Mario Molina puts the atmosphere and ozone on the political agenda

(Version 2)

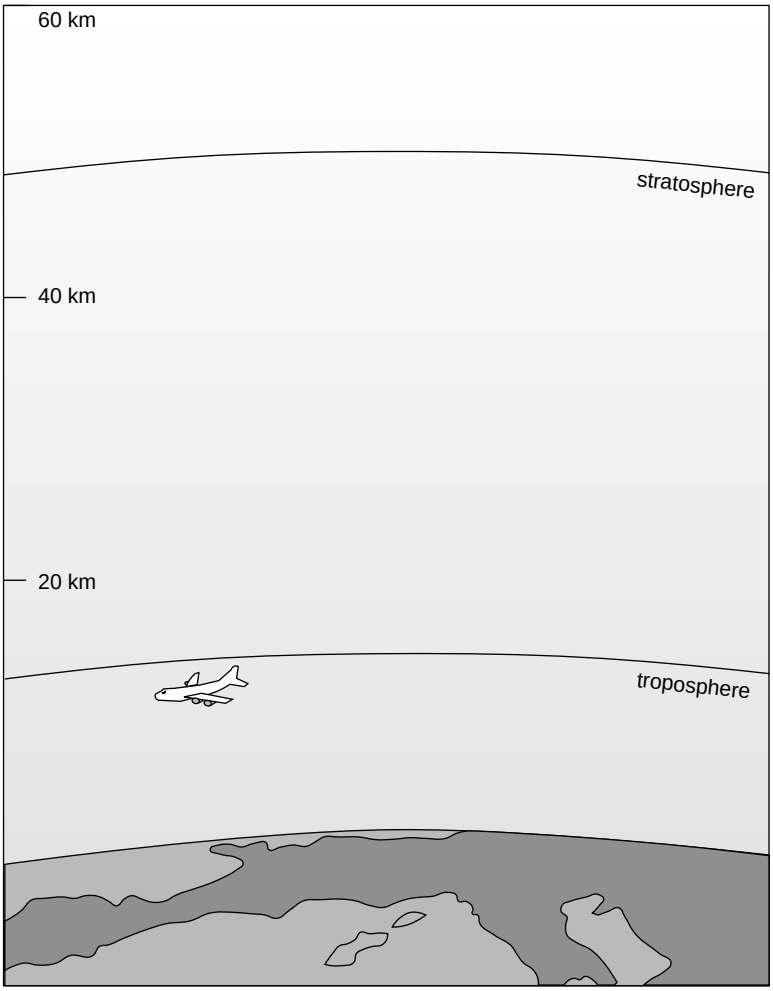
Ozone has three oxygen atoms. Ozone is a strong smelling, pale blue gas, which is poisonous to humans. Ozone is described by the following hazard symbols.

1.

Use the following words to label the hazard symbols.

Irritant	Oxidising agent	Toxic

2. How do you think you would feel if you were exposed to ozone?



A diagram of our atmosphere
(Reproduced with permission from The Ozone Layer, UNEP/GEMS Environment Library No. 2, 1987, UNEP, Nairobi, Kenya.)

The diagram of the atmosphere shows that ozone exists in the troposphere and the stratosphere.

Ozone in the stratosphere absorbs and protects the Earth from harmful UV radiation. Exposure to too much UV radiation leads to skin cancer and damages plant and marine life.

3. Why do you think it is important to look after the ozone layer?

_____

Ozone protects us from the sun

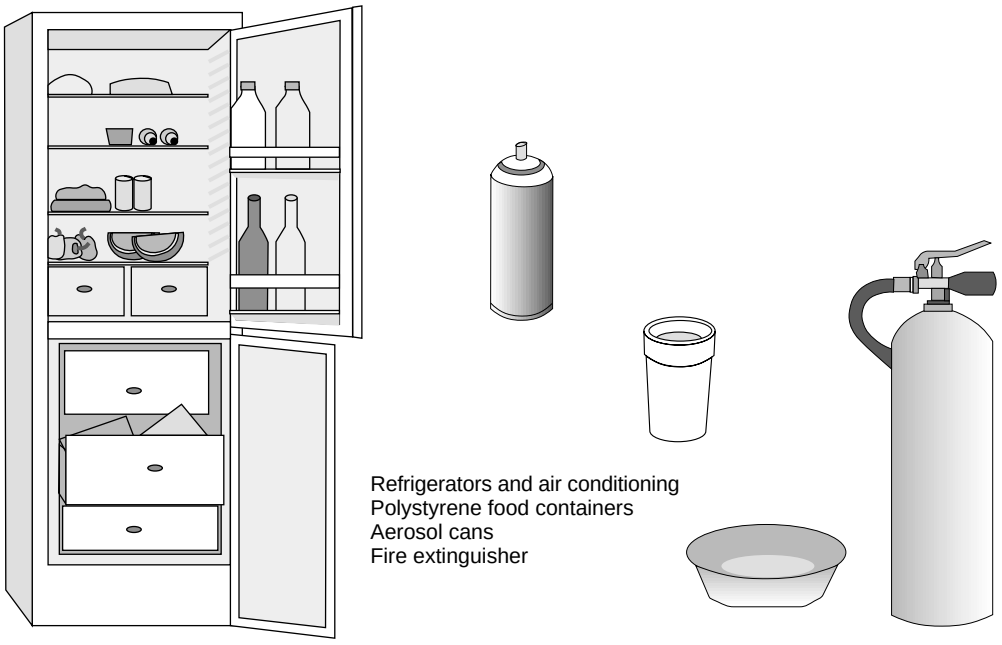
How much do you know about sunbathing? Complete the table by ticking the correct box.

	True	**False**
A sun tan is healthy		
A tan will protect you from the sun		
You can get burnt on a cloudy day		
You can get burnt if you are in water		
With sunscreen to protect me, I can sunbathe for much longer.		

After carrying out some calculations in 1973, Mario Molina, the research scientist, believed that CFCs could destroy the ozone layer in the stratosphere, and the Earth would no longer be protected from the harmful UV radiation.

$CFCl_3$ is a CFC used in air conditioners and refrigerators.

4. Name the elements in a CFC molecule._____



The booming CFC industry of the early 1970s

5. Give four uses of CFCs.

_____

_____

6. Why do you think the CFC industry was doing so well in the early 1970s?

_____

_____

After Molina made his initial discovery, he knew that, if he was right, then the Earth would be in serious trouble. As a scientist he felt that he had a responsibility to tell the world, and to do something about the ever-growing CFC industry.

7. What did Mario Molina believe CFCs would do to the Earth?

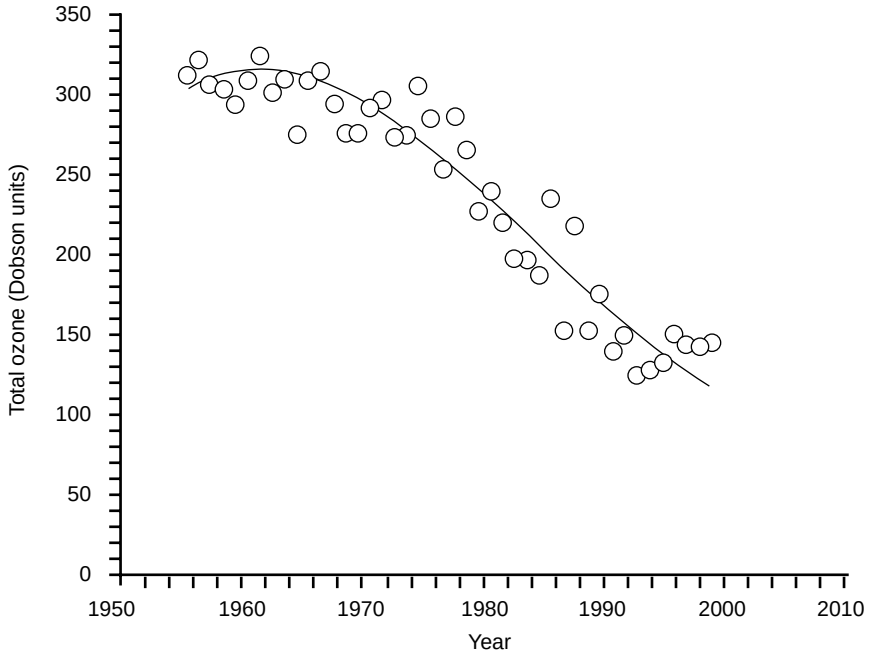
_____

_____

You now could make a timeline, which tells the CFC-ozone story so far. Your teacher will give you the instructions, which are on a separate sheet. It is important to realise that the story is not yet over. Every day scientists record the ozone level and alternative chemicals to CFCs are being researched because it will be a long time before the ozone hole is mended.

Looking at the evidence

The amount of ozone in the stratosphere has been closely monitored since 1956, at the Halley, Rothera and Vernadsky / Faraday stations in Antarctica. Scientists have shown that the amount of chlorine in the stratosphere has rapidly increased since the late 1970s.



The mean October ozone levels recorded at the Halley station
(Reproduced with permission from J. Shanklin, British Antarctic Survey.)

9. In your own words describe what the graph tells us.

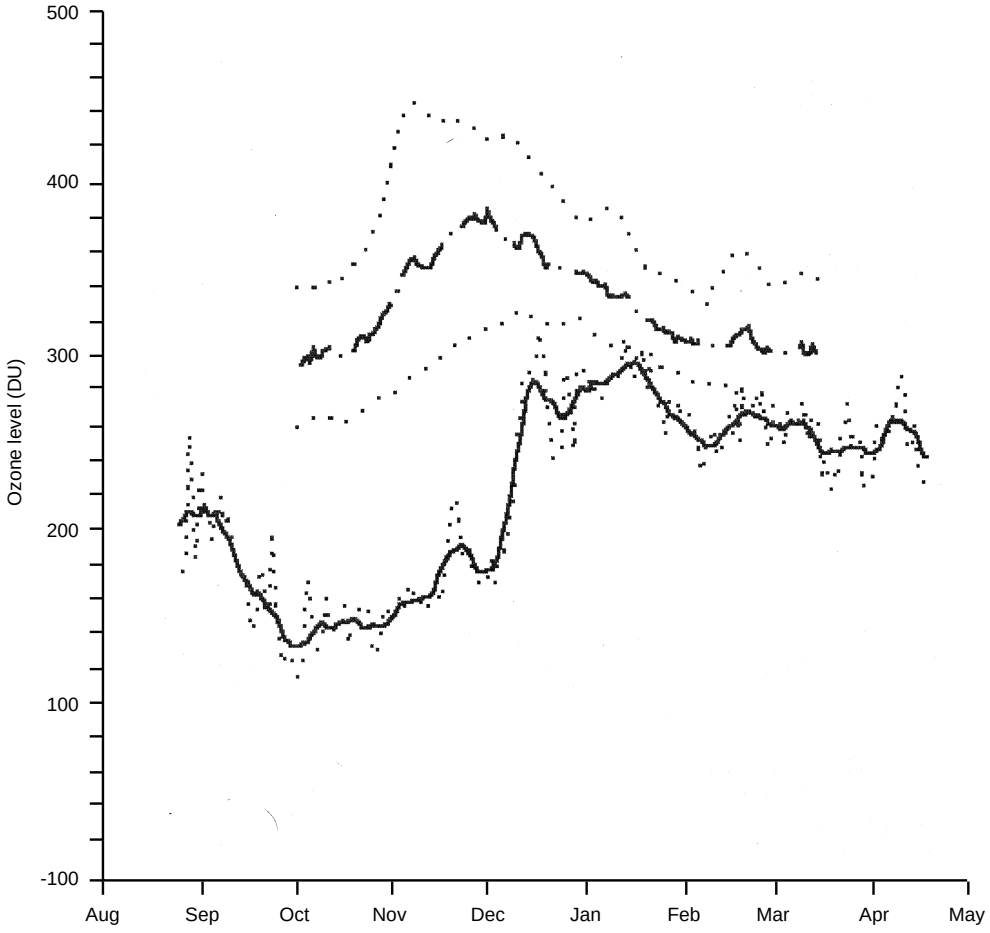
_____

_____

10. In which year did the ozone levels start to decrease?

_____

Constant monitoring in the Antarctic has revealed that ozone levels naturally fluctuate throughout the year.



Real ozone data recorded at the Halley Station, 1999–2000
(Reproduced with permission from J. Shanklin, British Antarctic Survey.)

11. In which month of the year are the ozone levels highest? _____

12 In which month of the year are the ozone levels lowest? _____

13. How much do the ozone levels fluctuate on a daily basis?_____

_____

_____

14. Compare the present ozone level with the level recorded before 1977.

_____

_____

15. Suggest a reason why ozone levels fluctuate.

_____

_____

_____

_____

The story continues…

CFCs and ozone still makes the papers…even with all the data from scientific research, it is still a controversial subject. In developing countries economic reasons have meant that these chemicals are still being used, and even in the developing world there is still controversy. Read the following newspaper extract.

Greens see red /Overseas news
World summary

Sydney: The environmental group Greenpeace has asked a court to order the Olympics Co-ordinating Authority to stop styling the 2000 Olympics as the Green Games because it says that an ozone-depleting chemical will be used in the cooling system at one of the venues

30 March 1999, The Times, p.15

Answer the following questions

16. Do you support the views of Greenpeace?

17. Research and find out about methods of cooling *ie* refrigerants and air conditioning systems that do not use CFCs.

18. Write a wordprocessed letter to the Sydney 2000 Olympic Games Committee, either supporting Greenpeace or supporting the Olympics Co-ordinating Authority, on the subject of 'Green Games'. You should include scientific / technological evidence to backup your opinion.