Composition of the Atmosphere

Name: _____ Date: _____ Total: 25 marks

Part A: Match the Gases (5 marks)

Match each gas with its correct description.

Gas	Description
1. Nitrogen	A. Used by living organisms for respiration
2. Oxygen	B. Protects life from harmful ultraviolet radiation
3. Carbon dioxide	C. Makes up approximately 78% of dry air
4. Argon	D. A greenhouse gas used by plants in photosynthesis
5. Ozone	E. A noble gas making up about 0.93% of dry air

Answers: 1. ____ 2. ____ 3. ____ 4. ____ 5. ____

Part B: Atmospheric Composition (5 marks)

The table shows the approximate composition of Earth's atmosphere, excluding water vapour.

Gas	Percentage
Nitrogen	78%
Oxygen	21%
Argon	0.93%
Carbon dioxide	0.04%
Other trace gases	0.03%

Composition of dry air

- Nitrogen 78%
- Oxygen 21%
- Other gases 1%

Answer the following questions.

1. Which gas is most abundant in Earth's atmosphere? (1 mark)

2. Approximately what percentage of the atmosphere is oxygen? (1 mark)

3. Calculate the combined percentage of nitrogen and oxygen. (1 mark)

4. Which is more abundant, argon or carbon dioxide? (1 mark)

5. Why is carbon dioxide called a trace gas? (1 mark)

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Part C: Short Answer Questions (6 marks)

1. Explain one way nitrogen is important for living organisms. (2 marks)

2. Describe two ways Earth's atmosphere supports life. (2 marks)

3. Explain why greenhouse gases are important for Earth's temperature. (2 marks)

Part D: Changes in the Atmosphere (5 marks)

The table shows approximate atmospheric conditions at different times in Earth's history.

Time	Atmospheric conditions
Early Earth	Very little free oxygen; much more carbon dioxide than today
2.4 billion years ago	Oxygen began increasing significantly
Today	Approximately 21% oxygen and 0.04% carbon dioxide in dry air

1. Which gas increased significantly around 2.4 billion years ago? (1 mark)

2. What biological process helped increase atmospheric oxygen? (1 mark)

3. Explain why carbon dioxide levels generally decreased over geological time. (2 marks)

4. Name one human activity that increases atmospheric carbon dioxide today. (1 mark)

Part E: Apply Your Knowledge (4 marks)

A scientist measures carbon dioxide in the atmosphere at two different times.

- Year A: 300 parts per million (ppm)
- Year B: 420 parts per million (ppm)

1. Calculate the increase in carbon dioxide concentration. (1 mark)

2. Calculate the percentage increase relative to Year A. (2 marks)

3. Explain one possible effect of increasing atmospheric carbon dioxide. (1 mark)

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Composition of the Atmosphere
Answer Key – Teacher Copy

Part A

1–C, 2–A, 3–D, 4–E, 5–B.

Part B

1. Nitrogen.
2. Approximately 21%.
3. 78% + 21% = 99%.
4. Argon.
5. Carbon dioxide is present in a very small proportion of the atmosphere.

Part C

1. Nitrogen is needed to make proteins and DNA. Plants obtain usable nitrogen compounds from the soil, with nitrogen-fixing microorganisms playing an important role in the nitrogen cycle.
2. Accept any two: provides oxygen for respiration; supplies carbon dioxide for photosynthesis; helps maintain suitable temperatures; protects organisms from harmful ultraviolet radiation.
3. Greenhouse gases absorb and re-emit infrared radiation, reducing heat loss to space and helping maintain temperatures suitable for life.

Part D

1. Oxygen.
2. Photosynthesis, particularly by early cyanobacteria.
3. Carbon dioxide was removed through photosynthesis, ocean absorption, and long-term storage in carbonate rocks and other geological reservoirs.
4. Burning fossil fuels, deforestation, or cement production.

Part E

1. 420 − 300 = 120 ppm.
2. Percentage increase = (120 ÷ 300) × 100 = 40%.
3. Increased carbon dioxide strengthens the greenhouse effect, contributing to global warming.

Learning target coverage: Parts A and B assess atmospheric gases and their relative abundances; Part C addresses the roles of gases and how the atmosphere supports life; Parts D and E examine historical and modern changes in atmospheric composition.

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