g only = **1** mark and Q mark if 2 ideas are linked*

3

[4]

M5. (a) each bar correct height (2 bars) to less than ± ½ square

1 mark for each

both bars correctly labelled (in relation to size of bars)

for 1 mark

3

(b) less

gains 1 mark

but a lot less / much less / 18 times less or more if referring to coal

gains 2 marks

2

(c) (i) carbon
sulphur

for 1 mark each

2

(ii) *ideas that*

- at high temperatures, (produced when fuels burn)
- nitrogen and oxygen from atmosphere combine / react

for 1 mark each

2

[9]

End of task. Go to the next page.

Revision Pack Topic 9 - Chemistry of the Atmosphere

Task: Try this quiz. Answers will follow.

Note – Answers will also tell you the level of difficult for each question

Using our Earth Sustainably

1. Which of these processes returns carbon dioxide to the atmosphere? [1 mark]

a) Photosynthesis ☐
b) Combustion ☐
c) Fossilisation ☐
d) Feeding ☐

2. By how much is Earth's average surface temperature projected to rise in the next 100 years? [1 mark]

a) 0 degrees Centigrade ☐
b) About 1 degrees Centigrade ☐
c) About 3 degrees Centigrade ☐
d) About 6 degrees Centigrade ☐

3. Which of the following processes did not decrease the amount of carbon dioxide in Earth's atmosphere? [1 mark]

a) Formation of sedimentary rocks ☐
b) Dissolution into oceans ☐
c) Respiration ☐
d) Photosynthesis ☐

4. Which of the following is not a greenhouse gas? [1 mark]

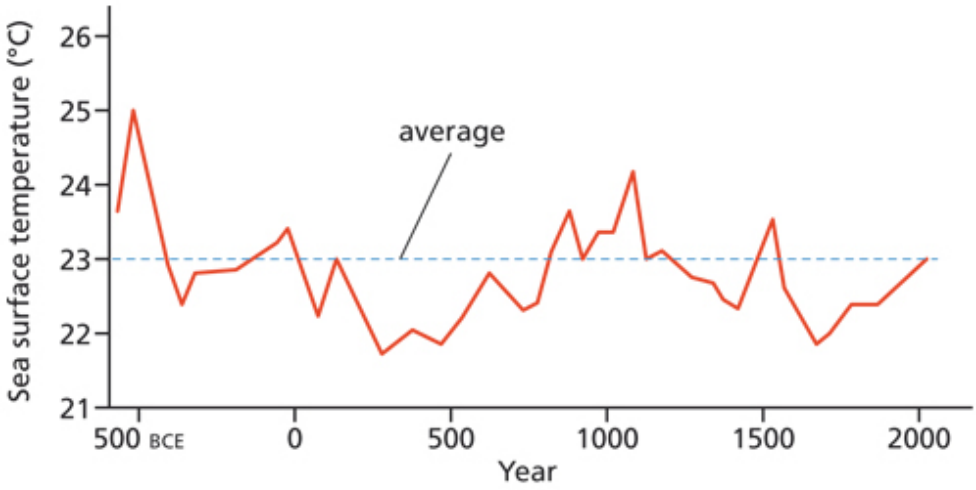
a) Methane ☐
b) Oxygen ☐
c) Carbon dioxide ☐
d) Nitrogen oxide ☐

5. In the carbon cycle, match the process to the product. [1 mark]

Fossilisation	Carbon dioxide
Feeding	Organic compounds in green plants
Respiration	Carbon in fossil fuels
Photosynthesis	Organic compounds in animals

6. Look at the graph. It shows sea surface temperature changes over 2500 years.

Revision Pack Topic 9 - Chemistry of the Atmosphere



In which two years were sea surface temperatures at their highest? [1 mark]

a) 500 BCE ☐
b) 0 ☐
c) 1100 ☐
d) 1500 ☐

7. How is acid rain formed? [2 marks]

.....
.....
.....
.....

8. Two types of materials can be recycled reasonably efficiently. What are they? [2 marks]

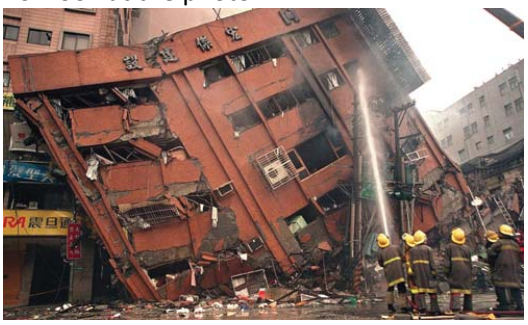
.....
.....
.....
.....

9. Which two gases in Earth's atmosphere are not elements? [2 marks]

.....
.....
.....
.....

Revision Pack Topic 9 - Chemistry of the Atmosphere

10. Look at the photo.



What evidence is there here of the movement of the Earth's surface? [2 marks]

.....

.....

.....

.....

11. Why are some volcanoes steep and conical, while others are shallow with sloping sides? [4 marks]

.....

.....

.....

.....

12. What effect on Earth's atmosphere did the evolution of plants that could photosynthesise have? [4 marks]

.....

.....

.....

.....

Revision Pack Topic 9 - Chemistry of the Atmosphere

Using our Earth Sustainably

Answers

1. Which of these processes returns carbon dioxide to the atmosphere? [1 mark]
b)
Difficulty level: moderate
Skill level: knowledge

2. By how much is Earth's average surface temperature projected to rise in the next 100 years? [1 mark]
c)
Difficulty level: difficult
Skill level: knowledge

3. On average, how far do tectonic plates move in 100 years? [1 mark]
b)
Difficulty level: moderate
Skill level: knowledge

4. Which of the following processes did not decrease the amount of carbon dioxide in Earth's atmosphere? [1 mark]
c)
Difficulty level: difficult
Skill level: application

5. Look at these rocks.

What happened to produce the upright layers? [1 mark]
d)
Difficulty level: moderate
Skill level: evaluation

Revision Pack Topic 9 - Chemistry of the Atmosphere

6. Which of the following is not a greenhouse gas? [1 mark]
b)
Difficulty level: moderate
Skill level: knowledge

7. Biodiversity is being lost in the Amazon rainforest. Which of the following is the main cause of this? [1 mark]
b)
Difficulty level: difficult
Skill level: knowledge

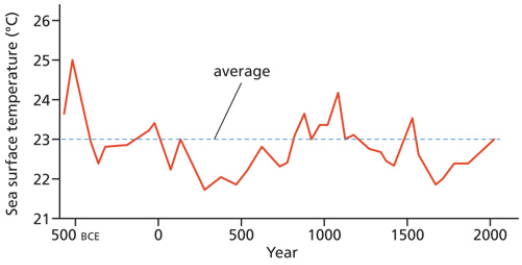
8. In the carbon cycle, match the process to the product. [1 mark]

Fossilisation	Carbon in fossil fuels
Feeding	Organic compounds in animals
Respiration	Carbon dioxide
Photosynthesis	Organic compounds in green plants

Difficulty level: moderate
Skill level: application

9. Which two of these materials decompose in five years or less? [1 mark]
c), d)
Difficulty level: moderate
Skill level: knowledge

10. Look at the graph. It shows sea surface temperature changes over 2500 years.



In which two years were sea surface temperatures at their highest? [1 mark]
a), c)
Difficulty level: difficult
Skill level: evaluation

11. How is acid rain formed? [2 marks]
(the answer should contain the following)
1) Burning impure fossil fuels produces sulfur dioxide
2) Sulfur dioxide dissolves in rain water and forms sulfuric acid
Difficulty level: moderate
Skill level: knowledge

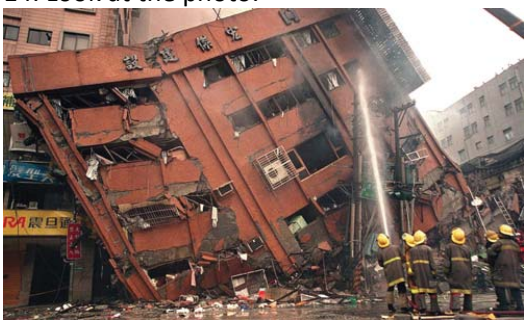
12. Two types of materials can be recycled reasonably efficiently. What are they? [2 marks]
(the answer should contain the following)
1) Metals
2) Glass

Revision Pack Topic 9 - Chemistry of the Atmosphere

Difficulty level: difficult
Skill level: knowledge

13. Which two gases in Earth's atmosphere are not elements? [2 marks]
(the answer should contain the following)
1) Carbon dioxide
2) Water vapour
Difficulty level: moderate
Skill level: knowledge

14. Look at the photo.



What evidence is there here of the movement of the Earth's surface? [2 marks]
(the answer should contain the following)
1) Building collapsed due to Earthquake
2) Earthquakes are a result of Earth's movements
Difficulty level: difficult
Skill level: evaluation

Revision Pack Topic 9 - Chemistry of the Atmosphere

15. Limestone, chalk and marble are chemically identical. They are all forms of calcium carbonate. However, they are not all the same type of rock. Explain why. [2 marks]
(the answer should contain the following)
1) Limestone and chalk are sedimentary rocks
2) Marble is a metamorphic rock, made from limestone or chalk
Difficulty level: moderate
Skill level: evaluation

16. Explain how water can cause rocks to break in cold winters. [2 marks]
(the answer should contain the following)
1) Water is trapped in cracks
2) Water freezes (becomes ice) and expands, splitting the rock
Difficulty level: difficult
Skill level: application

17. Why are some volcanoes steep and conical, while others are shallow with sloping sides? [4 marks]
(the answer should contain the following)
1) Steep and conical volcanoes are made of acidic magma
2) Acidic magma is very viscous and cools and hardens before it spreads far
3) Volcanoes that are shallow with sloping sides are made of alkaline magma
4) Alkaline magma is very runny and travels long distances before it cools and hardens
Difficulty level: moderate
Skill level: application

18. What effect on Earth's atmosphere did the evolution of plants that could photosynthesise have? [4 marks]
(the answer should contain the following)
1) The early atmosphere was mainly carbon dioxide
2) It contained very little oxygen
3) Photosynthesis converts carbon dioxide and water into glucose and oxygen
4) Over time the amount of oxygen increased until it reached its present level
Difficulty level: difficult
Skill level: application