

HOMWORK BOOKLET

C9 & C10 Foundation

Evolution of the Atmosphere

Number the cards below and reorganise them into the correct sequence.

Animals and other complex life evolved.

Water vapour, released from volcanoes, condensed to form oceans.

The early atmosphere began to form and was mostly carbon dioxide with no oxygen.

Green plants and algae evolved and began to use the carbon dioxide for photosynthesis.

Photosynthetic organisms released oxygen which began to build up in the atmosphere.

The Earth's surface was covered in active volcanoes which released a lot of gases.

Carbon dioxide gas began to dissolve into the oceans and formed sediments on the sea bed.



Chemistry of the Atmosphere

Multiple Choice Questions

Homework 1

Set 1

You may use a periodic table to help you answer these questions.

Tick **one** box.

- Which gas makes up approximately four-fifths of the present-day atmosphere?
 - carbon dioxide
 - methane
 - nitrogen
 - oxygen
- What is believed to have released the gases which formed the Earth's early atmosphere?
 - bacteria
 - fossil fuels
 - plants
 - volcanoes
- Which gas was first produced by algae and plants about 2.7 billion years ago?
 - carbon dioxide
 - methane
 - nitrogen
 - oxygen
- When the first oceans formed, which gas dissolved in their waters, reducing its quantity in the early atmosphere?
 - carbon dioxide
 - methane
 - nitrogen
 - oxygen
- Why are greenhouse gases in the atmosphere important?
 - they are highly toxic
 - they are needed for cellular respiration
 - they maintain a temperature on Earth which can support life
 - they protect the Earth's surface from solar flares



6. Which of these human activities leads to an increase in atmospheric methane?
- A. cattle farming
 - B. combustion of fossil fuels
 - C. deforestation
 - D. use of transportation
7. Scientists believe there is a link between the rising average global temperature and which of the following effects?
- A. changes in the global distribution of rainfall
 - B. increased frequency and severity of storms
 - C. rising sea levels
 - D. all of the above
8. What is a carbon footprint?
- A. the amount of carbon dioxide released when a fuel is burned
 - B. the amount of carbon dioxide that is emitted by a product or person in its lifetime
 - C. the amount of carbon stored in the ground
 - D. the total amount of all greenhouse gases emitted by a product, service, or event over its life cycle
9. What are the products of the complete combustion of propane, C_3H_8 ?
- A. carbon dioxide and water
 - B. carbon dioxide only
 - C. carbon monoxide and water
 - D. carbon monoxide only
10. Which atmospheric pollutant causes global dimming?
- A. carbon monoxide
 - B. nitrogen oxides
 - C. particulates
 - D. sulfur dioxide



Chemistry of the Atmosphere

Multiple Choice Questions

Homework 2

Set 2

You may use a periodic table to help you answer these questions.

Tick **one** box.

1. Approximately what proportion of the present-day atmosphere is oxygen?
 - A. 20%
 - B. 40%
 - C. 60%
 - D. 80%

2. What happened to the large amount of water vapour that is thought to have been present in the early atmosphere of the Earth?
 - A. it condensed to form oceans
 - B. it drifted out into space
 - C. it still forms a large proportion of the atmosphere
 - D. it was absorbed by plants

3. Which process first released oxygen into the atmosphere?
 - A. combustion
 - B. decomposition
 - C. photosynthesis
 - D. respiration

4. Which process has removed carbon dioxide from the atmosphere over time?
 - A. combustion
 - B. decomposition
 - C. photosynthesis
 - D. respiration

5. Which of the following is **not** a greenhouse gas?
 - A. carbon dioxide
 - B. hydrogen
 - C. methane
 - D. water vapour



6. Which of the following would indicate that evidence of global climate change is reliable?
- A. it contains evidence from a single source
 - B. it contains a range of opinions
 - C. it has been peer-reviewed
 - D. it is complex and difficult to understand
7. Which of these is **not** a potential effect of global climate change?
- A. increased frequency and severity of storms
 - B. increased occurrence of drought
 - C. rising atmospheric temperatures
 - D. rising sea levels
8. How could a person reduce their carbon footprint?
- A. eat less meat
 - B. recycle waste
 - C. walk or cycle when making a short journey
 - D. all of the above
9. What type of reaction would produce carbon monoxide or carbon particulates?
- A. carbon capture
 - B. complete combustion
 - C. incomplete combustion
 - D. thermal decomposition
10. What problem is caused by increased levels of sulfur dioxide in the atmosphere?
- A. acid rain
 - B. deforestation
 - C. global dimming
 - D. global warming



Chemistry of the Atmosphere

Multiple Choice Questions

Homework 2

Set 3

You may use a periodic table to help you answer these questions.

Tick **one** box.

- Which gas makes up approximately one-fifth of the present-day atmosphere?
 - carbon dioxide
 - hydrogen
 - nitrogen
 - oxygen
- Why is it **not** possible to be certain about the composition of the early atmosphere of the Earth?
 - because the early atmosphere of the Earth is thought to be like that of Mars or Venus today
 - because it was so long ago
 - because there is a lot of evidence to analyse
 - because there is only one theory about how the atmosphere has developed
- Which equation shows the process by which oxygen was first released into the atmosphere by plants?
 - carbon dioxide + glucose \rightarrow oxygen + water
 - carbon dioxide + water \rightarrow glucose + oxygen
 - hydrogen peroxide \rightarrow water + oxygen
 - water \rightarrow hydrogen + oxygen
- The formation of sedimentary rocks and fossil fuels caused a reduction in the amount of which gas in the early atmosphere?
 - carbon dioxide
 - hydrogen
 - nitrogen
 - oxygen



5. Which statement about the greenhouse effect is **not** correct?
- A. greenhouse gases in the atmosphere only absorb long wavelength radiation
 - B. some of the energy transferred by the Sun is reflected back into space from the surface of the Earth
 - C. the Earth radiates long and short wavelength radiation
 - D. the surface of the Earth is warmed by infrared radiation emitted by the Sun
6. Which of these human activities leads to the increase of atmospheric methane?
- A. combustion of fossil fuels
 - B. deforestation
 - C. disposal of waste in landfill sites
 - D. incineration of waste
7. Which of the following is a possible effect of the polar ice caps melting?
- A. a reduced number of habitats
 - B. coastal areas experience flooding
 - C. rising sea levels
 - D. all of the above
8. Which of these is **not** a method of reducing a carbon footprint?
- A. carbon capture
 - B. eating only organic meat
 - C. using renewable energy sources
 - D. using energy efficient appliances
9. Crude oil contains a small amount of ethanethiol, C_2H_6S . Which of the following will not be produced in the complete combustion of ethanethiol?
- A. carbon dioxide
 - B. carbon particulates
 - C. sulfur dioxide
 - D. water
10. Which problem is associated with carbon monoxide?
- A. acid rain
 - B. global dimming
 - C. global warming
 - D. it is toxic and not easily detected



Chemistry of the Atmosphere

Multiple Choice Questions

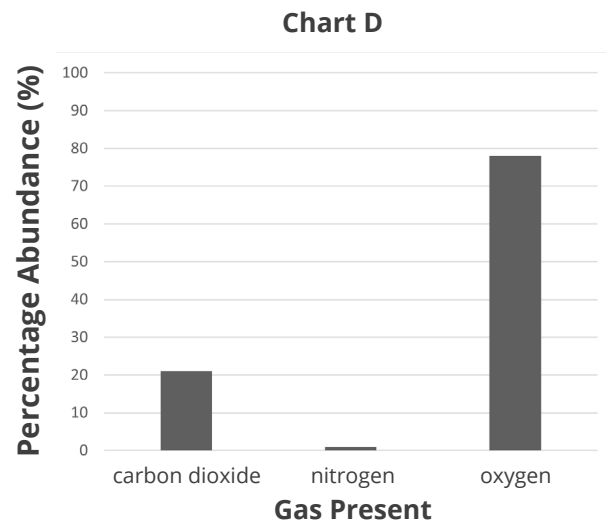
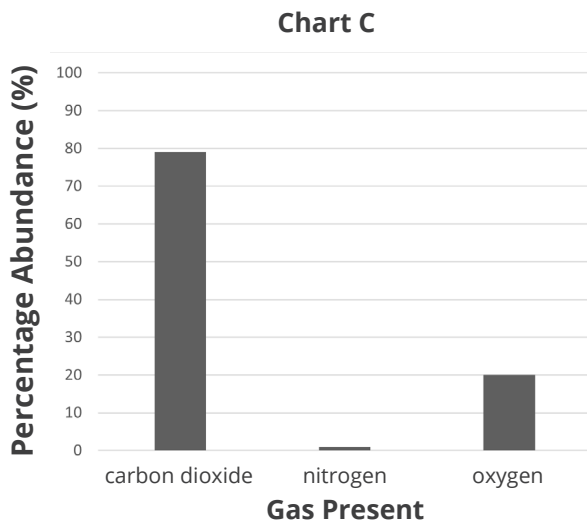
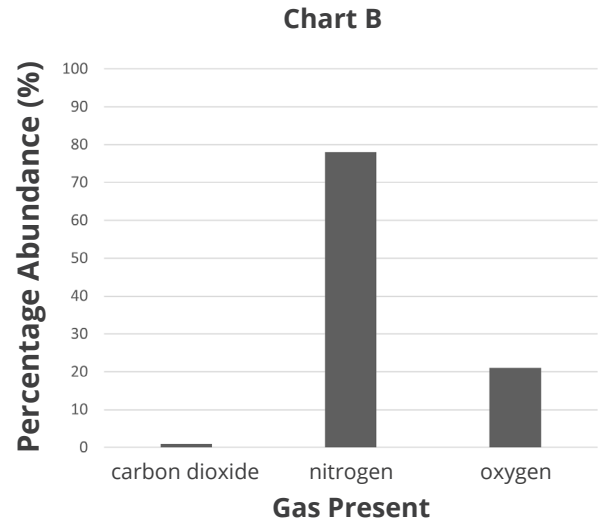
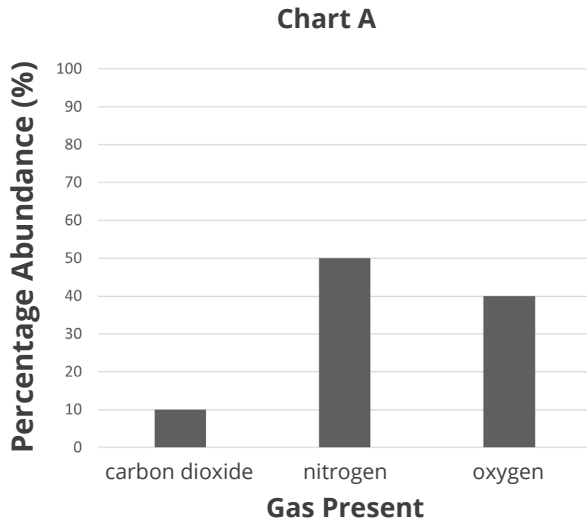
Homework 2

Set 4

You may use a periodic table to help you answer these questions.

Tick **one** box.

1. Which chart shows the approximate composition of the present-day atmosphere?



- A. A
- B. B
- C. C
- D. D

2. Which gas was the most abundant in the early atmosphere of the Earth?

- A. carbon dioxide
- B. hydrogen
- C. nitrogen
- D. oxygen



3. What first produced the oxygen found in the present-day atmosphere of the Earth?
- A. algae and plants
 - B. animals
 - C. bacteria
 - D. volcanoes
4. Which of the following reduces the amount of carbon dioxide in the atmosphere?
- A. formation of fossil fuels
 - B. formation of sedimentary rock
 - C. photosynthesis
 - D. all the above
5. Water vapour, carbon dioxide and methane are examples of what?
- A. fossil fuels
 - B. greenhouse gases
 - C. hydrocarbons
 - D. toxins
6. Deforestation is linked to an increase in the atmospheric levels of which gas?
- A. carbon dioxide
 - B. methane
 - C. nitrogen
 - D. oxygen
7. Which statement is **not** true?
- A. climate change can affect the migration and hibernation of wildlife
 - B. climate change can affect the amount of food that it is possible to produce for people
 - C. climate change can lead to the loss of habitats
 - D. climate change only affects wildlife, not people



8. Which statement is **not** true?
- A. carbon capture can be used to reduce the carbon footprint of some industries
 - B. individuals, companies, industries and whole countries can all reduce their carbon footprint
 - C. most scientists and governments agree on how carbon footprints can be reduced
 - D. reducing carbon footprints can be an expensive and time-consuming process
9. Propanol, C_3H_7OH , is a fuel. What are the products of the complete combustion of propanol?
- A. carbon dioxide
 - B. carbon dioxide and water
 - C. carbon monoxide and water
 - D. carbon particulates
10. What problem is associated with oxides of nitrogen?
- A. acid rain
 - B. deforestation
 - C. global dimming
 - D. global warming



Chemistry of the Atmosphere

Multiple Choice Questions

Homework 2

Set 5

You may use a periodic table to help you answer these questions.

Tick **one** box.

- For how long have the proportions of gases in the present-day atmosphere of the Earth been approximately consistent?
 - 200 years
 - 2000 years
 - 2 000 000 years
 - 200 000 000 years
- Which gas was **not** present in the early atmosphere of the Earth?
 - carbon dioxide
 - nitrogen
 - oxygen
 - water vapour
- Which gas needed to be present in the atmosphere to enable animals to evolve?
 - carbon dioxide
 - nitrogen
 - oxygen
 - water vapour
- The percentage of which atmospheric gas has decreased because of photosynthesis?
 - carbon dioxide
 - nitrogen
 - oxygen
 - water vapour
- Which statement about greenhouse gases is correct?
 - greenhouse gases absorb all the radiation from the Sun
 - greenhouse gases absorb long wavelength (infrared) radiation from the surface of the Earth
 - greenhouse gases are all toxic
 - greenhouse gases are only produced by the combustion of fossil fuels

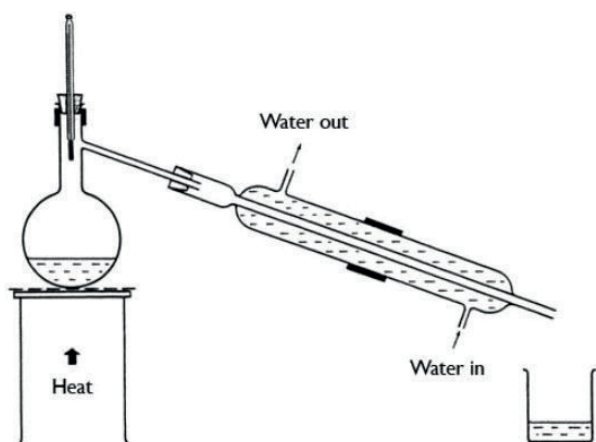


6. Which of these activities has **not** been linked to an increase in the atmospheric levels of greenhouse gases?
- A. cattle breeding
 - B. deforestation
 - C. disposal of waste in landfill sites
 - D. generation of electricity through nuclear power
7. What do most scientists believe is the major cause of global climate change?
- A. hunting of endangered species
 - B. increased frequency and severity of storms
 - C. overfishing of the oceans
 - D. rising average global temperature
8. Which mode of transport has the lowest greenhouse gas emissions?
- A. aeroplane
 - B. bus
 - C. car
 - D. walking
9. A student used a Bunsen burner to heat some water in a beaker. After the experiment, the student noticed a black residue on the bottom of the beaker. Which conclusion is correct?
- A. complete combustion of the gas from the Bunsen burner occurred
 - B. incomplete combustion of the gas from the Bunsen burner occurred
 - C. the beaker reacted with oxygen in the air when heated
 - D. the gas from the Bunsen burner was contaminated
10. Which pollutant is toxic due to it affecting the ability of red blood cells to carry oxygen?
- A. carbon monoxide
 - B. carbon particulates
 - C. oxides of nitrogen
 - D. sulfur dioxide

Water Purification

Questions

1. Distillation can be carried out using a piece of equipment called the Liebig condenser, as shown in the diagram below.



Compare this method of distillation with the method you used in your investigation. In your answer, remember to include:

- Any differences in the methods.
- Which method you prefer, and why.
- The advantages to the differences.
- An explanation of how distillation works.

2. Name two solutions that could be separated by distillation.

3. The pH of water can vary. How can the pH of water be tested? Give two methods.

Sewage Treatment Process

Number the cards below and reorganise them into the correct sequence to show the method for treating sewage.

The sediment is removed and treated by anaerobic digestion.

The sewage is screened to remove large bits, e.g. twigs, plastic bags and grit.

The sewage stands in a settlement tank to form a layer of sediment (heavier) and effluent (lighter).

Additional treatments can include addition of chemicals, UV radiation or using membranes.

The clean water is then released back into the environment.

The treated sediment produces methane (for energy) and digested waste (for fertiliser).

The effluent is removed and treated by biological aerobic digestion.



Using Resources Multiple Choice Questions

Set 1

Tick **one** box.

1. What do humans use the Earth's resources for?

- A. food
- B. shelter
- C. warmth
- D. all of the above

2. Which of these is a renewable natural resource?

- A. copper
- B. crude oil
- C. natural gas
- D. timber

3. How is most potable water produced in the United Kingdom?

- A. desalination of salty water
- B. filtration and sterilisation of ground water
- C. treatment of waste water
- D. all of the above

4. Is potable water pure water?

- A. it cannot be known because it depends on where the water comes from
- B. it cannot be known because is not possible to test the purity of water
- C. no, because it contains small amounts of dissolved salts
- D. yes, because it comes from a natural source

5. Which of these is **not** a stage in the treatment of sewage?

- A. anaerobic digestion of sludge
- B. screening
- C. sedimentation
- D. sterilisation with chlorine



6. Why are life cycle assessments sometimes said to be subjective?
- A. because it is not possible to quantify every stage of a product's life cycle
 - B. because they can be selective in the information they present
 - C. because they can be misused to reach biased conclusions
 - D. all of the above

7. Which product can be widely reused?
- A. aluminium foil
 - B. glass milk bottles
 - C. paper carrier bags
 - D. polystyrene cups

Table 1 gives some information about paper bags and plastic bags.

Table 1

	Paper Bag	Plastic Bag
Raw Materials	wood	crude oil
Reusability	single-use	can be reused many times
Disposal	biodegradable and can be recycled	mostly landfill

8. Which type of bag in **Table 1** is made from a renewable resource?
- A. both paper bags and plastic bags
 - B. neither paper bags nor plastic bags
 - C. paper bags only
 - D. plastic bags only

9. What advantage of using paper bags is given in **Table 1**?
- A. a fossil fuel is used as the raw material
 - B. they can be reused many times
 - C. they contribute to deforestation
 - D. they naturally decompose

10. Which statement about recycling is not true?
- A. recycling an item is more energy-efficient than replacing it
 - B. recycling helps to reduce the environmental impact of mining and quarrying
 - C. recycling materials helps to preserve limited resources
 - D. the raw materials used to make an item can only be recycled once



Using Resources Multiple Choice Questions

Set 2

Tick **one** box.

1. Which statement about food, clothing, timber and fuels is correct?
 - A. they are always artificially made
 - B. they are always made from finite resources
 - C. they are always made from natural resources
 - D. they can be made from natural resources, supplemented by agriculture

2. What is a finite resource?
 - A. a limited resource that could run out
 - B. a resource that can be remade as quickly as it is being used
 - C. a resource that is made sustainably
 - D. a synthetic material

3. What is potable water?
 - A. all water is potable water
 - B. pure water
 - C. seawater
 - D. water which is safe to drink

4. Why is chlorine used in the production of potable water?
 - A. to kill microbes
 - B. to remove large debris
 - C. to remove salts
 - D. all of the above

5. What is the purpose of waste water treatment?
 - A. to make it safe to release the water back into the environment
 - B. to remove harmful chemicals from industrial processes
 - C. to remove organic waste and harmful microbes
 - D. all of the above



6. Which of these is **not** a stage of a life cycle assessment (LCA)?

- A. extraction of raw materials to make the product
- B. disposal of the product
- C. manufacturing of the product
- D. the colour and style of the product

7. Which material is **not** widely recycled in the United Kingdom?

- A. cardboard
- B. glass
- C. fabric
- D. metal

Table 1 shows information about the life cycle of two different milk bottles.

Table 1

	Glass Milk Bottle	Plastic Milk Bottle
Raw Materials	sand, soda ash, limestone	crude oil
Energy Required for Manufacturing (MJ/kg)	6.57	3.75
Lifespan	reusable	single-use

8. Calculate the number of times a glass milk bottle needs to be reused before it is more energy-efficient than a plastic milk bottle.

- A. 1
- B. 2
- C. 3
- D. 4

9. How does reusing a glass bottle reduce its environmental impact? Use information from **Table 1**.

- A. it preserves natural resources
- B. it reduces the volume of waste rock from quarrying
- C. it requires less energy than recycling
- D. all of the above



10. Which of the following statements is true? Use the information in **Table 1**.

- A. glass milk bottles cannot be used more than once
- B. glass milk bottles require twice as much energy to manufacture compared to plastic milk bottles
- C. plastic milk bottles are made using finite materials
- D. plastic milk bottles are made using renewable materials



Life Cycle Assessments

Number the cards below and reorganise them into the correct sequence to show each stage of a product's life cycle which is assessed for its environmental impact.

Manufacturing of the products and packaging.
Duration of use of the product.
Extraction of the raw materials.
Disposal of waste and by-products from the manufacturing process.
Processing of the raw materials.
Disposal of the product after use.
Pollution or environmental harm from use of the product.



Using Resources Crossword

Homework 4

Solve the clues to complete the crossword. Each of the answers to the clues relates to using the Earth's natural resources. The number of letters in each word has been given to help you.

The crossword puzzle grid consists of 12 numbered starting points for clues:

- 1: Down, 1 letter
- 2: Down, 1 letter
- 3: Down, 1 letter
- 4: Across, 4 letters
- 5: Across, 5 letters
- 6: Across, 8 letters
- 7: Across, 12 letters
- 8: Across, 8 letters
- 9: Across, 8 letters
- 10: Across, 8 letters
- 11: Across, 12 letters
- 12: Across, 12 letters



Across

4. A word to describe a limited resource that isn't replenished or replaced quickly enough to be considered renewable. (6)
5. The waste material that can be treated using a process of screening, sedimentation, anaerobic digestion of sludge, and aerobic biological treatment of effluent. (6)
6. The process used to remove undissolved solids from water. (10)
7. The name for water containing low levels of dissolved substances, that collects in the ground, lakes and rivers when it rains. (5,5)
8. The collection and processing of used materials to make new products. (9)
10. A word to describe substances made by chemical processes, i.e. not natural. (9)
11. A word relating to farming, including cultivating soil, growing crops and rearing livestock. Materials produced this way can be used to supplement natural resources to provide food, clothing and fuels. (11)
12. A word to describe a process that is able to be maintained at a certain level or rate, or continue over time. (11)

Down

1. Water that is safe to drink. It is not the same as pure water because it contains dissolved substances. (7,5)
2. A process that assesses the environmental impact of a product over the course of its life. (4,5,10)
3. The removal of microorganisms from water. This can be done by using chlorine, ozone or ultraviolet light. (13)
9. A process that removes salt from salty water or sea water. It can be done by distillation or by processes that use membranes such as reverse osmosis. (12)