



# Chem!stry

Name: ..... ( )

Class: .....

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## Assignment on Atmosphere and Pollution

### Question 1.

When fossil fuels are burnt in a motor car, the following gases are emitted from the car's exhaust.

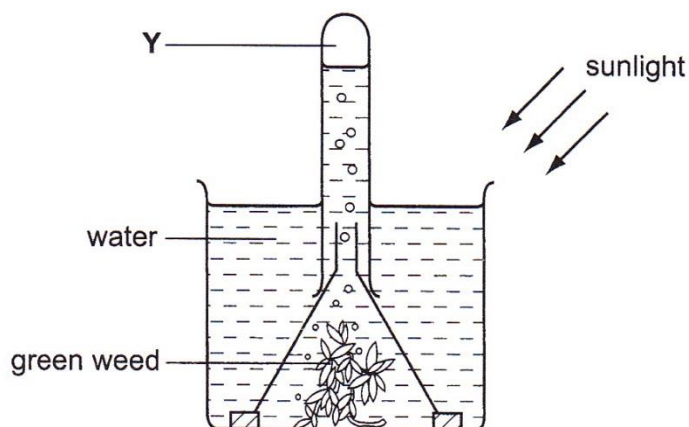
- 1  $C_8H_{18}$
- 2 CO
- 3  $NO_2$
- 4  $SO_2$

Which gases are the result of incomplete combustion?

- |          |          |          |          |
|----------|----------|----------|----------|
| <b>A</b> | 1 and 4. | <b>B</b> | 2 and 3. |
| <b>C</b> | 3 and 4. | <b>D</b> | 1 and 2. |

### Question 2.

The diagram shows a common laboratory experiment.

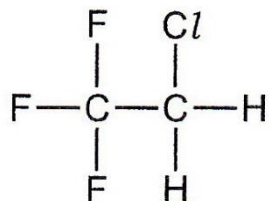


Which gas is being collected at Y?

- |          |                 |          |           |
|----------|-----------------|----------|-----------|
| <b>A</b> | Carbon dioxide. | <b>B</b> | Hydrogen. |
| <b>C</b> | Nitrogen.       | <b>D</b> | Oxygen.   |

**Question 3.**

In the past, CFC compounds were used as aerosol propellants. The structure of one CFC compound is shown.



Which element in this compound can cause a depletion of ozone?

- A** Carbon.
- B** Chlorine.
- C** Fluorine.
- D** Hydrogen.

**Question 4.**

To reduce atmospheric pollution, the waste gases from a coal-burning power station are passed through powdered calcium carbonate. Which waste gas will **not** be removed by the powdered calcium carbonate?

- A** Carbon monoxide, CO.
- B** Nitrogen dioxide, NO<sub>2</sub>.
- C** Phosphorus(V) oxide, P<sub>2</sub>O<sub>5</sub>.
- D** Sulfur dioxide, SO<sub>2</sub>.

**Question 5.**

Methane, sulfur dioxide and carbon dioxide are gases which affect the atmosphere and the environment. In what way do these gases affect the environment?

	Methane	Sulfur Dioxide	Carbon Dioxide
<b>A</b>	Depletion of ozone layer.	Acid rain.	Global warming.
<b>B</b>	Global warming.	Photochemical smog.	Acid rain.
<b>C</b>	Photochemical smog.	Global warming.	Depletion of ozone layer.
<b>D</b>	Global warming.	Acid rain.	Global warming.

**Question 6.**

A sample of air is slowly passed through aqueous sodium hydroxide and then over heated copper. Which gases are removed by this process?

- A** Carbon dioxide and water vapour.
- B** Carbon dioxide and oxygen.
- C** Nitrogen and oxygen.
- D** Nitrogen and water vapour.

**Question 7.**

Molecules present in car exhaust fumes include carbon dioxide, carbon monoxide, nitrogen, nitrogen dioxide, sulfur dioxide and water. Which of these molecules are also present in unpolluted air?

- A Nitrogen only.
- B Nitrogen and water only.
- C Nitrogen, carbon dioxide and water only.
- D Nitrogen, carbon monoxide, carbon dioxide and water only.

**Question 8.**

In which pair do both pollutants cause damage to buildings?

- A Carbon monoxide and nitrogen monoxide.
- B Carbon monoxide and sulfur dioxide.
- C Nitrogen dioxide and sulfur dioxide.
- D Nitrogen monoxide and carbon dioxide.

**Question 9.**

Air contains 21% oxygen by volume. When a sample of river water was boiled, the air expelled was found to contain 30% oxygen. What is the best explanation of this difference in oxygen content?

- A Carbon dioxide is more soluble in water than is oxygen.
- B Nitrogen reacts with water.
- C Oxygen is more soluble in water than is nitrogen.
- D The noble gases are insoluble in water.

**Question 10.**

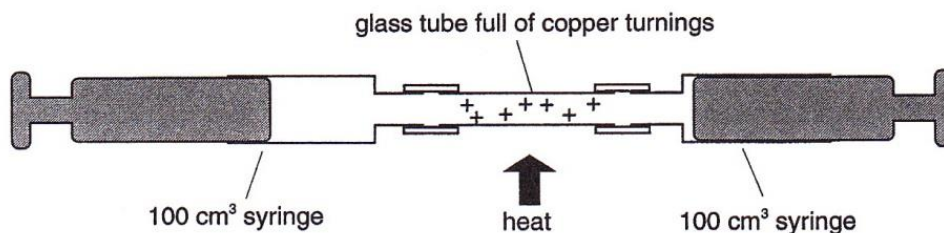
Which statements about the pollutant carbon monoxide are correct?

- 1 It is a colourless and odourless gas.
- 2 It is formed by the incomplete combustion of natural gas.
- 3 It reacts with haemoglobin in the blood.

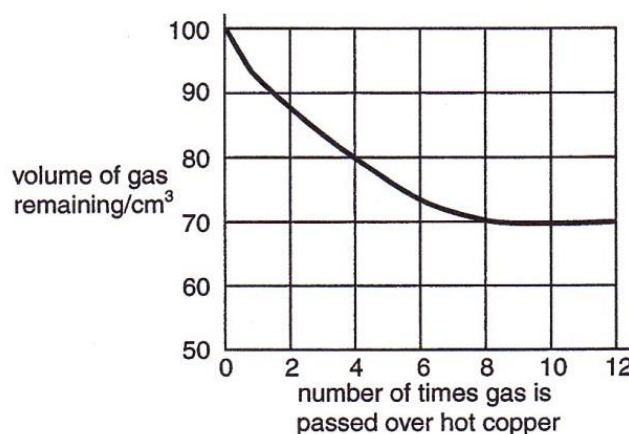
- A 1 and 2 only.
- B 1 and 3 only.
- C 2 and 3 only.
- D 1, 2 and 3.

**Question 11.**

A 100 cm<sup>3</sup> sample of bottled gas used for diving was placed in a gas syringe in the apparatus shown.



The gas was passed backward and forward over heated copper turnings. The results obtained were used to plot the graph.



What is the percentage of oxygen in the bottled gas?

- A 20%.
- B 30%.
- C 70%.
- D 80%.

**Question 12.**

Which atmospheric pollutants, emitted by internal combustion engines, are reacted together to convert them to less harmful products?

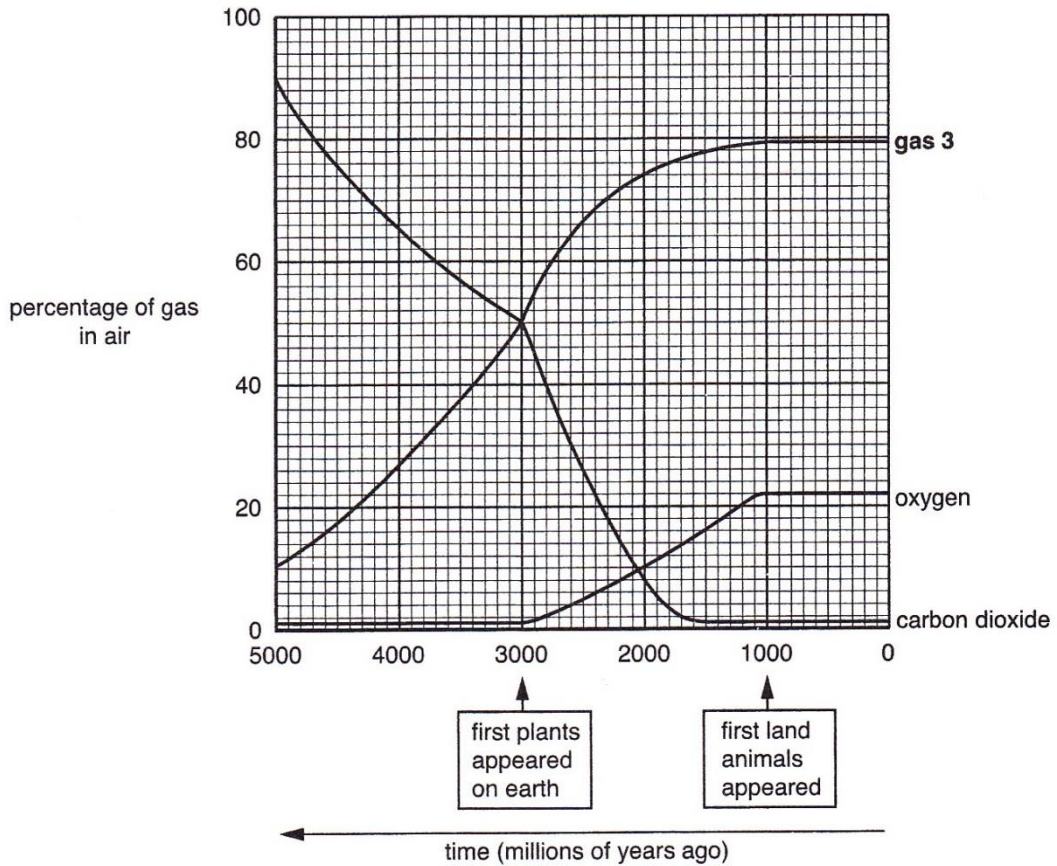
- A Carbon monoxide and nitrogen dioxide.
- B Carbon monoxide and unburned hydrocarbons.
- C Nitrogen dioxide and sulfur dioxide.
- D Sulfur dioxide and unburned hydrocarbons.

Write your answers to the 12 multiple choice questions in the table provided on the right.

1.	2.	3.	4.
5.	6.	7.	8.
9.	10.	11.	12.

**Question 13.**

This graph shows how the percentage of three of the gases in the Earth's atmosphere has changed over five thousand million years.



Use the information from the graph to answer the following questions.

- a) i)** How long have the percentages of all gases in the atmosphere remained unchanged?  
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- ii)** Name **gas 3**. Give a reason for your answer.  
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 .....
- b) i)** Describe how the percentages of carbon dioxide and oxygen have changed.  
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- ii) Suggest an explanation for the changes that have taken place in carbon dioxide and oxygen percentages, identifying the processes involved and giving equations for any reactions.

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**Question 14.**

A farmer living in a tropical country grows sugar cane on his land. Once harvested, glucose in the sugar cane is fermented to produce ethanol:

glucose → carbon dioxide + ethanol



The farmer uses the ethanol as fuel for his farm machines.

- a) Write a balanced chemical equation to show how carbon dioxide and water are converted into glucose and oxygen in the sugar cane.

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- b) Write a balanced chemical equation for the complete combustion of ethanol to form carbon dioxide and water.

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- c) Explain why ethanol from sugar cane is described as a “carbon neutral” fuel.

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**Question 15.**

Using infrared spectroscopy, astrochemists have discovered that the atmosphere of a planet 17.3 light years from Earth has the following percentage composition by volume:

<b>Gas Present in the Planet's Atmosphere</b>	<b>Percentage of the Gas Present in the Planet's Atmosphere by Volume</b>
Carbon Dioxide	18%
Carbon Monoxide	21%
Nitrogen	48%
Oxygen	12%
Argon	Approximately 1%

a) Which gas is present in the planet's atmosphere in the same percentage that it is present in the Earth's atmosphere?

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b) Explain why the planet's atmosphere is harmful to human health.

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c) The planet's atmosphere does not contain any ozone. Explain why this is both an *advantage* and a *disadvantage* to organisms that may be living on the surface of the planet.

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d) i) If a 70.0 cm<sup>3</sup> sample of the planet's atmosphere were passed repeatedly over the surface of hot copper, what would the volume of the remaining gas be?

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ii) If the gas produced by the experiment in **16 d) i)** were bubbled through a concentrated solution of aqueous sodium hydroxide, what would the volume of the remaining gas be?

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**Note:** The volumes of all gases are measured at 25 °C and 101 000 Pa.

**Question 16.**

**a)** Briefly explain how carbon monoxide and nitrogen monoxide are formed in internal combustion engines.

**i)** Carbon monoxide:

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**ii)** Nitrogen monoxide:

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**b)** Explain the problems caused by carbon monoxide and nitrogen monoxide in the environment.

**i)** Carbon monoxide:

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**ii)** Nitrogen monoxide:

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**c)** A catalytic converter fitted to a motor car converts carbon monoxide and nitrogen monoxide to carbon dioxide and nitrogen. Write a balanced chemical equation, including state symbols, for this reaction.

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- Scan the QR code given below to view the answers to this assignment.



[http://www.chemist.sg/atmosphere\\_pollution\\_ans.pdf](http://www.chemist.sg/atmosphere_pollution_ans.pdf)