Water pollution

Definition of water pollution: water pollution is any change in the physical, chemical, or biological properties of water that will have harmful effects on living organisms.

Q / What are the main pollutants of water ?

I / wastewater and other waste that requires oxygen:

These include biodegradable organic compounds, which are found in domestic sewage and some industrial liquid waste, these compounds are decomposed by bacteria, especially aerobic, which leads to the removal of oxygen from the water, which may lead to the death of aquatic organisms due to lack of oxygen.

There are four processes that affect the oxygen level in water:

1- Contact with air 2- Photosynthesis 3- Breathing 4- Oxidation

The first and second processes increase the levels of oxygen in the water, while the second and third processes lead to its decrease.

Q/ How is this type of pollution measured?

This type of pollution is measured by the amount of dissolved molecular oxygen in the water required for the analysis of organic matter , the standard test for this is the five-day test Demand Biological Oxygen (BOD), which expresses what the living air microorganisms (bacteria and yeasts) consume from the oxygen needed to breathe during its analysis of organic matter, the Demand Chemical Oxygen (COD) is used for non-biodegradable organic matter and the COD value is greater than BOD because it needs more oxygen to decompose.

Note

- The amount of dissolved oxygen in water increases as the temperature decreases.

The presence of oxygen	Lack of oxygen
Carbon turns into carbon dioxide (CO_2)	carbon turns into methane (CH_4)
sulfur turns into sulfate (SO_4)	sulfur turns into hydrogen sulfide (H_2S)
Nitrogen turns into nitrates (NO_3)and ammonia (NH_3)	Nitrogen into amines with a special smell

II / Infection Agents: Water from hospitals, tanning factories and various food industries are among the most important sources of water containing pathogenic bacteria, unicellular microorganisms, intestinal parasites and viruses causing diseases for humans and animals.

III / Synthetic organic chemicals: These include Pesticides (Insecticides, Herbicides and Fungicides) , Detergents and other industrial chemicals, expressed in units of ppm or mg / l, many of which are non-degradable and many of them are toxic to fish in low concentrations.

IV/ Inorganic chemicals and Mineral substances: - Inorganic acids and bases, heavy metals and other materials flowing from the discharges of mine water (coal mine) , factories and others .The ecosystem is affected by these pollutants changing the pH of water .

Heavy metals(Mineral substances): Means the minerals with a density greater than 5 g / cm 3, such as lead, nickel, mercury, copper ..etc. . These elements are dangerous because they are not degraded by bacteria and other natural processes, as well as, their stability and Bioaccumulation in the tissues and organs of living organisms.

V/ Sediments: - Include soil, sand and mineral grains that reach the water, and affect:

1- Life on the bottom is very harmful to benthic animals such as oysters, corals, snails, worms, etc.

2- The rivers and lakes reduce their depths

3- The quality of the water when it is kept in the home tanks.

4- Light transmittance, which reduces photosynthesis of phytoplankton in the water column,

5- Makes water unsuitable for domestic and industrial use.

VI/ Plant nutrients: The most important of these nutrients are nitrogen and phosphorus, as their presence in water causes the phenomenon of Eutrophication, which occurs naturally or by the influence of human activities. These elements stimulate the growth of many algae and aquatic plants. This phenomenon can be defined as ((increasing nutrient salts, especially nitrates and phosphates in water bodies such as rivers and lakes)). Agricultural pollutants such as nitrogen fertilizers and phosphates, as well as detergents, are among the most important sources of Eutrophication.

The phenomenon of Eutrophication leads to :

1- It leads to the disappearance of some species (Biodiversity)

2- An increase in the turbidity of the water

3- The aging of the lake due to sedimentation

4 - Difficulty treating drinking water

5 - Eutrophication has health damages, as dissolved nitrates affect children and young animals, because these nitrates (NO_3) turn into nitrite toxic (NO_2) in the gut because of the digestive tract in young people contain different bacteria,as it combines with hemoglobin of blood and is a toxic compound , NO_2 binds with hemoglobin of blood and forms a toxic compound It is called Methaemoglobin which does not have the ability to transport oxygen from the lungs to the tissues, so it will have a fatal effect on children. This condition is called Methaemoglobinaemia.

6- Eutrophication limits the use of lakes for tourism purposes

VII / Radioactive substances: Radioactive substances reach the water coming from :

1- Naturally from the earth's crust
2- Human activities such as
   a- Nuclear weapons production
   b- Electric energy production
   c- Water used to cool nuclear reactors is one of the biggest sources of contamination of water sources with radioactive materials

Note

- The most important and most dangerous radioactive material on the environment is thorium 320-and Radium-226 Radium similar in calcium absorption by the bone.

VIII/ Thermal pollution: Thermal pollution is defined as the condition in which water receives excess heat in water bodies from different sources, and this will lead to a decrease in the amount of oxygen dissolved in the water surface, which affects various forms of life in the water **(** Disease resistance decreases and the effectiveness of bacteria increases with increasing temperature **)** .

Q/ What are the sources of excess heat for water ?

1- Using water in cooling systems for electric power and nuclear reactors.
2- Iron and steel factories, oil refineries and other industries near water sources.

Q/ What are the factors that help raise the temperature of water bodies?

1 - Removing green plants from the edges of rivers.
2 - Adding sediment from erosion as it absorbs light energy, causing a rise in water temperature.