SCIENCE

Chapter 18: Pollution of Air and Water

Pollution of Air and Water

Pollution

- The presence of unusually high concentrations of harmful or poisonous substances in the environment is called **pollution**.
- An unwanted and harmful substance which contaminates the environment is called a **pollutant**. Examples: Carbon monoxide, sulphur dioxide, smoke, dust.

Air Pollution

- The contamination of air with harmful gases such as carbon monoxide, sulphur dioxide and nitrogen oxide is called **air pollution**.

Sources of air pollution	○ Ash from volcanic eruptions, dust from storms, forest fires, exhaust given out by automobiles, gases released from industries and factories, mining activities, accidental emissions of radioactive elements, pesticides and insecticides, burning of garbage, burning of fossil fuels and deforestation.
Major air pollutants	○ Carbon monoxide (CO), carbon dioxide (CO_2), chlorofluorocarbon, nitrogen oxide (NO), sulphur dioxide (SO_2), particulate matter and hydrocarbons
Effects of air pollution	○ Acid Rain: Sulphur dioxide and nitrogen dioxide combine with the moisture present in the clouds and form sulphuric acid and nitric acid, respectively. These acids fall on the Earth along with rain as acid rain. ○ Smog: Smog is formed when heat and sunlight react with particles suspended in air. ○ Greenhouse Effect and Global Warming: Gases such as carbon dioxide, methane, nitric oxide and nitrous oxide in the atmosphere act as greenhouse gases. Their increased concentration in the atmosphere prevents the escape of heat, which warms the air. ○ Ozone Depletion: Compounds such as CFCs (Chlorofluorocarbons) have damaged the ozone layer. Ozone depletion often leads to sun burns, skin cancers and mutations. ○ Health Problems: Eye irritation, respiratory disorders, bronchitis and asthma, headaches, dizziness, nausea, decreased oxygen-carrying capacity of the blood, anaemia, liver, kidney and brain damage, abnormal fertility and pregnancy, silicosis, byssinosis, asbestosis and black lungs.

Reduced air pollution

- Using more and more public transport.
- Avoid the use of crackers.
- Using energy-efficient light bulbs and appliances.
- Use of CNG
- Using solar energy, hydro, and wind energy instead of fossil fuels might assist a lot.
- Say no to plastic bags.
- Turn off the lights when they are not in use.
- Carpets and furniture are the major causes of indoor air pollution.
- The Indian government has taken initiatives to combat air pollution. Pollution under control (PUC) certification is given to gasoline-powered vehicles that are tested for carbon monoxide and hydrocarbons.

Water Pollution

- The contamination of water sources such as rivers, lakes, oceans and groundwater with unwanted and harmful substances is called **water pollution**.

Sources of water pollution	○ Household detergents, sewage, industrial waste, domestic waste, oil spills, fertilisers, pesticides and herbicides.
Major water pollutants	○ Sewage, fertilisers, pesticides and industrial wastes.

Effects of water pollution	○ Brain and nerve damage, cholera, dysentery, jaundice, typhoid, diarrhoea, malaria, dengue, fever and yellow fever, intestinal parasitism leading to anaemia and weakness, skin disorders and cancer, kidney and liver damage, diarrhoea in children, methaemoglobinemia, respiratory diseases and lung cancer, oil spills, eutrophication and biomagnification.
Measures to control water pollution	○ Sewage, industrial and domestic waste should be treated in order to make them harmless. ○ Use of chemical pesticides must be minimised. ○ Washing utensils, clothes and bathing cattle in water bodies must be avoided. ○ Garbage and other domestic waste should not be thrown in water bodies. ○ Leakage in drainage pipes must be repaired. ○ Laws should be formulated to control water pollution.

Conservation of Water

- Fix leaks and dripping taps at once.
- Do not leave the tap open while applying soap or brushing your teeth.
- Use a bucket to have a bath instead of a shower.
- Instead of using a hosepipe, use a bucketful of water to wash your car.
- Use the water that is used for washing vegetables, dals and cleaning utensils for watering plants.
- Collect rainwater and use it for watering plants, cleaning the floor etc.
- Avoid wastage of water by recycling it.

Potable Water

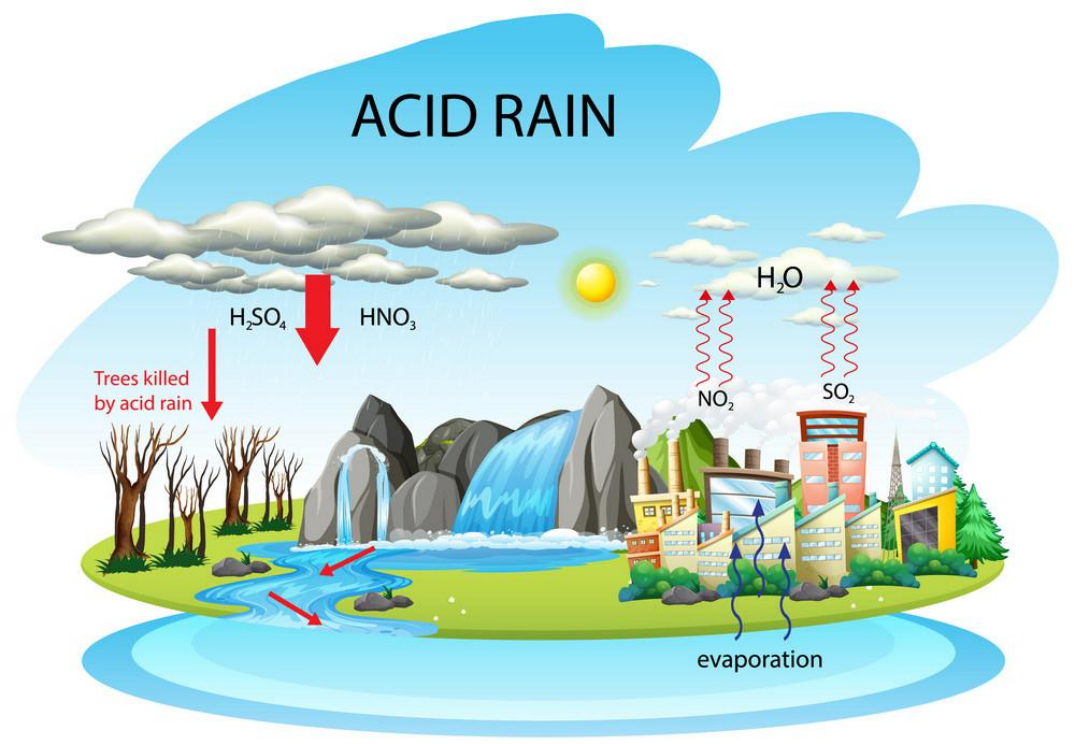
- **Potable water** is safe for drinking.
- It is free from disease-causing germs and harmful chemicals.

Methods to Make Water Potable

Boiling	Water can be boiled at 100°C for several minutes to make it germ-free.
Candle filter	Water can also be passed through a porcelain candle filter where most of the bacteria are trapped.
Ultraviolet filter	An ultraviolet filter has ultraviolet light which kills the germs present in the water.
Chlorination	Water can be chlorinated by adding chlorine tablets to it. As chlorine is a disinfectant, it kills the harmful germs present in water.
Treatment with lime	Excess fluoride in water can be removed by treating water with lime.
Potassium permanganate crystals	Well water can be disinfected by adding few crystals of potassium permanganate to it. Potassium permanganate is a germicide. It kills the germs thereby making the water safe for drinking.

Acid Rain

- Acid rain can cause damage to forests, soil resources, and even human death. When acid rain falls on leaves, they lose nutrients present in them.
- Acid rain is a threat to living and non-living things both. The corrosion of buildings, monuments, and statues is caused by acid rain.
- The combustion of fossil fuels such as coal and oil in automobiles emits gases into the atmosphere such as carbon dioxide, sulphur dioxide, and nitrogen oxide.
- In clouds, these gases react with water vapour to form sulphuric acid, carbonic acid, and nitric acid.
- The rain that falls as a result of such cloud precipitation is highly acidic and is thus referred to as acid rain.
- The monuments made of marble are corroded by acid rain. Marble Cancer is another name for this phenomenon.



Why has the Taj Mahal located in Agra become a matter of concern?

- Its marble has become discoloured as a result of pollution in the air. The yellowing of the marble has been exacerbated by suspended particulate matter, such as soot particles released by the Mathura oil refinery.
- The Mathura oil refinery, as well as other businesses like as autos, rubber manufacturing, and chemicals, emit toxic compounds into the atmosphere are some of the major pollutants and their emission must be checked.
- Several attempts have been taken by the Supreme Court to save the Taj. The government has directed enterprises to use greener fuels such as CNG and LPG.

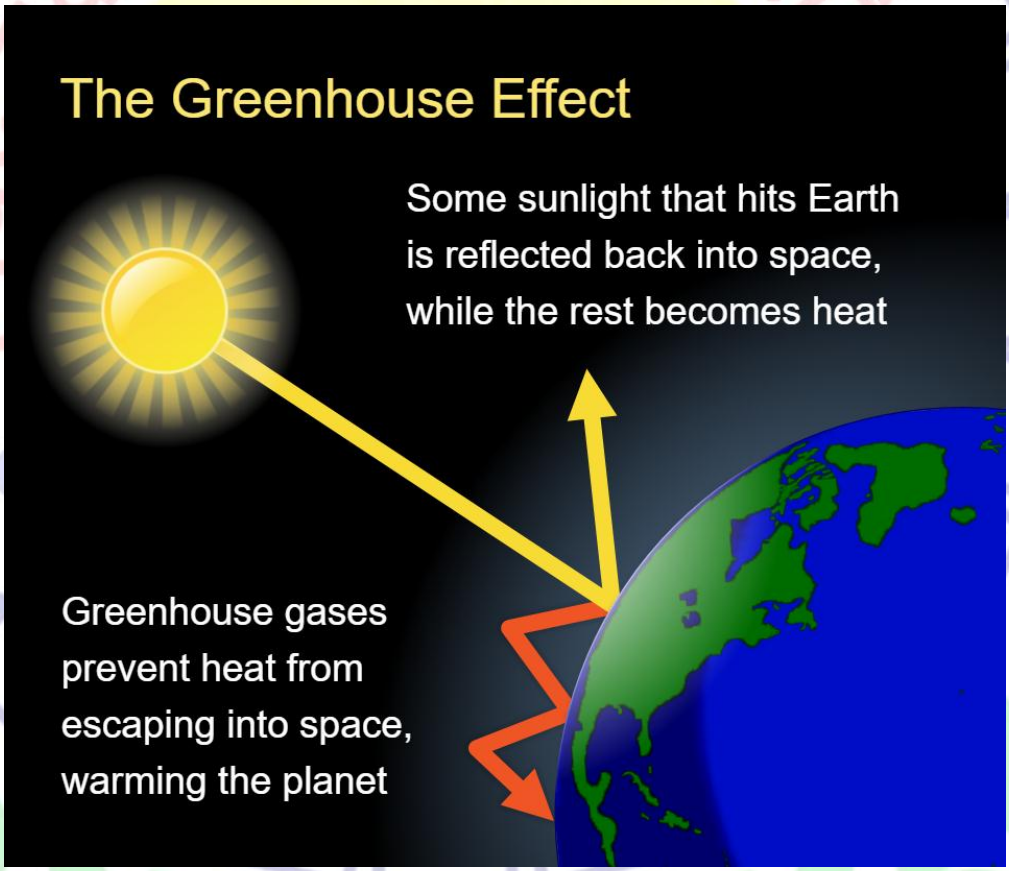
Greenhouse effect

It is the atmosphere's action that allows heat in, but also prevents a part of it from returning to space.

Greenhouse gases are the gases that cause the greenhouse effect, such as carbon dioxide, water vapour, methane, nitrous oxide, and CFCs.

Life on Earth would not have been feasible without this mechanism. However, it is now a hazard to life.

One of the gases responsible for the greenhouse effect is an excess of carbon dioxide in the atmosphere.



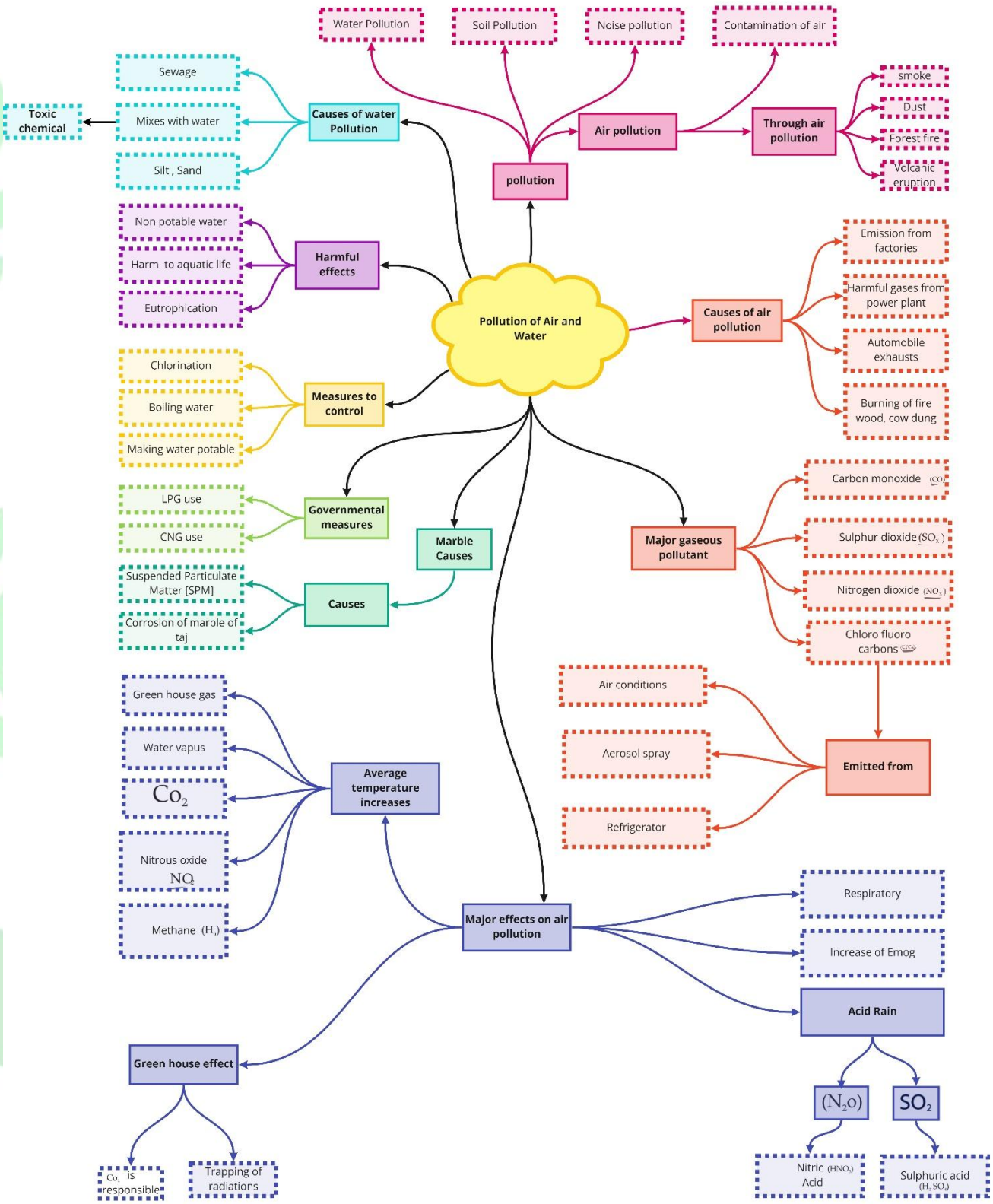
Global Warming

Increasing levels of greenhouse gases like carbon dioxide lead to global warming.

Carbon dioxide traps heat and does not allow it to escape into space, which results in a gradual increase in the earth's atmosphere.

Gradual melting of glaciers such as Gangotri Glacier in the Himalayas is a consequence of global

Class : 8th Science
Chapter 18 Pollution of Air and Water



Important Questions

Multiple Choice questions-

Question 1. Which gas is the major pollutant of air?

(a) Carbon monoxide

(b) Nitrogen

(c) Oxygen

(d) Propane

Question 2. The increase in concentration of which gas is not responsible for Global Warming?

(a) Sulphur dioxide

(b) Nitrogen

(c) Carbon dioxide

(d) Methane

Question 3. In which year Ganga Action Plan was launched?

(a) 1980

(b) 1984

(c) 1982

(d) 1985

Question 4. What radiations are absorbed by CO2?

(a) Ultrared radiations

(b) Infrared radiations

(c) Ultraviolet radiations

(d) None of these

Question 5. Which element is present in the exhaust of automobiles?

(a) Lead

(b) Calcium

(c) Chromium

(d) Magnesium

Question 6. The phenomenon of marble cancer is due to

(a) soil particles

(b) fog

(c) CFCs

(d) acid rain

Question 7. The solid or liquid particles dispersed in the air are called

(a) oxides

(b) acids

(c) hydrocarbons

(d) aerosols

Question 8. The type of pollution which is likely to affect Taj Mahal in Agra to a greater extent is

(a) air pollution

(b) soil pollution

(c) water pollution

(d) noise pollution

Question 9. The major causes of air pollution include

(a) burning of coal and petroleum

(b) afforestation

(c) deforestation

(d) recycling of paper

Question 10. Bhopal tragedy was caused due to

(a) air pollution

(b) emission of poisonous gas

(c) water pollution

(d) leakage of poisonous gas

Question 11. Which of the following contents is most harmful to aquatic animals?

(a) Heavy metal ions

(b) Sodium ions

(c) Potassium ions

(d) Chloride ions

Question 12. Water containing high salt concentration can be purified by

(a) boiling

(b) UV irradiation

(c) filtration

(d) reverse osmosis

Question 13. Which of the following is a non-biodegradable pollutant?

(a) Sulphur dioxide

(b) DDT

(c) Nitrogen oxide

(d) Hydrogen oxide

Question 14. Which of the following is major source of water pollution?

(a) Industrial wastes

(b) Untreated sewage

(c) Use of fertilisers

(d) Toxic metals

Question 15. Which of the following techniques of irrigation should be used to save water?

(a) Water wheel

(b) Canal irrigation

(c) Drip irrigation

(d) Lift irrigation

Very Short Questions :

1. What is the percentage of nitrogen in atmosphere?
2. What is the percentage of oxygen in atmosphere?
3. Which problem arises by air pollution?
4. What is smog?

5. Which gases are responsible for acid rain?
6. Which gas is responsible for greenhouse effect?
7. What is global warming?
8. Which phenomenon causes global warming?
9. What is air pollution?
10. Which gas is responsible for depletion of ozone layer?

Short Questions :

1. Why it is dangerous to burn polymers?
2. What is the cause of acid rain?
3. How does industry pollute the environment?
4. What are factory fumes?
5. What are the harmful effects of acid rain?
6. What are the causes of increasing amount of carbon dioxide in air?
7. Explain the three R principles to reduce pollution.
8. Define water pollution.
9. List three major man-made source of air pollution.
10. How does environment problem effect people health?

Long Questions :

1. What do you mean by acid rain? How does it affect both living and non-living things?
2. What is eutrophication? How does it affect aquatic organisms?
3. Write a short note on water pollution.
4. How can you prevent water pollution?
5. How can you prevent air pollution?

ANSWER

MCQ Answer:

1. Answer: (a) Carbon monoxide
2. Answer: (b) Nitrogen
3. Answer: (d) 1985
4. Answer: (b) Infrared radiations
5. Answer: (a) Lead

6. Answer: (d) acid rain
7. Answer: (d) aerosols
8. Answer: (a) air pollution
9. Answer: (a) burning of coal and petroleum
10. Answer: (d) leakage of poisonous gas
11. Answer: (a) Heavy metal ions
12. Answer: (d) reverse osmosis
13. Answer: (b) DDT
14. Answer: (b) Untreated sewage
15. Answer: (c) Drip irrigation

Very Short Answer:

1. **Answer:** 78%
2. **Answer:** 21%
3. **Answer:** Respiratory problem
4. **Answer:** A thick fog-like layer in the atmosphere is called smog.
5. **Answer:** Sulphur dioxide and nitrogen dioxide.
6. **Answer:** CO_2 (carbon dioxide)
7. **Answer:** Increasing temperature in atmosphere is called global warming.
8. **Answer:** Greenhouse effect
9. **Answer:** Addition of pollution in air is called air pollution.
10. **Answer:** Chlorofluorocarbons (CFCs)

Short Answer :

1. **Answer:** When polymers such as plastics are burned carbon containing gases are released. During the burning process, the carbon combines with oxygen present in the atmosphere & forms oxides of carbon. These gases have been linked with global warming, depletion of the ozone layer, acid rain, etc.
2. **Answer:** Oxides of nitrogen, sulphur, carbon produced by combustion of coal, petroleum, etc. dissolve in atmospheric water vapour. They form their corresponding acids like nitric acid, sulphuric acid, etc., and reach the earth's surface as acid rain.
3. **Answer:** Factories pollute the air by pumping out chemicals that are harmful for all living things. Factories can pollute the environment through thermal pollution, chemical pollution, air pollution, noise pollution.
4. **Answer:** Nitrous Oxides (NO, NO_2 and N_2O), Sulphur Dioxide, Carbon Dioxide and Carbon

Monoxide are the famous ones, depending on the reactions that are taking place in the factory.

5. **Answer:** Harmful effects of acid rain are as follows:
    - It irritates eyes and skin of human beings.
    - It inhibits germination and growth of seedlings.
    - It changes the fertility of the soil, destroys plants and aquatic life.
    - It causes corrosion of many buildings, bridges, etc.
6. **Answer:** Human activities are the main reason for increasing the amount of carbon dioxide (CO_2) in the atmosphere. The major sources of human emissions are the burning of fossil fuels such as coal, oil and natural gas for industry, driving our transport, heating our homes and generating electricity. Another factor is deforestation which increases the amount of carbon dioxide in the atmosphere, because new trees are not allowed to replace those removed.
7. **Answer:** The three R principle includes recycle, reuse, and reduce of the available resources
8. **Answer**: Water pollution is the contamination of water bodies such as lakes, rivers, oceans, and groundwater caused by human activities, which can be harmful to organisms and plants which live in these water bodies.
9. **Answer:** Three major man-made source of air pollution are: Industrialisation, Urbanisation and Automobiles.
10. **Answer:** Air pollution is a significant risk factor for multiple health conditions including respiratory infections, heart disease, and lung cancer. The health effects caused by air pollution may include difficulty in breathing, wheezing, coughing and aggravation of existing respiratory and cardiac conditions.

Long Answer:

1. **Answer:** Due to fossil fuel and industrial combustions that mostly emits nitrogen oxides (NO_x) and sulphur dioxide (SO_2) into the atmosphere. Water vapour present in atmosphere reacts with these gases to form nitric acid and sulphuric acid. Normal rain water is slightly acidic with a pH range of 5.3-6.0, because carbon dioxide and water present in the air react together to form carbonic acid, which is a weak acid. When the pH level of rain water falls below this range due to combining with these acids in atmosphere, it becomes acid rain. Acid rain has significant effects on the world environment and public health.

   Effect on aquatic environment: Acid rain lowers pH level below 5, most fish eggs cannot hatch. Lowering in pH can also kill adult fish.

   Effect on forests: It makes trees vulnerable to disease, extreme weather, and insects by destroying their leaves, damaging the bark and arresting their growth.

Effect on soil: Acid rain highly impacts soil microbes and biological activity as well as soil chemical compositions. Thus affecting crop production.

Effect on architecture and buildings: Acid rain on buildings, especially those constructed with limestone, react with the minerals and corrode them away. This leaves the building weak and susceptible to decay. Irreplaceable damage can be caused to the old heritage buildings.

Effect on public health: When in atmosphere, sulphur dioxide and nitrogen oxide gases, degrades visibility and can cause accidents, leading to injuries and deaths. Intensified levels of acid depositions in dry form in the air can cause lung and heart problems such as bronchitis and asthma.

Other effects: Acid rain leads to weathering of buildings, corrosion of metals, and peeling of paints on surfaces. Acid rain also corrodes metals like steel, bronze, copper and iron.

2. **Answer:** Enrichment of an ecosystem with nutrients, typically compounds containing nitrogen, phosphorous or both, is known as eutrophication. Eutrophication in lakes, ponds or rivers encourages the growth of algae and other aquatic plants. These algae grow rapidly in the water system and forms algal bloom. They compete for sunlight, oxygen and space. This badly affect the aquatic life and deteriorates water quality. This is also responsible for the large scale death of aquatic plants and animals.

3. **Answer:** Water pollution is the contamination of water bodies (e.g., lakes, rivers, oceans, aquifers and groundwater). This form of environmental degradation occurs when pollutants are directly or indirectly discharged into water bodies without adequate treatment to remove harmful compounds.

Water is available both on surface and under the ground. The major pollutants of surface water are toxic and poisonous wastes from households, industries, nuclear wastes, oil spills, agricultural waste, accumulation of heavy metals, chemicals from chemical factories, microorganisms from human faeces, etc.

Groundwater is mainly contaminated by leaching of harmful chemicals into the soil. Seepage of sewer near groundwater aquifer contaminates with disease causing microorganisms. Accumulation of heavy metals in soil may also lead to groundwater pollution.

Water pollution affects the entire biosphere plants and organisms living in these bodies of water. In almost all cases the effect is damaging not only to individual species and population, but also to the natural biological communities.

4. **Answer:** Be careful about what you throw down your sink or toilet. Don't throw paints, oils or other forms of litter down the drain.

Use enyironment-friendly household products, such as washing powder, household cleaning agents and toiletries.

Take great care not to overuse pesticides and fertilisers. This will prevent runoffs of the

material into nearby water sources.

By having more plants in your garden you are preventing fertiliser, pesticides and contaminated water from running off into nearby water sources.

Don't throw litter into rivers, lakes or oceans. Help to clean up any litter you see on beaches or in rivers and lakes, make sure it is safe to collect the litter and put it in a nearby dustbin.

5. **Answer:**

- Conserve energy-remember to turn off lights, computers, and electric appliances when not in use.
- Use energy efficient light bulbs and appliances.
- Limit driving by carpooling, using public transportation, biking and walking.
- Combine errands for fewer trips.
- Keep your automobile well-tuned and maintained. Follow the manufacturer's instructions on routine maintenance, such as changing the oil and filters, and checking tyre pressure and wheel alignment.
- Choose environment-friendly appliances.
- Petrol can be substituted with CNG.
- Make fertilisers of biodegradable wastes instead of burning them.
- Plant more and more trees.
- Scrubbers need to be used in the smokestacks to reduce the amount of sulphur dioxide emission in air.