

Section A: Multiple Choice: (Nos. 1-8, 1 mark each)

Use the multiple choice answer sheet on page 4

1. What is the main criterion for designating the corresponding layers of the atmosphere?

- (A) The composition of each layer
- (B) The temperature in each layer
- (C) The density of each layer
- (D) The type of reaction occurring in each layer

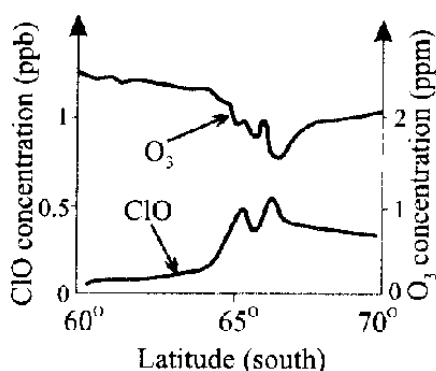
2. The formation of ozone in the troposphere is due to which situation?

- (A) Presence of the very short UV radiation acting on an oxygen molecule
- (B) Presence of medium short frequency UV radiation acting on nitric oxide molecules
- (C) Presence of low frequency UV radiation acting on nitrogen dioxide molecules
- (D) Presence of medium high frequency UV acting on hydrocarbons

3. The condensed structural formula of the compound is $\text{CF}_3\text{CHClCH}_3$. What is its systematic name?

- (A) 2-chloro-1,1,1-trifluoropropane
- (B) 2-chloro-3,3,3-trifluoropropane
- (C) 1,1,1-trifluoro-2-chloropropane
- (D) 3,3,3-trifluoro-2-chloropropane

4. Which chemical reaction given below supports the information given in the following diagram?



- (A) $2 \text{ClO} (g) \rightleftharpoons \text{Cl}_2\text{O}_2(g)$
- (B) $\text{Cl}_2\text{O}_2 (g) \rightleftharpoons 2 \text{Cl} (g) + \text{O}_2(g)$
- (C) $\text{ClO}(g) + \text{O}_2(g) \rightleftharpoons \text{Cl}(g) + \text{O}_3(g)$
- (D) $\text{Cl}(g) + \text{O}_3(g) \rightleftharpoons \text{ClO}(g) + \text{O}_2 (g)$

5. Which of the following choices correctly describes the thermosphere, troposphere and stratosphere?

	THERMOSPHERE	TROPOSPHERE	STRATOSPHERE
(A)	Ozone destroyed in this layer due to high temperature	Lowest layer of the atmosphere	Ozone produced in this layer
(B)	Hottest layer	Layer surrounding the Earth's surface	Layer with the most pollutants
(C)	CFCs destroyed in this layer	Ozone formed in this layer due to high UV flux	Highest layer
(D)	Highest layer	Layer with the most pollutants	Ozone formed and destroyed in this layer

6. Water authorities regularly test drinking water to ensure the health of the populace. Which of the test profiles would be indicative of high quality water?

	TDS	DO	BOD
(A)	high	high	high
(B)	high	low	high
(C)	low	high	low
(D)	low	low	low

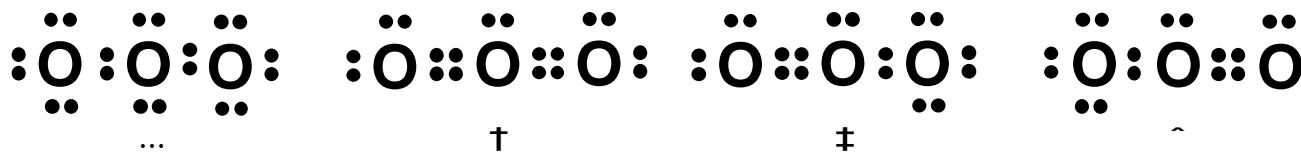
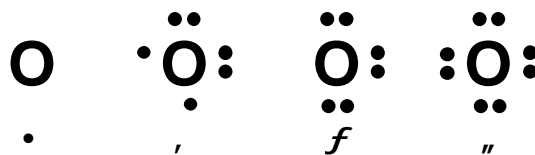
7. The table lists ions to be identified and test solutions.

ION TO BE IDENTIFIED	TEST SOLUTION USED
1. Ba ²⁺	5 AgNO ₃
2. Cl ⁻	6 BaCl ₂
3. CO ₃ ²⁻	7 HNO ₃
4. SO ₄ ²⁻	8 H ₂ SO ₄

Which of the following sets shows the correct matching?

- (A) 1 + 8; 2 + 5; 3 + 7; 4 + 6
 (B) 1 + 5; 2 + 8; 3 + 6; 4 + 7
 (C) 1 + 7; 2 + 6; 3 + 5; 4 + 8
 (D) 1 + 6; 2 + 7; 3 + 8; 4 + 5

8. Study these Lewis electron dot structures...



Which pair represents the correct structures of oxygen (free radical) and ozone?

- (A) 1 and 6
- (B) 2 and 7
- (C) 3 and 8
- (D) 4 and 5

INSTRUCTIONS

Use the multiple choice answer sheet below.

Select the alternative A, B, C or D that best answers the question. Fill in the response square completely.

Sample $2+4=$ (A) 2 (B) 6 (C) 8 (D) 9

A • B | C • D •

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A | ~~B~~ | C • D •

If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and drawing an arrow as follows:

~~A~~ | ~~B~~ | C • D •
 correct ↗

Section A

Multiple Choice Answer Sheet

- | | | | | |
|----|-----|-----|-----|-----|
| 1. | A • | B • | C • | D • |
| 2. | A • | B • | C • | D • |
| 3. | A • | B • | C • | D • |
| 4. | A • | B • | C • | D • |
| 5. | A • | B • | C • | D • |
| 6. | A • | B • | C • | D • |
| 7. | A • | B • | C • | D • |
| 8. | A • | B • | C • | D • |

Section B:
Short Answer Questions

Question 9 (3-marks)

Your recent labwork involved the identification of the following ions...

*phosphate, sulfate, carbonate, chloride, barium, calcium, lead,
copper and iron*

- (a) Identify one of these ions and explain why its presence must be monitored in substances used by society. 2

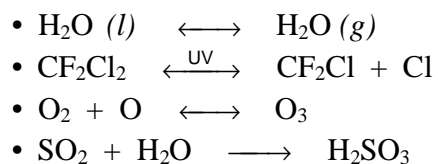
.....
.....
.....

- (b) Describe the chemical test and a positive result for the presence of the aqueous ion identified in (a) 1

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

Question 10 (1 mark)

The following reactions can occur in the atmosphere...



Draw the Lewis electron dot structure of a free radical species found above. 1

Question 11 (2-marks)

Describe the conditions under which rusting of iron occurs. Use half equations to support your answers

2

.....

.....

.....

.....

.....

Question 12 (3 marks)

Describe the work of Davy and Faraday in increasing understanding of electron transfer reactions.

2

.....

.....

.....

.....

.....

Question 13 (3 marks)

Identify alternative chemicals used to replace CFCs and evaluate the effectiveness of their use as a replacement for CFCs.

3

.....

.....

.....

.....

.....

MARKS

Question 14 (3 marks)

Describe the design and composition of microscopic membrane filters and explain how they purify contaminated water.

3

.....

.....

.....

.....

.....

END OF PART 1 A

Multiple Choice: (1 mark each)

1. What is the main criterion for designating the corresponding layers of the atmosphere?

- (A) The composition of each layer
- (B) The temperature in each layer
- (C) The density of each layer
- (D) The type of reaction occurring in each layer

Ans.: B Outcome:H13

2. The formation of ozone in the troposphere is due to which situation?

- (A) presence of the very short UV radiation acting on an oxygen molecule
- (B) presence of medium short frequency UV radiation acting on nitric oxide molecules
- (C) presence of low frequency UV radiation acting on nitrogen dioxide molecules
- (D) presence of medium high frequency UV acting on hydrocarbons

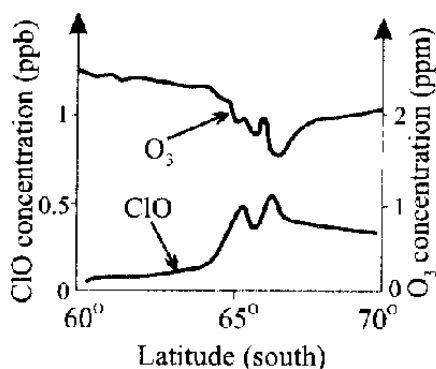
Ans:B Outcomes:H8

3. What is the correct IUPAC name of a compound whose condensed structural formula is $\text{CF}_3\text{CHClCH}_3$?

- (A) 2-chloro-1,1,1-trifluoropropane
- (B) 2-chloro-3,3,3-trifluoropropane
- (C) 1,1,1-trifluoro-2-chloropropane
- (D) 3,3,3-trifluoro-2-chloropropane

Ans A: Outcomes H13

4. Which chemical reaction given below supports the information given in the following diagram?



- (A) $2 \text{ClO} (g) \rightleftharpoons \text{Cl}_2\text{O}_2(g)$
- (B) $\text{Cl}_2\text{O}_2 (g) \rightleftharpoons 2 \text{Cl} (g) + \text{O}_2(g)$
- (C) $\text{ClO}(g) + \text{O}_2(g) \rightleftharpoons \text{Cl}(g) + \text{O}_3(g)$
- (D) $\text{Cl}(g) + \text{O}_3(g) \rightleftharpoons \text{ClO}(g) + \text{O}_2 (g)$

Ans:D Outcomes H6, H7, H9

5. Which of the following choices correctly describes the thermosphere, troposphere and stratosphere?

	THERMOSPHERE	TROPOSPHERE	STRATOSPHERE
(A)	Ozone destroyed in this layer due to high temperature	Lowest layer of the atmosphere	Ozone produced in this layer
(B)	Hottest layer	Layer surrounding the Earth's surface	Layer with the most pollutants
(C)	CFCs destroyed in this layer	Ozone formed in this layer due to high UV flux	Highest layer
(D)	Highest layer	Layer with the most pollutants	Ozone formed and destroyed in this layer

Answer (D)

Outcome H4

6. Water authorities regularly test drinking water to ensure the health of the populace. Which of the test profiles would be indicative of high quality water?

	TDS	DO	BOD
(A)	high	high	high
(B)	high	low	high
(C)	low	high	low
(D)	low	low	low

Answer (C)

Outcome H4

7. The table lists ions to be identified and test solutions.

ION TO BE IDENTIFIED	TEST SOLUTION USED
• Ba ²⁺	• AgNO ₃
• Cl ⁻	• BaCl ₂
• CO ₃ ²⁻	• HNO ₃
• SO ₄ ²⁻	• H ₂ SO ₄

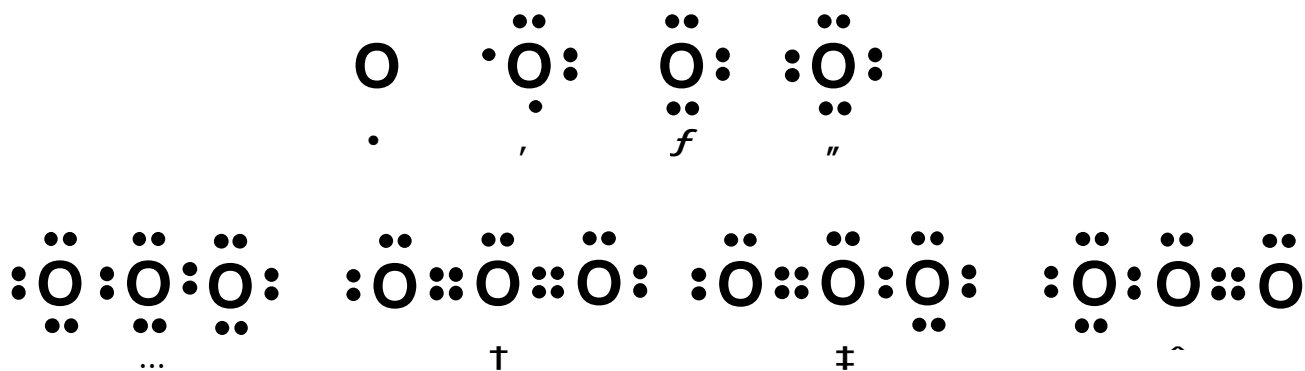
Which of the following sets shows the correct matching?

- (A) 1 + 8; 2 + 5; 3 + 7; 4 + 6
 (B) 1 + 5; 2 + 8; 3 + 6; 4 + 7
 (C) 1 + 7; 2 + 6; 3 + 5; 4 + 8
 (D) 1 + 6; 2 + 7; 3 + 8; 4 + 5

Answer (B)

Outcome H6

Study these Lewis electron dot structures...



Which pair represents the correct structures of oxygen (free radical) and ozone?

- (A) 1 and 6
 (B) 2 and 7
 (C) 3 and 8
 (D) 4 and 5

Answer (B)

Outcome H6

INSTRUCTIONS

Use the multiple choice answer sheet below.

Select the alternative A, B, C or D that best answers the question. Fill in the response square completely.

Sample $2+4=$ (A) 2 (B) 6 (C) 8 (D) 9

A • B C • D •

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A B C • D •

If you change your mind and have crossed out what you consider to be the correct answer, then indicate this by writing the word *correct* and drawing an arrow as follows:

A B ^{correct} C • D •

Section A

Multiple Choice Answer Sheet

1. A • B C • D •
2. A • B C • D •
3. A B • C • D •
4. A • B • C • D
5. A • B • C • D
6. A • B • C D •
7. A • B C • D •
8. A • B C • D •

**Section B:
Short Answer Questions**

Question 9

Your recent labwork involved the identification of the following ions...

*phosphate, sulfate, carbonate, chloride, barium, calcium, lead,
copper and iron*

- (a) Identify one of these ions and explain why its presence must be monitored in substances used by society. 2

Outcome: H4

Answer: Lead is monitored in water supplies and food because it is toxic.

– OR –

Phosphate is monitored in water supplies because it can cause blue-green algal blooms which are toxic.

- (b) Describe the chemical test and a positive result for the presence of the aqueous ion identified in (a) 1

Outcome: H8

**Answer: Lead ion is tested by reaction with dilute HCl resulting in a white ppt. which is soluble in hot water.
Alternatively, test with KI resulting in a distinctive golden yellow precipitate.**

– OR –

**Phosphate ion is tested by reaction with ammonium molybdate solution.
When warmed a yellow precipitate results.
Alternatively, add a solution of NH₃ and Ba(NO₃)₂ resulting in a white ppt.
Then add, ammoniated Mg²⁺ + NH₄NO₃ buffer producing a final white ppt.**

MARKS

Question 13

Identify alternative chemicals used to replace CFCs and evaluate the effectiveness of their use as a replacement for CFCs.

3

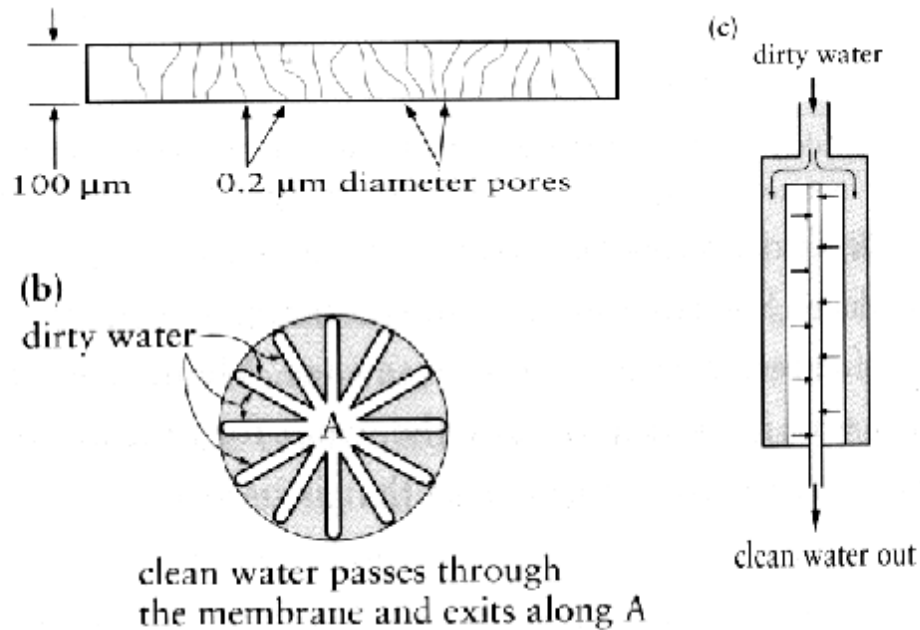
Outcomes:H4, H16

Alternative chemicals are the HCFCs, hydrochlorofluorocarbons and the HFCs, hydrofluorocarbons. The HCFCs are only half effective as a replacement for CFCs because although they are mostly degraded in the troposphere, a small amount still reach the stratosphere to destroy ozone. The HFCs are more effective as a CFC replacement than the HCFCs. They are degraded in the troposphere but because they contain no C-Cl bonds, do not destroy ozone. They are however, less efficient and more expensive than the CFCs.

Question 14 (3 marks)

Describe the design and composition of microscopic membrane filters and explain how they purify contaminated water.

A membrane filter is a thin film of a synthetic polymer (such as polypropylene, polytetrafluoroethylene and polysulfone). through which there are pores (small holes) of fairly uniform size. Water is passed through the membrane and particles bigger than these pore sizes are filtered off. The simplest type is just a sheet of porous polymer that is pleated a around a central rigid porous core and held in place with a surrounding mesh. This filter cartridge is placed in a suitable housing (c) mounted in the water pipe and filters water as it flows through.



END OF PART 1 A