1- INTRODUCTION

1.1. General:

Almost every pollution problem that we face has chemical basis. Even the most qualitative description of such problems are the greenhouse effect, ozone depletion, toxic wastes, ground water contamination, air pollution, and acid rain[1].

Environmental pollution with trace metals has to be seen from two angles: First pollution caused by human activities and second, the diffusion of trace metals and their components to areas far away from the human activities. Such consideration emerges from the fact that, these wastes may contain large concentration of several pollutant elements produced from the industries existing in the zone. Elements such as: Pb, Sb, Cd, Hg are considered to be highly toxic and have environmental hazards. In many areas pollution problems remain undetected due to lack of monitoring facilities. According to Garg[2], it is absolutely essential to know the occurrence and content of trace elements in various materials for achieving true success of actual investigation program in the field of environmental studies.

1.2. Environmental pollutants:

Pollutants are classified into three categories: gaseous, liquid, and solid pollutants. Gaseous pollutants include sulfur-, phosphorus-, nitrogen-, carbon-, containing gases. The main source of air pollution is industrial activities. Among the gaseous pollutants highly considered is NO_x, which

lead to physical discomfort and eye smarting. SO_2 and SO_3 gases originating from sulfur containing compounds. The deposition of such two gases on metallic surfaces causes corrosion problems, which indirectly affects the national economy.

Liquid pollutants are classified according to their nature into organic and inorganic liquid pollutants. Organic liquid pollutants include benzene, toluene, ethyl benzene, and phenol in addition to other volatile aromatic pollutants. Most of these organic pollutants are determined by Rhoades and Nalton[3] for example during the analysis of variety of industrial waters and effluents. Inorganic pollutants include SO_4^{2-}, PO_4^{3-}, Pb, Hg, Cr, Sb, Zn, Cd, U, Th, Ce, Cs, ...etc. Most of industrial and municipal wastes end up in rivers, lakes and seas. So, industrial wastes and effluents may contain most of these inorganic pollutants.

The third class of pollutants is solid pollutants, which include dust, elemental sulfur, suspended particulates, fly ash, and respirable dust. These pollutants are produced mainly from ores used by industrial plants or from desert or mountain zones easily affected by wind blow.

1.2.1. Hazardous waste:

Toxic substances induce some human health diseases such as cholera, typhoid, cancer and birth defects. U.S. Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in 1980 to lead with already contaminated sites, and in 1980 and 1984 it strengthened the Resource Conservation and Recovery Act (RCRA), which controls new sources of hazardous wastes. In essence, CERCLA deal with problems of the past, while RCRA attempts to prevent

future problems. These two laws have provided the driving force behind almost all efforts at hazardous waste control. Hazardous waste is defined in RCRA[4] as: anything which, because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contributes to, an increase in mortality; or cause an increase in incapacitating reversible, illness, or pose a substantial present or potential hazard to human health and the environment when improperly treated, stored, transported, or disposed of, or otherwise managed. EPA (Environmental Protection Agency) listed wastes into three categories: source – specific wastes, generic wastes, and commercial chemical products. Source – specific wastes include sludges and wastewaters from treatment and production processes in specific industries, such as petroleum refining and wood preserving. The generic wastes include wastes from common manufacturing and industrial processes. The U.S. Environmental Protection Agency (EPA)[5] states that " Hazardous waste means waste which requires special precaution in its storage, collection, transportation, treatment or disposal to prevent damage to persons or property and includes explosive, flammable, volatile, radioactive, toxic and pathological wastes.

1.2.1.1. Types of hazardous wastes:

1.2.1.1.1. Industrial waste:

In general industrial waste may contain variety of polluting elements, which affect directly the environment and the human health. Some industries use radiotracers in large amounts. Such industries and the nuclear industries impose serious hazard to the environment due to the probable release of radioactivity and toxic radioactive isotopes and substances. Depending on the nature of the industry and the projected uses

of the waters of the receiving stream, pollutants may be removed before discharge. The various waste constituents could be divided as follow:

i) Soluble organics causing depletion of dissolved oxygen.

ii) Suspended solids as sludge blankets containing organic solids, which undergo decomposition resulting in oxygen depletion.

iii) Trace organics: phenol and other organics discharged into industrial wastes could cause odors in the water. If these contaminants are not removed before discharge, additional water treatment is required.

iv) Nitrogen and phosphorus: when effluents are discharged to lakes, ponds, and other recreational areas, the presence of nitrogen and phosphorus is particularly undesirable since it stimulates undesirable algae growth.

v) Oil and floating materials: which can be removed by regulations.

vi) Volatile materials: Hydrogen sulfide and several volatile organics will create air- pollution problems[6].

vii) Color and turbid materials: (Dye- waste):

The pollution of certain water sources, especially in the East Midlands, by color derived from dye residues has led to significant public complaint. Certain rivers in textile producing areas such as in the East Midlands, have given rise to significant public complaint due to the level of coloration. In 1992 this led to approximately 300 complaints of color to the National Rivers Authority (NRA) (known now as the Environment Agency), Severn Trent Region[7]. Abnormal color in rivers caused by dye residues is an environmental problem with a complex series of causes. The color pollution of rivers is, however, much more than a problem of increased public awareness and improved river quality.

viii) Heavy metal pollution:

Heavy metal pollution is a problem of great importance for Ukrainian surface water. The main source of heavy metals, especially in the most polluted southern reservoirs, is insufficiently treated wastes from mining, metallurgic and chemical factories. Toxicity of the water pollutants for Man and water organisms depends primarily not on total content but on the physico- chemical state of heavy metals in water[8-10]. Where free ions are documented as the most toxic forms[9,11]. The high toxicity of industrial wastes containing heavy metals is caused basically by free ions. The binding of heavy metals in complexes with inorganic, and particularly with naturally occurring organic matter, causes a decrease in toxicity or complete suppression[9,12]. The EPA has defined a list of toxic organic and inorganic chemicals that now appear as specific limitations in most permits. The identified priority pollutants are listed in table (1)[6]. Toxic substances, and the routes by which they may reach and contaminate the aquatic environment, are several and variable. They include contaminants from gaseous origin, which are generated by the burning of fossil fuels; and liquids or solids, contaminants both organic and inorganic, dumped on land sites from which they leach into groundwater. Whatever the nature of toxic wastes and the route they may take, their risks could be taken through life forms, including plants, land, fresh water or the seas, and possibly enter our food chains irrespective of their degree of toxicity[13]. Maximum Admissible Concentrations (MAC) of lead in top water is 50μg/L. Low concentrations of lead, generally < 25μg/L, are found in surface and ground waters which are used as a source for drinking water supplies. These concentrations usually decrease further due to water treatment processes prior to distribution. Hence, lead levels, which exceed the MAC are caused by contamination from lead components in the distribution systems such as lead pipes and water storage tanks or from any