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ATMOSPHERIC POLLUTION

SCOPE OF SYLLABUS

(i) **Acid rain – composition, cause and its impact.**

Sulphur in fossil fuels giving oxides of sulphur when burnt. High temperatures in furnaces and internal combustion engines produce oxides of nitrogen. (Equations to be included). Acid rain affects soil chemistry and water bodies.

(ii) **Global warming**

Greenhouse gases-their sources and ways of reducing their presence in the atmosphere. (water vapour, carbon dioxide, methane and oxides of nitrogen)

(iii) **Ozone depletion**

Formation of ozone - relevant equations.

Function in the atmosphere.

Destruction of the ozone layer - chemicals responsible for this to be named but reactions not required.

IMPORTANT POINTS TO REMEMBER

1. The gaseous envelope surrounding the earth is called as **atmosphere**. The atmosphere extends about 50 km above the sea level.

2. The atmosphere of the earth may be divided into several distinct layers.

(a) The troposphere

(b) Stratosphere and the ozone layer

Troposphere – lowest portion of earth's atmosphere. It contains approximately 75% of earth's atmosphere more and 99% of its water vapour and aerosol.

Stratosphere is the second major layer of earth's atmosphere, just above the troposphere. It is situated between about 10 km and 50 km above the sea level.

3. **Ozone layer** absorbs 97-99% of sun's UV light, which is damaging the life on earth. It is mainly located in the lower portion of the stratosphere from approximately 13 to 40 km above the sea level.

4. The tropospheric pollution or the air pollution is caused by the following pollutants :

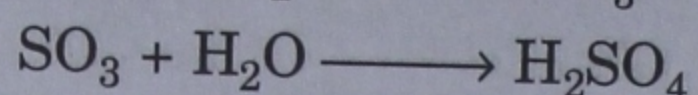
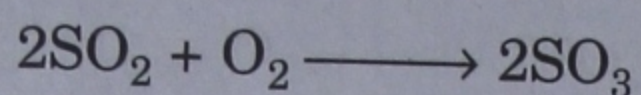
(i) **Gaseous air pollutants** : This includes mainly oxides of sulphur, oxides of nitrogen, oxides of carbon, ozone, hydrogen sulphide etc.

(ii) **Particulate air pollutants** : This includes smoke, dust, fumes etc.

5. Sulphur dioxide is one of the major atmospheric pollutants.

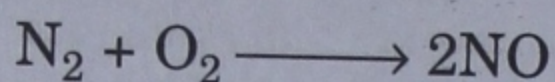
6. Sulphur dioxide is added into our environment by various activities like by burning of sulphur containing fuels, by burning of oils and during the roasting of sulphide ore in metallurgy.

7. The presence of sulphur dioxide in the atmosphere badly affects the human physiology. It causes severe headache, nausea, vomiting and in some cases it can prove fatal.
8. Sulphur dioxide is oxidized by atmospheric oxygen to form sulphur trioxide which combines with water to form sulphuric acid. This acid gets washed down with the rain and causes **acid rain**.



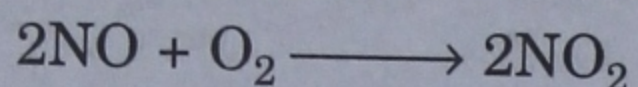
The acid corrodes the limestone and metals of the buildings and bridges etc.

9. Oxides of nitrogen are another major air pollutants which are introduced into the atmosphere by the burning of the fossil fuels in internal combustion engines produces a very high temperature and thus nitrogen and oxygen of air combine to form nitric oxide.

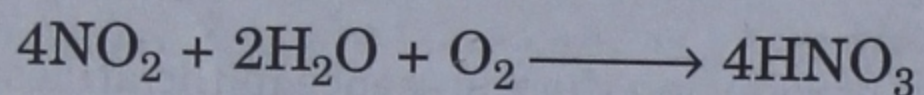


(Nitric oxide)

Nitric oxide further combines with atmospheric oxygen to form nitrogen dioxide.



Nitrogen dioxide combines with rain water and oxygen to form nitric acid which comes to the earth in the form of acid rain.



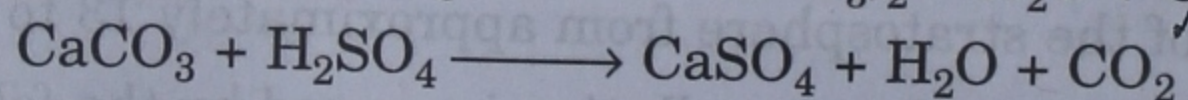
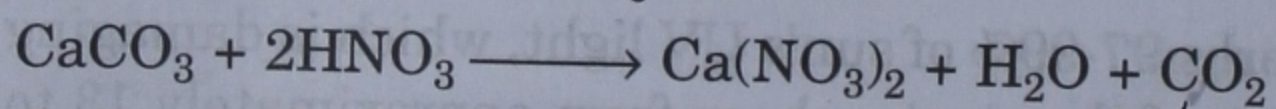
10. Nitrogen dioxide is a major atmospheric pollutant and adversely effects the human beings, plants and animals. The adverse effects of NO_2 are as follows –

- It causes irritation in mucous membrane.
- Large quantities of NO_2 can lead to serious lung congestion and in some cases can prove fatal.
- The presence of nitrogen dioxide severely damages the leaves of the plants.
- Nitrogen dioxide in the presence of light oxidizes hydrocarbon leading to the formation of photo chemical smog which cause irritation in eyes, asthma attack and other respiratory tract infections.

11. **Acid rain** has a very adverse affect on the soil chemistry, the water bodies, buildings and the vegetation –

- Acid rain removes the basic essential nutrients from the soil.
- Acid rain increases the acidic character of the water bodies and thus the water becomes unfit for the survival of the aquatic animals like fishes.
- Acid rain basically damages the leaves of the plants.
- It has harmful effect on the sculptures monument and buildings made of limestone, marbles and metals.

12. Taj Mahal (one of the seven wonders of the world) made of marble which is chemically calcium carbonate is being eroded by the acid rain and if the emission of NO_2 and SO_2 are not stopped in the nearby refineries then it can give a very ugly look to the Taj Mahal.



13. The rise in temperature of the earth's surface is called as **global warming**. It is caused due to the trapping of sun's radiation by carbon dioxide in the atmosphere. This process is called as **greenhouse effect**.

14. The gases which causes the greenhouse effect are called as **greenhouse gases**. Which includes carbon dioxide, methane, water vapour, ozone, chlorofluorocarbon, nitrous oxide etc.

15. The earth surface gets heated up by infrared radiations of the sun rays. Earth surfaces emits the infra red radiations and it escapes the earth's surface. During the process of emission some of the IR rays get absorbed by the greenhouse gases and thus it remains on the earth and these trapped radiations warm the surface of the earth and lower atmosphere.

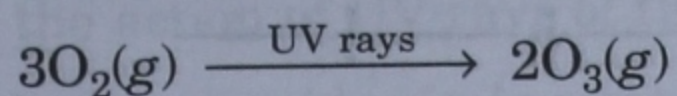
16. The various effects of global warming are —

- (i) It will lead to the melting of the glaciers and the polar ice caps which would lead to submerging of low lying coastal areas.
- (ii) Global warming increases the water vapour in the atmosphere which will contribute further in increasing the temperature of the earth.

17. Ways of reducing the greenhouse gases in the atmosphere—

- (i) Afforestation—Plant more trees, save forests, increase green cover.
- (ii) Minimum use of automobiles—use more of public transport, car pools, ride bicycles for shorter distances etc.
- (iii) Burning of fossil fuels should be minimized.

18. **Ozone** is formed by the action of UV rays of the sun on oxygen.



19. Ozone prevents the harmful ultraviolet radiations to reach the earth.

20. Ozone layer protects the life on earth from harmful UV rays which would lead to several skin diseases.

21. Decrease of the ozone in the stratosphere is called as the **depletion of the ozone layer** or the **destruction of the ozone layer**.

22. The formation of the holes in the ozone layer causes the harmful UV rays to enter into the earth.

23. The main causes of the depletion of ozone layer are

- (i) Excessive use of chlorofluorocarbons.
- (ii) Flying of super sonic planes.

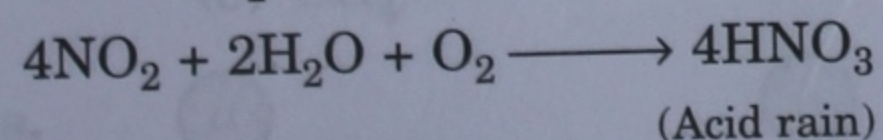
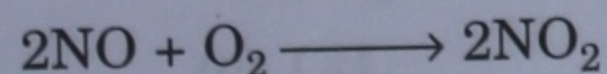
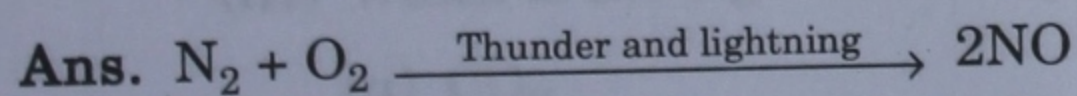
IMPORTANT QUESTIONS

Q1. Name the following :

- (i) A gas which contributes towards greenhouse effect.
- (ii) Two gases which causes acid rain.
- (iii) The oxide of nitrogen which causes greenhouse effect.
- (iv) An allotrope of oxygen which causes greenhouse effect.
- (v) Another name of greenhouse effect.

- Ans. (i) Carbon dioxide
 (ii) Nitrogen dioxide and sulphur dioxide
 (iii) Nitrous oxide
 (iv) Ozone
 (v) Global warming

Q2. Write balanced chemical equation for the formation of acid rain.



Q3. What are the causes for the destruction of ozone layer ?

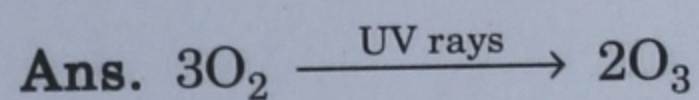
Ans. The major causes are

- (i) Excessive use of chlorofluorocarbon
- (ii) Flying of supersonic planes.

Q4. What is the full form of CFC ?

Ans. Chlorofluorocarbon.

Q5. Give equation for the formation of ozone in the atmosphere.



Q6. Fill in the blanks.

- (i) Ozone absorbs the harmful _____ rays coming from the sun.
- (ii) Carbon dioxide enters into atmosphere due to _____.
- (iii) The rise in the average temperature of earth's surface is called _____.
- (iv) Taj Mahal is made up of _____ which is chemically _____.
- (v) The particulate pollutants include _____, _____, _____, _____, and _____.

Ans. (i) ultraviolet

(ii) burning

(iii) global warming

(iv) marble, calcium carbonate

(v) dust, smoke, mist, fumes and spray

Q7. Define atmosphere.

Ans. The gaseous envelope surrounding the earth is called as atmosphere.

Q8. What are the ways of reducing greenhouse effect ?

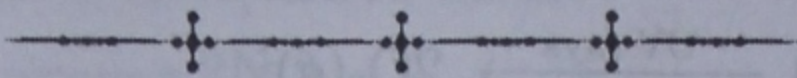
- Ans.** (i) Afforestation – Plant more trees.
 (ii) Minimum use of automobiles – use public transport.
 (iii) Burning of fossil fuels should be minimized.
 (iv) Deforestation should be stopped.

Q9. Define pollution.

Ans. Any undesirable change in our natural environment is called as pollution.

Q10. What is the main source of sulphur dioxide in atmosphere ?

Ans. By the burning of fossil fuels.



LET'S RECALL

Fill Your Answer in the Space Given for Each Question.

Q1. State whether the following statements are True or False.

- (i) Ozone is formed by the action of UV rays of the sun on oxygen.
- (ii) The major gas which causes acid rain is water vapour.
- (iii) Global warming increases the sea-level.
- (iv) Global warming makes the environment healthy.
- (v) A Photochemical smog is beneficial to human beings.

Q2. Fill in the blanks.

- (i) Nitric oxide is _____ toxic.
- (ii) The gaseous material which envelopes the earth is called _____.
- (iii) The lowest region of the atmosphere is called _____.
- (iv) Stratosphere mainly contains _____, _____ and ozone.
- (v) Rain water containing H_2SO_4 and HNO_3 is called _____.

Q3. Each question has four options out of which only one option is correct. Dark the bubble for correct answer.

(i) Select the odd one.

(a) CO_2

(c) O_2

(b) H_2O

(d) O_3

Ans.

(a)

(b)

(c)

(d)

(ii) Choose the air pollutant which is non-acidic.

(a) NO_2

(c) SO_3

(b) SO_2

(d) Ozone

Ans.

(a)

(b)

(c)

(d)

(iii) Which is not a greenhouse gas ?

(a) CO_2

(c) CH_4

(b) CO

(d) N_2O

Ans.

(a)

(b)

(c)

(d)

(iv) Choose the odd one.

(a) HCl

(c) HNO_3

(b) H_2CO_3

(d) H_2SO_4

Ans.

(a)

(b)

(c)

(d)

(v) CFC enters into atmosphere due to the use of

(a) Mobile phone

(b) Air conditioners

(c) both (a) and (b)

(d) none.

Ans.

(a)

(b)

(c)

(d)

Answers

- | | | | | |
|----------------|-----------------|-------------------|-----------------------|-----------|
| 1. (i) True | (ii) False | (iii) True | (iv) False | (v) False |
| 2. (i) less | (ii) atmosphere | (iii) troposphere | (iv) nitrogen, oxygen | |
| (v) Acid rain. | | | | |
| 3. (i) (c) | (ii) (d) | (iii) (b) | (iv) (a) | (v) (b) |

Q1. Each question has four options out of which only one option is correct. Mark the bubble for correct answer.

(i) Select the odd one.

- (a) CO_2
(b) O_2

- (c) H_2O
(d) O_3

(a)

(b)

(c)

(d)

Ans.

(ii) Choose the air pollutant which is non-acidic.

- (a) NO_2
(b) SO_2

- (c) SO_3
(d) Ozone

(a)

(b)

(c)

(d)

Ans.

(iii) Which is not a greenhouse gas?

- (a) CO_2
(b) CH_4

- (c) CO
(d) N_2O

(a)

(b)

(c)

(d)

Ans.

(iv) Choose the odd one.

- (a) HCl
(b) HNO_3

- (c) H_2CO_3
(d) H_2SO_4

(a)

(b)

(c)

(d)

Ans.

SELF EVALUATION TEST

Marks : 30

Time : 30 minutes

- | | |
|---|----------|
| Q1. Name the type of atmospheric pollutants. | 2 |
| Q2. How does global warming cause the change in sea-level ? | 2 |
| Q3. What is the function of ozone in stratosphere ? | 2 |
| Q4. Give two major causes for the destruction of ozone layer. | 2 |
| Q5. What is acid rain ? Name the main acids which causes acid rain. | 3 |
| Q6. What is the danger to the historical monuments made of marble ? Show with the help of equations. | 3 |
| Q7. State three ways of minimizing greenhouse effect ? | 3 |
| Q8. What is greenhouse effect ? Name the greenhouse gases. | 4 |
| Q9. What is meant by the depletion of ozone layer ? How is ozone formed in the atmosphere ? | 4 |
| Q10. Why is acid rain considered a threat to Taj Mahal ? | 5 |

(APPENDIX)**CHAPTER 6****WATER****Water Pollution**

1. Presence of any undesirable substance in the water bodies such as lake, river oceans etc. is termed as **water pollution**. Polluted water is unfit for human consumption as by consuming this water we can get infected by the diseases.

2. The major causes of water pollution are

- | | |
|--------------------------------|-----------------------|
| (i) Household waste | (ii) Sewage |
| (iii) Detergents | (iv) Industrial waste |
| (v) Off shore and oil drilling | |

3. The major water pollutants are

- | | |
|--|----------------------------------|
| (i) Microorganisms in domestic sewage | (ii) Decaying animals and plants |
| (iii) Discharge of untreated waste into the water bodies from the factories. | |
| (iv) Insecticides | (v) Pesticides |
| (vi) Oil slicks | (vii) Fungicides |
| (viii) Heat | |

4. The polluted water has an offensive smell, has oil and grease floating over it, has a bad taste.

5. The **control** or the **treatment of water pollution** can be done by following the steps given below:

(i) Proper collection and disposal of domestic wastes.

The domestic waste should be collected separately in two bags, one for biodegradable material and other for non-biodegradable materials. The biodegradable material are deposited in land fills whereas the other which includes plastics, metal, scraps etc. goes for recycling.

(ii) Treatment of industrial wastes by recycling to yield safe effluents.

The broken glasses can be used for making glass ware, the metal scrap can be used for making certain alloys etc.

It depends upon the nature of the pollutants present. In order to ascertain it, the pH of the medium is first determined and the waste is then neutralised with the help of suitable acids or alkalies.

The chemical substances present in the industrial waste products dissolved in water can be precipitated by suitable reactions and removed later on from water.

(iii) **Sewage treatment of industrial wastes** to yield safe **effluents** – It takes place in the following steps:

(a) **Filtration:** The bigger solids are removed by filtration of water through screens.

(b) **Sedimentation:** The water free from bigger particles is allowed to stand in large tanks where the smaller particles settle down in the form of sludge.

(c) The quality of waste water is improved by filtration, coagulation and then disinfecting it by passing chlorine.

IMPORTANT QUESTIONS

1. Define water pollution. 1

Ans. Presence of any undesirable substance in the water bodies is called water pollution.

2. State two major sources of water pollution. 1

Ans. (i) Household waste (ii) sewage

3. What should be the pH range of drinking water? 1

Ans. Its pH must lie between 6 to 9.