UNIT - 18 : ENVIROMENTAL CHEMISTRY

Important Points

Environmental chemistry means scientific study of chemical and biochemical processes occurring in environment. Through it we can know the reasons for changes and processes occurring in environment. Solid, liquid and gaseous pollutants, polluting environment can be generally classified as rapidly degradable, slowly degradable and non-biodegradable pollutants. Pollutants which degrade rapidly are known as rapidly degradable pollutants. e.g. discarded vegetables. Pollutants which degrade slowly are known as slowly degradable pollutants. e.g. agricultural waste. Some pollutants remain for decades in their original form without degradation. They are known as non-degradable pollutants. e.g. dichlorodiphenyltrichloroethane (DDT), plastic materials, heavy metals, radioactive wastes. Troposphere and stratosphere greatly affect the biosphere of earth due to which study of pollution in these two regions is most important for study of pollution in enviornment. Gaseous pollutants - SO_x, NO_x, CO, CO_2, H_2S, O_3, hydrocarbons and particulate pollutants - dust, mist, fumes, smoke, smog etc cause pollution in troposphere. The process of warming of the earth is known as 'Green house effect' or 'Global warming' and the gases actively involved in it are called 'Green house gases'. Carbon dioxide, methane, ozone, chlorofluorocarbon (CFC), nitrous oxide and water vapour present in atmosphere act as green house gases. Heat retaining capacity of greenhouse gases are called Global Warming Potential (GWP). The GWP based sequence of green house gases is as CFC > N_2O > CH_4 > CO_2. When the pH of rain water becomes lower than 5.6 then it is called acid rain. Gaseous pollutants present in troposphere are responsible for it. The acid rain in water reservoirs like rivers, ponds adversely affect fishes, microorganisms and plants, in aquatic world. Ozone layer present in stratosphere protect the living being against harmful ultraviolet radiations from space. But ODS (Ozone Depletion Substances) used by human beings deplete ozone layer. To create awareness in the whole world about the depletion of ozone layer and the remedies to protect depletion, United Nations has decided to celebrate 16th September of every year as 'Ozone Layer Protection Day' at the international level. Today, a person hesitates to use natural water directly for drinking, because soluble, insoluble, biological, physical or chemical impurities from different sources mixing with surface water or ground water which pollute the water. Due to this, institutions like WHO (World Health Organization) at world level and BIS (Bureau of Indian Standards) and ICMR (Indian Council of Medical Research) India level have prescribed standards for quality of drinking water. Chemical, physical and biological methods are known for purification of drinking water. For soil pollution, indiscriminate use of fertilizers and pesticides, dumping of solid wastes in soil and deforestation are observed as main causes. Removal of wastes, produced from different industries in air, water or soil are ultimately harmful for living beings. To determine the amount of organic waste in liquid effluents of industries, measurements of Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) are important. By BOD measurement, the amount of organic materials present in liquid waste, which can be degraded by bacteria can be measured. By COD measurement, the amount of all the organic materials present in liquid waste can be determined. BOD measurement requires 5 days and COD measurement requires 2-3 hours. By controlling, managing or treating the waste from households, exhausts from vehicles, industrial wastes and biomedical wastes we can control the environmental pollution. Efforts to control environmental pollution resulted in delvelopment of science for synthesis of chemicals favourable to environment, which is called green chemistry. Gujarat State Government has established the Pollution Control Board for control of environmental pollution in Gujarat.

M.C.Q.

1. Which order for green house gases is truly based on GWP ?
   (a) $CFC > N_2O > CO_2 > CH_4$ (b) $CFC > CO_2 > N_2O > CH_4$
   (c) $CFC > N_2O > CH_4 > CO_2$ (d) $CFC > CH_4 > N_2O > CO_2$
2. Which of the following pollutant cannot be degraded by natural process ?
   (a) DDT (b) Nuclear waste (c) Heavy metals (d) all of the above
3. Which of the following bacteria are responsible for the Gastrointestinal Disease ?
   (a) Ecoli (b) S Faecalis (c) Both a and b (d) S aurous
4. The prescribed upper limit concentration of lead in drinking water is about
   (a) 30 ppb (b) 70 ppb (c) 50 ppb (d) 60 ppb
5. What is the range of pH of acid rain?
   (a) More than 5.6 (b) In between 5.6 to 6.6
   (c) Less than 5.6 (d) In between 6.00 to 6.66
6. Which of the following statement is inocorrect ?
   (a) Taj Mahal is affected by hydrocarbon.
   (b) Building are adversely affected by acid rain.
   (c) Due to acid rain, micro organisms are affected.
   (d) Large amount of acid rain decreases soil fertility.
7. Which of the following disease increase due to Green house Gases effect ?
   (a) Malaria (b) Dengue (c) Yellow fever (d) All of the above.
8. Which of the following chemist associate with Green house Gas effect ?
   (a) Jean fowier (b) Chamberlin (c) Swante Arrhenius (d) Both b and c
9. Which of the following is used in aerosols ?
   (a) NOx (b) SOx (c) CFC (d) COx
10. The Diameter of solid dust particle is
    (a) 10^{-2} meter (b) 10^{-6} meter (c) 10^{-4} meter (d) 10^{-1} meter
11. Which of the following size of particulate will cause diseases related to lungs ?
    (a) 10^{-2} meter (b) 10^{-6} meter (c) 10^{-4} meter (d) 10^{-1} meter
12. Classical Smog Occurs in
    (a) warm humid climate (b) Natural humid climate
    (c) Cool humid climate (d) Both a and b
13. Which of the following metal will pollute water ?
    (a) Cd (b) Na (c) K (d) None of the above
14. Which of the following ion is encouraging for the formation of algae in water ?
    (a) SO_4^{2-} (b) PO_4^{3-} (c) ASO_4^{3-} (d) CO_3^{2-}

15. Which of the following techniques is/are used to control water pollution ?

(a) Adsorption process (b) Ion exchange process

(c) Reverse Osmosis (d) All of the above

16. The lowest region that extends upto the height of 10 to 15 km from sea level is called ?

(a) Troposphere (b) Stratosphere

(c) Smoke (d) None of the above.

17. Which of the following pollutants are present in troposphere ?

(a) Smog (b) Oxides of Sulphur (c) Both a and b (d) Metal oxides

18. Which one is not a Green house Gas ?

(a) H_2O (b) O_2 (c) CO_2 (d) O_3

19. Which of the following industries will be the best source of producing CO in the atmosphere ?

(a) Dyes (b) petrochemical (c) paper & pulp (d) Both b and c

20. Which of the following is responsible for photochemical Smog ?

(a) SOx (b) NOx (c) COx (d) none of the above

21. London Smog is built-up of

(a) Sulphur Oxide and particulate matter of fuel combustion.

(b) Corbon Oxide and particulate matter of fuel combustion.

(c) Nitrogen Oxide and particulate matter of fuel combustion.

(d) Water Vapour and particulate matter of fuel combustion.

22. The region closest to the earth's surface is

(a) Stratosphere (b) Mesoshpere (C) Troposhpere (d) Thermoshpere

23. Which of the following oxides of nitrogen is not a common air polutant ?

(a) NO_2 (b) N_2O (c) NO (d) N_2O_5

24. Depletion of ozone layer causes ?

(a) Blood Cancer (b) Bone Cancer (c) Lung Cancer (d) Skin Cancer

25. Oxides of sulphur and nitrogen are important pollutants of :

(a) water (b) Air (c) Soil (d) Both c and d

26. Tajmahal is threatened by pollutant from

(a) Nitric oxide (b) Carbon oxide (c) Sulphur oxide (d) Chlorine

27. Most dangerous metal pollutant of automobile exhaust is ...

(a) lead (b) Arsenic (c) Mercury (d) Cadmium

28. DDT is _____

(a) An antibiotic (b) Biodegradable pollutant

(c) Non-Biodegradable pollutant (d) Nitrogen containing insecticide

29. COD stands for _____

(a) Chemical oxygen demand (b) Controlled oxygen demand

(c) clouds causing ozone depletion (d) Chlorinated oxygen demand

30. Which of the following will be affected by Smog ?

(a) Rubber (b) Building (c) Carving (d) All of the above

31. The pollutants like SOx, CO and NOx caused for the damage of :

(a) Throat (b) Kidney (c) Nervous system (d) Hair loss

32. The main components of acid rain in the atmosphere are :

(a) Oxide of sulphur and nitrogen (b) Oxide of carbon and nitrogen

(c) Oxide of phosphorous and nitrogen (d) Oxide of Carbon

33. One free radial of chlorine can destroy molecules of ozone

(a) 100 (b) 500 (c) 250 (d) 1000

34. Which of the following is responsible for Green house effect ?

(a) Glass roof (b) Aluminium sheet (c) Metallic roof (d) Jute roof

35. Which of the following industry produces the waste of phenolic compounds and suspended solids ?

(a) petroleum (b) paper & pulp (c) sugar (d) Detergent

36. Which of the following industry produces the waste of animal protein ?

(a) petroleum (b) paper & pulp (c) sugar (d) leather

37. The source of chlrofluoro carbons pollution is

(a) Jet air craftss (b) Refrigerators

(c) fire extinguishers (d) all of the above

38. In the coming years, skin realated disorders will be more common due to

(a) water pollution (b) organic waste material

(c) pollutants of atnosphere (d) depletion of ozone layer

39. Which of the following is/are gaseous pollutants ?

(a) Carbon (b) Aerosols (c) Dust particles (d) Carbon monoxide

40. Which of the following component causes water pollution ?

(a) Smog (b) Sodium chloride (c) algle (d) Industrial waste

41. The major cause of air pollution in big cities is ...

(a) Burning of coal (b) Domestic exhaust

(c) Burning of cooking gas (d) Vehicular exhaust

42. Depletion of ozone layer in stratosphere may cause ...

(a) lung damage (b) global warming (c) global cooling (d) skin cancer

43. Green house effect was first described by ...

(a) Yues Chauvin (b) Einstein (c) Fourier (d) Newton

44. A substance which may alter environmental constituents or cause pollution is called ...

(a) Radiator (b) Pollutant (c) Reducer (d) Decomposer

45. The percentage of total amount of CO present in atmosphere, due to forest fires is ...

(a) 63% (b) 17% (c) 9.5% (d) 7.4%

46. The homosphere constituents how much percent of the total atmosphere

(a) 80% (b) 86% (c) 90% (d) 99.99%

47. Acid rain is due to the increase in the concentration of which of the following in the atmoshpere ?

(a) $O_3 + NO_2$ (b) CO_2 and CO (c) SO_3 and CO (d) SO_2 and NO_2

48. Which of the following is a solid pollutant ...

(a) Carbon (b) Nitric oxide (c) Sulphur dioxide (d) Carbon monoxide

49. The Green house effect is caused by ...

(a) Methane only (b) CO_2 and SO_2

(C) CO_2,SO_2 and NO_2 (d) CO_2, CFC $CH_4$and NO_2 gases

50. The brown haze of photochemical Smog is largely attributable to ...

(1) NO (2) NO_2 (3) $CH_3COOONO_2$ (4) CH_2=CH-CH=O

51. Smog is essentialy caused by the presence of ...

(a) Oxides of sulphur and nitrogen (b) O_2 and N_2

(c) O_2 and O_3 (d) O_3 and N_3

52. Ozone in the stratosphere is depleted by

(a) CF_2 Cl_2 (b) C_6F_{16} (c) $C_6H_6CL_6$ (d) C_6F_6

53. The basic component of Smog is

(a) PAN (b) PBN (c) Ozone (d) all of these

54. Spraying of DDT on crops causes pollution of

(a) Air and Water (b) Soil and air (c) Soil and water (d) Crops and air

55. Regular use of which of the following fertilizers increases the acidity of soil ?

(a) potassium nitrate (b) Urea

(c) Superphosphate of lime (d) Ammonium Sulpate

56. In Antartica, ozone depletion is due to the formation of the following compound ...

(a) Acrolein (b) peroxy acetyl nitrate

(c) SO_2 and SO_3 (d) Chlorine nitrate

ANSWER KEY

1	C	16	A	31	C	46	D
2	D	17	C	32	A	47	D
3	C	18	B	33	D	48	A
4	C	19	D	34	A	49	D
5	C	20	B	35	A	50	B
6	A	21	A	36	D	51	A
7	D	22	C	37	D	52	A
8	D	23	D	38	D	53	D
9	C	24	D	39	D	54	C
10	B	25	B	40	D	55	D
11	B	26	C	41	D	56	D
12	C	27	A	42	D		
13	A	28	C	43	C		
14	B	29	A	44	B		
15	D	30	D	45	B		