

## Earth's Atmosphere and Climate Change

Q1. (2018)

A)

1 The Earth's atmosphere contains several gases.

(a) Figure 1 shows the relative amounts of gases thought to be in the Earth's early atmosphere.

| gas            | relative amount in Earth's early atmosphere |
|----------------|---------------------------------------------|
| oxygen         | small                                       |
| carbon dioxide | large                                       |
| nitrogen       | small                                       |
| water vapour   | large                                       |

Figure 1

The amount of water vapour in today's atmosphere is much less than the amount in the Earth's early atmosphere.

Explain why the amount of water vapour in the atmosphere has decreased.

(2)

B)

(b) The apparatus shown in Figure 2 is used to find the percentage of oxygen in dry air.

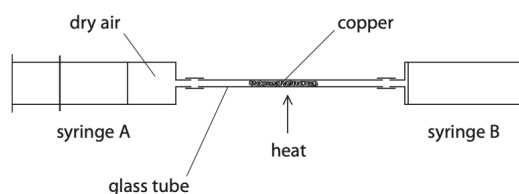


Figure 2

Syringe A contains  $50 \text{ cm}^3$  of dry air and syringe B contains no air.

The copper in the glass tube is heated strongly.

The air in the apparatus is passed backwards and forwards over the copper until all the oxygen has been removed.

(i) The following results were obtained

initial volume of air in apparatus =  $50 \text{ cm}^3$

final volume of gas in apparatus =  $40 \text{ cm}^3$

Calculate the percentage of oxygen in this sample of dry air.

(2)

.....

.....

.....

percentage oxygen in the air = .....

C)

(ii) At the end of the experiment, the apparatus and its contents are allowed to cool before the final volume of gas is measured.

(1)

The apparatus and its contents must be allowed to cool because

- ☐ A reading the volume while the apparatus is hot is dangerous
- ☐ B the glass tube may crack when it is hot and allow air into the apparatus
- ☐ C the gas has expanded when it is hot
- ☐ D the copper reacts with other gases in the air when it is hot

D)

- (c) The Earth's earliest rocks contained iron sulfide and no iron oxide.  
Later the rocks contained iron oxide as well as iron sulfide.

Explain what happened to allow this change to occur.

(2)

Q2. (2019)

- 5 (a) Carbon dioxide is one of the gases in the Earth's atmosphere.  
The percentage of carbon dioxide in the Earth's atmosphere has changed over time.

A)

- (i) Which row of the table shows the approximate percentage of carbon dioxide thought to be in the Earth's early atmosphere and how this percentage changed to form the Earth's atmosphere today?

(1)

|                                       | approximate percentage of carbon dioxide in the Earth's early atmosphere | change in percentage carbon dioxide to form the Earth's atmosphere today. |
|---------------------------------------|--------------------------------------------------------------------------|---------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> A | 5                                                                        | increased                                                                 |
| <input checked="" type="checkbox"/> B | 5                                                                        | decreased                                                                 |
| <input checked="" type="checkbox"/> C | 95                                                                       | increased                                                                 |
| <input checked="" type="checkbox"/> D | 95                                                                       | decreased                                                                 |

B)

- (ii) The actual percentage of carbon dioxide in the Earth's atmosphere today varies.

Explain **two** factors that cause the percentage of carbon dioxide in today's atmosphere to vary.

(4)

factor 1 .....

.....

.....

.....

factor 2 .....

.....

.....

.....

Q3. (2020)

- 7 (a) Air contains several gaseous elements.

Which of these shows the three most common gaseous elements in air, listed in order from the most common to the least common?

(1)

- ☒ A oxygen, chlorine, nitrogen  
☒ B nitrogen, oxygen, hydrogen  
☒ C oxygen, nitrogen, helium  
☒ D nitrogen, oxygen, argon

## Q4. (2020) – 7b (ii)

(b) The density of a gas can be found using the equation

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

A student carried out an experiment to find the density of argon.

The mass of a stopper and flask, containing no gas, was known.  
The flask was completely filled with argon and its mass measured.

Figure 4 shows the results the student wrote down.

|                                              |        |
|----------------------------------------------|--------|
| mass of stopper and flask in g               | 78.639 |
| mass of stopper and flask full of argon in g | 79.120 |
| volume of flask in cm <sup>3</sup>           | 250.0  |

Figure 4

(ii) The flask used for the experiment is shown in Figure 5.

The flask holds 250.0 cm<sup>3</sup> when filled up to the line.

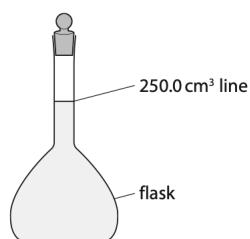


Figure 5

There is an error in the volume the student has used in the calculation.  
This would give an incorrect value for the density of argon.

Identify this error and state what should be done to correct it.

(2)

error .....

.....

what should be done to correct it .....

.....

.....

## Q5. (2020) – 7d

(d) Much of the carbon dioxide present in the Earth's early atmosphere dissolved into the oceans.

This led to the formation of compounds including calcium carbonate, CaCO<sub>3</sub>.

Some of the calcium carbonate reacted with magnesium ions to form dolomite, CaMg(CO<sub>3</sub>)<sub>2</sub>.

Complete the **ionic** equation for the reaction of calcium carbonate with magnesium ions.

(2)



## Q6. (2020) – 7e

(e) **P** and **Q** are both mixtures of gases.

One has the same composition as the early atmosphere and the other has the same composition as the current atmosphere.

Tests are carried out on gas mixtures **P** and **Q**.

The test for carbon dioxide is to bubble the gas into limewater; if carbon dioxide is present calcium carbonate is formed.

The results of the tests are shown in Figure 6.

| test                                  | result with gas mixture P               | result with gas mixture Q                |
|---------------------------------------|-----------------------------------------|------------------------------------------|
| bubble gas into limewater             | white precipitate forms after 4 minutes | white precipitate forms after 10 seconds |
| place burning splint into gas mixture | splint continues to burn                | splint immediately goes out              |

**Figure 6**

Explain, using the data in Figure 6, which gas mixture represents the early atmosphere. (2)

## Q7. (2021) – 5d

(d) Figure 6 shows two gas syringes connected by a glass tube.

Inside the glass tube there are some pieces of zinc.

Zinc reacts with oxygen at a temperature of over 225 °C.

Not all the oxygen reacts at once, the oxygen reacts only when in contact with the zinc.

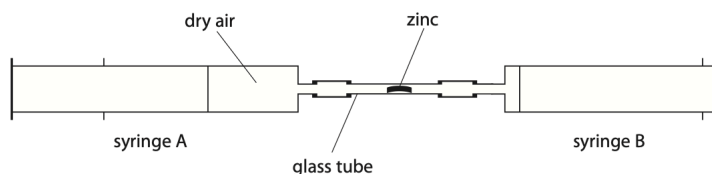


**Figure 6**

Devise a plan to find the volume of oxygen contained in a known volume of air, using the apparatus shown in Figure 6. (4)

## Q8. (2022)

7 This question is about oxygen.

(a) The percentage of oxygen in today's atmosphere is greater than the percentage of oxygen in the Earth's early atmosphere.

Explain what caused this change to happen. (2)

## Q9. (2022) – 7d

- (d) A student uses the apparatus shown in Figure 10 to investigate the percentage of oxygen in the atmosphere.

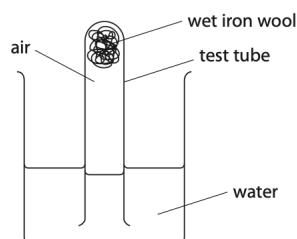


Figure 10

The apparatus was left for a few days.

A)

- (i) Explain one change the student would see after a few days.

(2)

B)

- (ii) Explain one change that can be made to the apparatus in Figure 10 to allow the student to calculate the percentage of oxygen in the atmosphere.

(2)

## Q10. (2023)

- 5 (a) Figure 9 shows the percentage of three gases, X, Y and Z, in the Earth's early atmosphere.

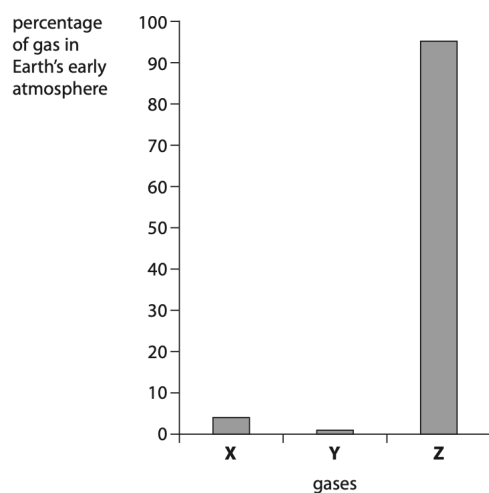


Figure 9

What is the name of gas Z?

(1)

- ☐ A argon
- ☐ B carbon dioxide
- ☐ C nitrogen
- ☐ D oxygen

## Q11. (2023) – 5d

(d) A student investigates the effect of acid rain on cress plants.

The student uses this method.

**step 1** grow 20 cress plants in each of two dishes, **A** and **B**

**step 2** water the cress plants in dish **A** with  $10\text{ cm}^3$  of dilute hydrochloric acid with a pH of 2

**step 3** water the cress plants in dish **B** with  $10\text{ cm}^3$  of pure water with a pH of 7

**step 4** repeat steps 2 and 3 every day for one week

**step 5** count how many plants are still alive after one week.

A)

(i) State what piece of equipment the student could use to measure the pH of each liquid.

(1)

B)

(ii) Explain **one** improvement that the student could make to the method to make the results more valid.

(2)

## Q12. (2024) – 3d

(d) Carbon dioxide is removed from the atmosphere by plants and stored in plants and soil as carbon compounds.

Figure 5 shows the relative amounts of carbon stored in plants and soils in different environments.

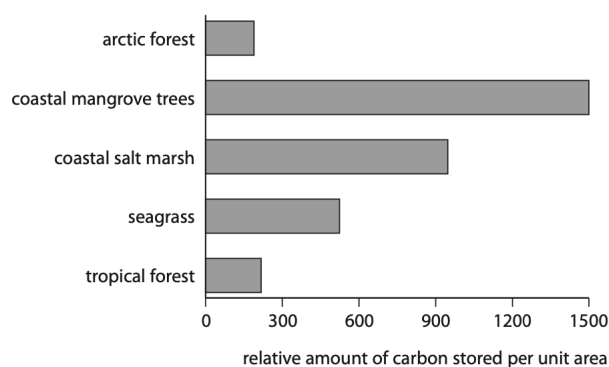


Figure 5

It has been suggested that preserving coastal ecosystems is more effective than reforestation in the mitigation of climate change.

Describe how the data in Figure 5 supports this suggestion.

(2)

## Q13. (2024)

- 6 (a) Damp iron wool reacts with oxygen in the air.  
A student uses the apparatus in Figure 7 to investigate the percentage of oxygen in the atmosphere.

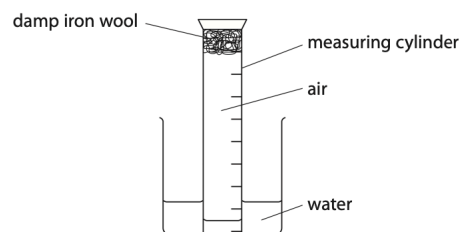


Figure 7

A)

- (i) The initial volume of air in the measuring cylinder was  $18.0\text{ cm}^3$ .

The student left the apparatus overnight.

The volume of gas in the measuring cylinder the next day was  $14.5\text{ cm}^3$ .

To the nearest whole number, what percentage of the air has reacted with the iron wool?

(1)

- ☐ A 19%
- ☐ B 21%
- ☐ C 24%
- ☐ D 81%

B)

- (ii) Describe **one** improvement the student could make to this method to ensure that all of the oxygen in the measuring cylinder has reacted.

(2)