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Responsibility of Chemistry in controlling the environmental pollution

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Abstract: Pollution is the addition of undesirable material into the environment as a result of human activities. Some physical, chemical or biological material inadvertently released into the atmosphere which is directly or indirectly injurious to humans and other living organisms. Chemistry can help us to recognize, supervise, protect and improve the environment around us. Chemists are developing equipment and techniques to make sure that we can see and measure environmental pollution. Environmental pollution primarily includes air, sound, water and soil pollution. Chemical pollution is caused by the discharge of chemicals into the atmosphere through steam and wastewater. The key pollutant chemicals in the liquid fraction are hydrogen sulfide (H_2S), arsenic (As), boron (B), mercury (Hg) and other heavy metals such as lead (Pb), cadmium (Cd), iron (Fe), zinc (Zn) and manganese (Mn). Other harmful constituents, although present in smaller quantities, are lithium (Li), ammonia (NH_3) and aluminium (Al). To protect the environment from pollution Green Chemistry was introduced.

The goal of this article to discuss about the responsibility of chemistry for the pollution. Also the role of green chemistry to minimize or eliminate the formation of harmful bi-products and to maximize the desired products in an environment friendly way.

Keywords: Pollution, Green Chemistry, Technique, Environment friendly

Introduction:

The environment is Nature's life support system. We know, environment that is water, air, soil, ultimately the living systems is habitually polluted bringing the environment in dreadful conditions. Due to escalating

inhabitants and urbanization increases industrial activities, showing the way to increasing rates of environmental pollution and degradation. **Pollution** may be defined as accumulation of unwanted substance into the environment from human activities. The agents, polluted environment are known as pollutants. It also can

Table 1. Air pollutants in Gaseous form: Sources and effects:

Problems	Causes	Source
1. Respiratory problems 2. Green house effects	Carbon di-oxides (CO ₂), Carbon monoxide (CO).	Burning of Carbon Compounds, Automobile/ Industrial exhaust, Burning of coal, wood, and plastics.
1. Disorder of respiratory system, particularly lung function, and irritation of the eyes.	Sulphur di oxides (SO ₂), Hydrogen sulphide (H ₂ S)	Burning of fossil fuels such as coal, oil and natural gas are the main source of sulphur dioxide emissions.
1. Long time exposure can reduce the lifetime of lung. 2. Respiratory problems arise.	Oxides of nitrogen NO, N ₂ O	Occurs from the reaction between... Oxygen and nitrogen in the air. Nitric oxide + More oxygen = nitrogen dioxide

be defined as a physical, chemical or biological substance which are involuntarily released into the environment directly or indirectly damages humans and other living organisms. The industrial revolution is one of the main causes of environmental pollution.

Analysis:

There are so many causes for environmental pollution like 1. Air pollution. 2. Sound pollution. 3. Water pollution. 4. Soil pollution. 5. Thermal pollution. 6. Radiation pollution etc.

AIR POLLUTION:

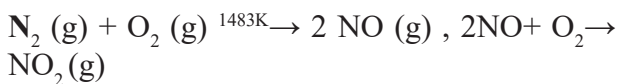
Air pollution has great impact on environment. Air pollution mainly occurred due to industrial and domestic activities. Enormous use of fossil fuels in power industries, mining and transportation had led to air pollution. According to the Chemical Science, huge numbers chemicals can pollute the air. (eg: Oxides of carbon, nitrogen, sulphur etc.)

Chemical reactions: i) $S + O_2 \rightarrow SO_2 (g)$
[Poisonous to both plants and animals] **Low**

concentration of SO₂ gas effects respiratory systems (Bronchitis, asthma etc.)

High concentration of SO₂ gas leads to stiffness of flower buds and fall down from plant. ii) $SO_2 + O_2 \rightarrow SO_3$ [sulphur tri oxide] causes pulmonary skin and eye damage.

ii) Nitrogen (N₂) and Oxygen (O₂) react with each other at very high temperature produce NO, further it oxidised and form NO₂.



High concentration of NO₂ (g) damage the leaves of plant therefore effects on photosynthesis process negatively. It is also harmful for metals and fabric fibres. Children are suffering from the acute respiratory problem due to presence of NO gas.

iii) *Carbon reacts with carbon dioxide, carbon monoxide is formed. Carbon burns in oxygen to produce CO₂; if air is insufficient it will produce or carbon monoxide(CO).*



Exposure to small concentrations of CO hinders the ability of Hb to deliver oxygen to the body, because carboxyhemoglobin forms more readily than does oxyhemoglobin (HbO₂). CO is produced in normal metabolism and is also a common chemical. Tobacco smoking (through carbon monoxide inhalation) raises the blood levels of COHb by a factor of several times from its normal concentrations.

CO binds to haemoglobin to form carboxyhaemoglobin which reduce the oxygen carrying capacity of the blood causes headache, weak eyesight, nervousness and cardiovascular disorder. Women having the habit of smoking delivered premature baby due to the increased of CO level in the blood.

Deforestation and burning of fossil fuel increases the CO₂ level and disturb the balance in the atmosphere. The increased amount of CO₂ in the air is mainly responsible for global warming.

Global Warming:

Prevention and Control of Air Pollution:

- i) Plantation of more and more trees for more absorbance of CO₂ exposed in the air from different sources.
- ii) Consciousness of the human should be increase during the burning of coal, fossil fuel and other things that are produced CO, CO₂.
- iii) People should try to decline the habit of smoking that may help to reduce the percentage of CO in the air.
- iv) **In Industries**, use of cleaner and environmentally friendly fuels like LNG (Liquid natural gas) in the power plants, fertilizer plants can reduce the level of some harmful gaseous pollutant like SO₂, NO,

Installing of modern devices can reduced the released air pollutants also.

SOUND POLLUTION:

Sound pollution is also called as Noise pollution. Noise pollution means the “**Sound without value**” or the noise that is intolerable. Level of intolerance level of sound is measured by unit decibel (dB). As per advice of the World Health Organisation (WHO) the most favourable level of sound is 45 dB and 35db in day and night time respectively.

Noise pollution is generally generated inside many industrial facilities and some other workplaces, but it also comes from highway, railway, and airplane traffic and from outdoor construction activities.

Effects of sound Pollution:

- i) **Hearing problems:** continuous exposure to loud sounds can damage our eardrums and loss of hearing. It also reduces our sensitivity to sounds that our ears pick up unconsciously to control our body’s rhythm.
- ii) **Sleeping Disorders:** Intolerable noise undoubtedly obstruct the sleeping pattern and creat irritation and uncomfortable situations.

Ultimately disturbance of sleep results hypertension (high blood pressure), emotional problems such as violent behaviour, mental depression and irritation. Noise pollution adversely affects efficiency and performance of individuals.

Prevention and control of Sound pollution:

Sound pollution can be avoid or reduced by better designing and proper maintenance of different transport vehicles, aircraft etc.

Industrial noises can be reduced by sound proofing equipment like generators and areas producing lot of noise.

WATER POLLUTION: Inclusion or occurrence of unwanted substances in water is called water pollution. Water pollution is one of the greatest cause of environmental pollution.

Causes:

- i) Water pollution is caused by a variety of human activities such as industrial, agricultural and domestic. Excessive fertilizers and pesticides from Agricultural sector, industrial effluents with toxic substances and sewage water with human and animal wastes pollute our water.
- ii) Pesticides like DDT and others used in agriculture may contaminate water bodies.
- iii) Metals like lead, zinc, arsenic, copper, mercury and cadmium in industrial drainage waste fall into the different water sources like pond and river etc makes the water polluted.
- iv) Sea water is also polluted by the oil leakage from ship, oil tanker and other industrial waste oily in nature.

There are so many causes of water pollution except the above causes.

Effects:

- i) **Uses of polluted water may causes of skin dieses of human and animals both.**
- ii) Use of the arsenic polluted water leads to the damage of body parts like blood, nails and hairs. Rough or dry skin, finally skin cancer may occur.
- iii) Due to the pollution of sea water hampers the lives of sea birds, fish and other living organism.

PREVENTION AND CONTROL OF

WATER POLLUTION:

- i) Consciousness of the peoples regarding proper use of water sources may help to reduce the rate of water pollution like **a.** Do not wash the dirty cloths and other home appliance in the pond, river. **b.** Do not through any waste materials, chemical hazards into the water sources.
- ii) Industrial chemical waste should be recycled properly and should not be added into the river, pond or any other water sources.

Now we will draw the attention on” Green Chemistry” How will it helps to reduce environmental pollution? Green chemistry is a highly effective approach to pollution prevention because it applies innovative scientific solutions to real-world environmental situations. There are so many benifits of Green Chemistry. Human health: Cleaner air: Less release of hazardous chemicals to air leading to less damage to lungs. Cleaner water: less release of hazardous chemical wastes to water leading to cleaner drinking and other uses of water

All we know, there are 12 basic principles of green chemistry, maintaining of which can provide the safest and healthy atmosphere for the living organism in the world. Principles can be enlisted in following way.

1. **Waste Prevention:** Waste production should be stopped or minimizes than dispose of it after produced.
2. **Safer chemicals designing:** Non-toxic and safer chemical products have to design to avoid side effects.
3. **Less hazardous chemical synthesis:** Usage of less toxic ingredients in the manufacture of various synthetic products. Synthesis process should be designed to use and generate substances that possess little or no toxicity to human health and environment.
4. **Reduces chemical derivatives:**

Derivatization like blocking group, protection/deprotection should be avoid which are not useful. Because such steps require additional reagents and can generate more waste.

5. **Catalysis:** Catalytic reagents should be used inspite of others (Stoichiometric). Green” catalyst it will have no toxicity in the process. Enzymes are wonderful examples of catalysts.
6. **Design for energy efficiency:** This principle focused on creating products and materials in a highly efficient manner and minimizes associated pollution and cost.
7. **Use of renewable feed stocks:** Chemicals recommended to use in reactions are made from renewable sources (i.e. Plant based) than chemicals obtained from depleting resources.
8. **Solvents and auxiliaries:** Safest available solvents must be selected for any given step and organic solvents which are highly toxic should be avoided whenever possible.
9. **Atom Economy:** this principles state for the maximum transformation from reactants to products in a chemical reaction. This helps to reduce waste at the molecular level.
10. **Degradation designing:** Chemicals have to design which are degradable and not exist in environment after the end of their role
11. **Prevention of Pollution:** .Chemical reactions should be monitor by the chemist in proper way. Reaction process should be controlled before production of unnecessary chemical hazards.
12. **Safer chemistry for accident protection:** This principle aim to minimize the accident like explosions, fire during chemical reactions and suggest choosing and developing modern chemical techniques and substances.

Conclusion: This can be concluded with the following words. Experts have the opinion that Chemistry is to a great extent responsible for

environmental pollution. On the contrary, it is also observed that Green chemistry plays an important role in controlling environmental pollution. Green Chemistry focuses on the minimization and prevention of risk factors as it reduces the production of hazardous substances.

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