

INTERNATIONAL DAY FOR THE PRESERVATION OF THE OZONE LAYER

16th September 2013

A healthy atmosphere, the Future We Want !

It is our great pleasure to invite you to celebrate the 2013 International Day for the Preservation of the Ozone Layer on 16 September, the day that was proclaimed as such by the resolution adopted by the United Nations General Assembly in 1994.

The theme for this year's celebration is "**A healthy atmosphere, the Future We Want**". The Montreal Protocol has been hailed as a prime example of successful international cooperation to protect the global commons.

In addition to protecting the ozone layer, the Montreal Protocol is also contributing to protect the global climate. Political commitment by all Governments of the world and good governance have been fundamental to the milestones achieved by the Parties under the Protocol, which have in turn generated trust and confidence to meet further challenges in the coming years.

On this occasion, Gujarat Science City and Gujarat Council on Science & Technology (GUJCOST) of Department of Science & Technology, Government of Gujarat have organised a series of programmes and outreach activities among school children, college students and community members across the state.

At Gujarat Science City, students can participate in the Ozone quiz, film, presentations and interaction with eminent scientists working in this field.

The World Ozone Day celebration reiterates our commitment and offers an opportunity to focus attention on the protection of Ozone Layer. Each of us can help to prevent further damage to this precious shield given to us by nature. Please click on the attached quiz to test your ozone awareness practices.

[PSA-3 \(Combined PSA 1 & PSA 2\)](#) (60 seconds)

GSC invites one and all to be a part of this celebration and to adopt a practice of using ozone friendly substances to protect our nature and environment.

Let's act now before it is too late. Please participate in the Ozone Quiz and spread the message of the importance of this precious layer to save our life and planet.

Gujarat Science City

Capturing New Heights in Science Literacy!

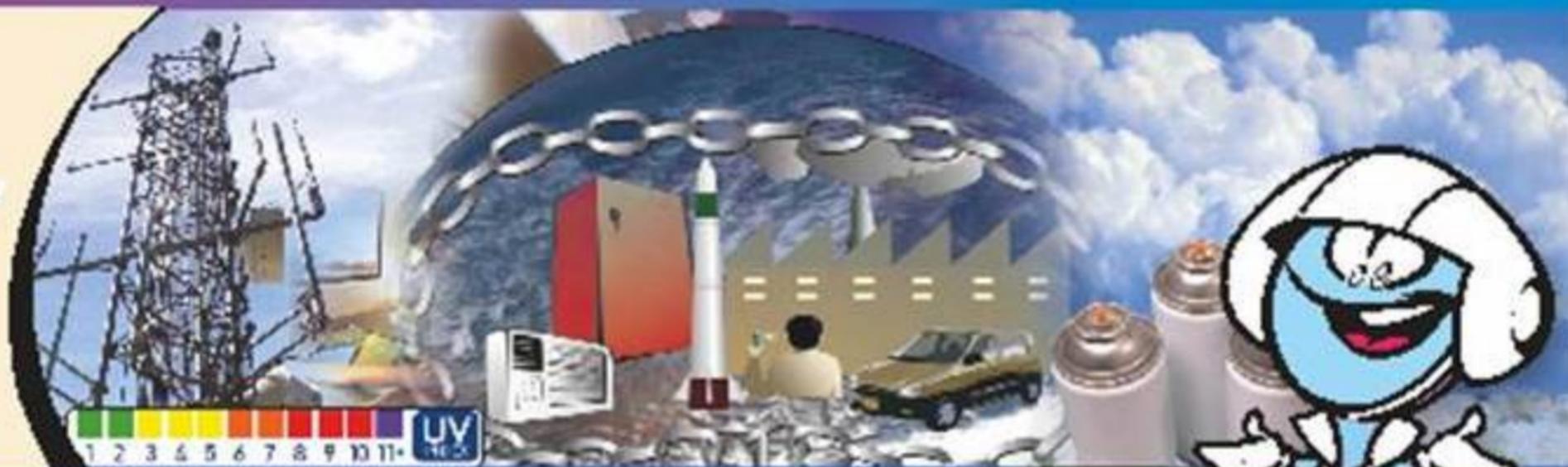
Gujarat Council on Science & Technology

Investing in Science: Investing in the Future!



WORLD OZONE DAY

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*A healthy atmosphere,
the future we want!*

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GUJARAT SCIENCE CITY

Capturing New Heights in Science Literacy !!

SCIENCE CITY ROAD, AHMEDABAD - 380 060



- 12. How is the location of measuring stations selected?**
 A randomly **C** measuring stations are scattered over different types of landscape
 B politically **D** don't know
- 13. How many Ozone measurement stations are there in India?**
 A 4 **C** 8
 B 6 **D** don't know
- 14. In which of the following Indian city has equipped with an Ozone measurement station?**
 A Ahmedabad **C** Kanpur
 B Varanasi **D** Kolkata
- 15. How do plants absorb ozone?**
 A with water through the roots **C** with air through the leaves
 B through wounds **D** don't know
- 16. What effects do the current ozone levels have on plants?**
 A slower growth **C** death
 B easily visible symptoms **D** don't know
- 17. When and where was the harmful effect of ozone on plants first recognised?**
 A 1930 around Peking **C** 1980 around Munich
 B 1944 around Los Angeles **D** don't know
- 18. What symptoms do increasing ozone levels induce in leaves and needles?**
 A yellowing **C** scattered, rather pale reddish or brown spots in summer, patchy color in winter
 B reddening **D** don't know
- 19. Under what conditions do plants absorb ozone?**
 A at average temperatures **C** in summer by day and night
 B in full sunlight **D** all of these
- 20. Does adding fertilizers aggravate the symptoms of excessive ozone?**
 A yes **C** don't know
 B no
- 21. When and where were the harmful effects of ozone on humans first recognised?**
 A 1940 in the Alps **C** 1960 in Rome
 B 1950 in Los Angeles **D** don't know
- 22. Where is the indoor level of ozone highest?**
 A in rooms with parquet flooring **C** in rooms with air-conditioning
 B in rooms with wall to wall carpeting **D** don't know
- 23. Where is the level of ozone highest?**
 A in a room with open windows **C** in a coffee shop
 B inside a car **D** don't know
- 24. What measurable reactions appear in humans and other mammals as a result of high ozone levels?**
 A difficulty in breathing **C** inflammation of the respiratory tract
 B asthma **D** all of these
- 25. Do more people die during smog periods with high ozone levels?**
 A yes **C** don't know
 B no **D**

- 26. When do we absorb the least ozone?**
A when we smoke **C** when we are asleep
B when we are jogging **D** don't know
- 27. Can ozone cause damage to buildings and other materials?**
A yes **C** only at artificially high levels
B no **D** don't know
- 28. Can ozone emergencies be predicted?**
A no **C** don't know
B yes, but only a short time beforehand and depending on the weather forecast **D**
- 29. Reducing the concentrations of some substances could help to lower ozone levels. Which ones?**
A organic compounds and nitrogen dioxide **C** heavy metals
B chlorated carbohydrates **D** don't know
- 30. Ozone at ground level reduces your**
A waist **C** IQ
B lung capacity and athletic performance **D** all of the above
- 31. Ozone is made up of how many atoms of oxygen?**
A three, as in O₃ **C** three, as in H₂O
B two, as in O₂ **D** four, as in O₄
- 32. When ground-level ozone is high, you get smog and sometimes**
A burning eyes **C** irritation of the nose and throat
B shortness of breath **D** all of the above
- 33. Sustained, high levels of ground-level ozone result from human activities such as**
A burning fuels **C** roasting chestnuts and steaks on an open fire
B spilling gasoline **D** all of the above
- 34. Combustion produces, among other oxides of nitrogen, nitrogen dioxide (NO₂). One of the oxygen atoms is freed to form the linked triplet of ozone, O₃ when**
A NO₂ absorbs energy from sunlight **C** NO₂ is inhaled
B NO₂ tires **D** all of the above
- 35. Without a protective ozone layer in the stratosphere, life as we know it could not exist. But in the 1980s,**
A an ozone hole appeared over the U.S. **C** an ozone hole was found to be forming every spring over the South Pole
B too much ozone accumulated and the sun was dimmed **D** ozone-polluted plankton was shown to be making penguins sick
- 36. Chlorofluorocarbon gasses were shown to waft up to the stratosphere, from earthly uses in air conditioners and spray cans, and be broken down by the sun's ultraviolet rays into ozone-destroying**
A hair gel **C** free chlorine atoms
B coolants **D** calcium-bound fluorosis

- 39. Because of political action to reduce chlorofluorocarbons, the ozone shield**
 A has been reformed
 B may be fine by 2010
 C may recover over the 21st Century
 D can't get better
- 40. In terms of the stratosphere, you can**
 A keep tires low
 B burn trash
 C properly dispose of old refrigerators, air conditioners and their coolants, as required by law
 D watch for air quality alerts
- 41. Stratospheric ozone, the ozone layer in the upper atmosphere**
 A needs to be reduced
 B protects us from the harmful rays of sunlight
 C causes skin cancer
 D Don't know
- 42. High ozone pollution levels are most likely to occur during**
 A cold, rainy days
 B cool, windy nights
 C hot, sunny days
 D all of the above
- 43. Tropospheric ozone is**
 A a gaseous emission from industry smokestacks and vehicle tailpipes
 B one of the main constituents of smog
 C formed on hot, sunny days when nitrogen oxides (NO_x) and volatile organic compounds (VOCs) undergo a photochemical reaction
 D Only B and C
- 44. Which of the following would reduce ozone pollution?**
 A Carpool or use public transportation
 B Use water-based paints and solvents, instead of volatile paints and solvents
 C Have your car tuned and inspected regularly
 D All of the above
- 45. Cars**
 A emit H₂O which causes ozone depletion
 B emit O₃
 C emit CO₂ which reacts with chlorofluorocarbons in the presence of sunlight to produce ozone
 D emit NO_x and VOCs, which react in the presence of sunlight to produce ozone pollution
- 46. Which of the following is true?**
 A Cars are solely responsible for ozone pollution
 B Only chemical industries are responsible for smog
 C Emissions from cars and industries contribute to ozone pollution
 D All of the above.
- 47. In order to protect yourself when ozone pollution levels are high, you should**
 A minimize your outdoor activities
 B stay indoors if you have respiratory problems
 C jog in the afternoons
 D A and B
- 48. We are concerned that ozone levels**
 A are too high at ground level
 B are too high in the stratosphere
 C are too low in the stratosphere
 D A and C.

Some Explanations:

1. Ozone is harmful for living things at **0 - 2 km** above ground level. The following questions refer to ozone at low elevations.
At a height of 40 km, on the other hand, it is 'useful' in that it filters out most ultra-violet light.

2. Christian Friedrich Schönbein described ozone in 1840 as a product of electrolysis of water, and in 1845 as a 'component of atmospheric air, which may play a part in slow oxidation'.

He exposed a piece of test paper soaked in a solution of **starch and potassium iodate** to the open air for some hours. It changed from white to dark blue/violet. This method remained in use up to 1920.

3. Ozone molecules decompose within a period of a few minutes to a few hours.
4. The concentration of ozone fluctuates in daily, weekly and yearly rhythms regardless of weather, mountains or valleys, sinks or sources.
Ozone consists of 3 oxygen atoms and easily releases one of these to form the more stable oxygen molecule (O₂).
In a variety of chemical reactions the oxygen atom released becomes attached to other molecules, changing their chemical composition.
5. The natural level of ozone varies from 20 to 80 µg/m³ (the second for high alpine areas). According to measuring stations in Switzerland, the concentration lies above the permitted level of 120 µg/m³ for 300 - 600 hours per year. In southern Switzerland, mean maximum hourly levels are around 300 µg/m³. A period of fine weather lasting more than 14 days with a level of 120 µg/m³ leads to visible symptoms in the leaves of sensitive plants.
6. Ozone levels fluctuate least in the mountains, although they are highest there. Fluctuations decrease with decreasing human influence and with increasing altitude (since ozone is mainly formed in the bottom 1500 m).
7. We are most sensitive to ozone in childhood, whereas in old age we are hardly so.
8. Ozone is formed in the presence of ultra-violet light from nitrogen dioxide NO₂ (exhaust gases), water vapour, volatile hydrocarbons, and carbon monoxide or sulfur dioxide SO₂ in chemical chain reactions. Locally, other chemical compounds may be involved.

9. In summer because there is most sunlight (necessary for ozone formation).

10.

11. The source of ozone can lie up to several 1000 km away from the measuring station. Around 30 µg/m³ ozone is formed per day as gases are carried through the air and mixed. Ozone is continually being formed and broken down. It may be carried both vertically and horizontally over long distances (10 km to several 1000 km, depending on the landscape).

12. The locations are selected in such a way as to obtain measurements from different types of landscape (e.g., town, forest, countryside, narrow valley etc.).

They may also be politically selected, if questions of air pollution are a political issue. Ozone levels can vary within distances of only meters.

13.

14.

15. Plants absorb ozone **with air through the leaves.**

16. The effects of ozone vary from species to species. Some react with slower growth, in others easily visible spots appear on the leaves.

17. High ozone levels were first connected with spots on the leaves of garden plants and crops around Los Angeles in 1944, USA. The ponderosa pines in the forests of the San Bernadino Mountains displayed spots on their needles and loss of needles. These forests finally died off in 1970 after a bark beetle epidemic.

18. In summer, scattered rather pale, reddish or brownish spots appear, especially on the upper surface of leaves and the needles, particularly those produced in the preceding year. The symptoms can be confused with those appearing after attack by insects, mites or fungi.

In the fall the coloration is patchy with green and brown areas. In plants growing in clean air the whole leaf undergoes the familiar change from green to yellow to red or brown.

19. Ozone may be absorbed under all of these conditions.

Ozone is absorbed under full sunlight at average temperatures but not if the temperature is too high or too low.

In tests, some tree species were found to absorb ozone during dusk and warm nights, in contrast to crop plants, which only do so during the day.

20. No. The appearance of the symptoms is independent of fertilisers. Lack of nutrients, however, may lead to yellowing of leaves (can be mistaken for ozone symptoms) and depresses growth much more than excessive ozone.

21. The relationship between respiratory problems and high ozone levels was first recognised in 1950 in Los Angeles in relation to outdoor sports.

22. In rooms with parquet flooring, because the labile ozone molecules decompose where there are rough surfaces (e.g. carpeting). Air-conditioning, on the other hand, efficiently decomposes ozone.

23. The level of ozone is highest in a a room with open windows, since it approximates the outdoor concentration.

Inside a car the ozone concentration is practically zero, regardless of whether the windows or roof is open, because, the smaller the volume the lower the ozone level; the conditions inside a car are not suitable for the formation of ozone from any exhaust gases entering; and because ozone entering from the surrounding air decomposes on the rough surfaces of upholstery and clothing.

Tests have shown that the ozone generated in a copyshop decomposes on rough surfaces or combines with numerous organic compounds in the ambient air.

24. If the ozone level is too high, humans and other mammals develop asthma (impaired functioning of the lungs), difficulty in breathing (reduced permeability of the membranes and/or inflammation of the respiratory tract).
25. Yes. In Europe during the hot summer 2003 mortality, related to ozone and airborne dust, of people with allergies or suffering of asthma was increased.
26. When we smoke. Tobacco smoke breaks down ozone molecules. It is, however, much more harmful than ozone. During outdoor exercise (sports), we absorb a lot of ozone because our air intake is greatest then. When we are asleep the converse is true.
27. Only at artificially high levels. In tests with artificially high levels (double or more the ambient level) ozone has been shown to cause elastic materials to become brittle and colours to fade and/or (together with moisture) damage to natural fibres. Under normal circumstances, ozone causes less damage than sulphur dioxide, chlorine compounds, light, changeable weather and micro-organisms.
28. Yes. Emergencies can be predicted for whole regions in the early morning or sometimes days in advance through models based on a combination of the weather forecast and prediction of transport of ozone over long distances (depending on prevailing winds).
29. The lowering of organic compounds, in agglomerations and of nitrogen dioxide in the countryside could help, as these are precursors for ozone formation.