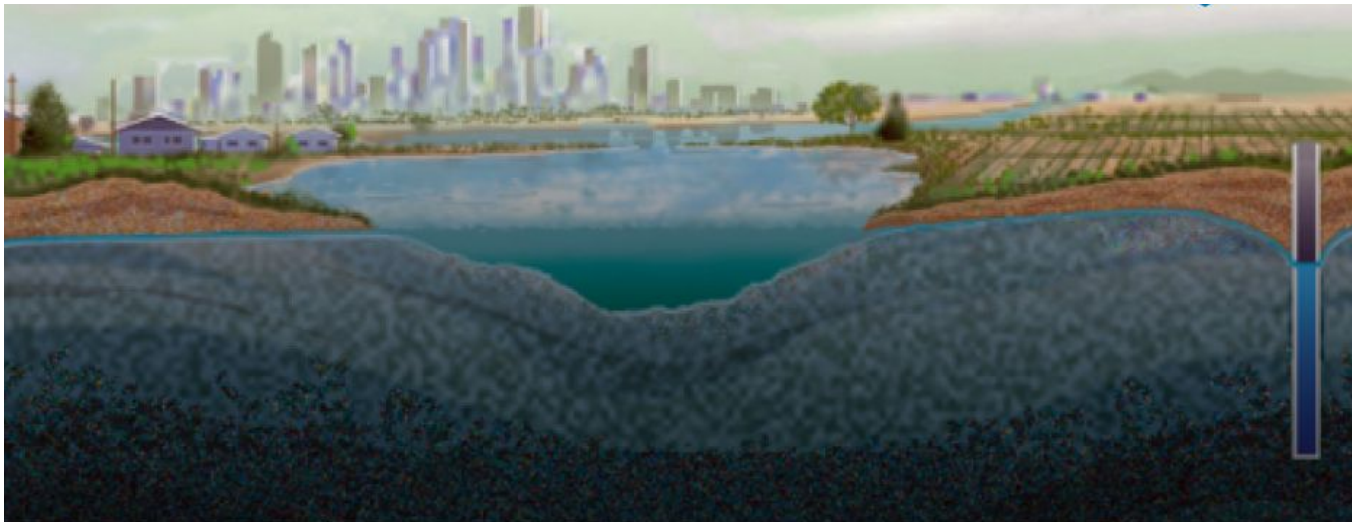
CHY1001

Chemistry Digital Assignment 2

Heavy Metal Contamination in Underground



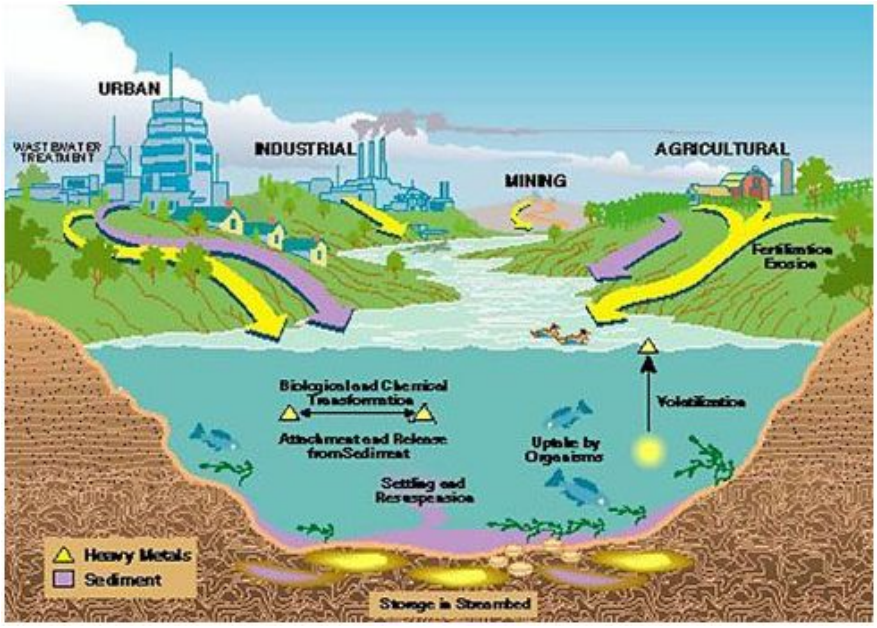
Name: OM ASHISH MISHRA

Reg. No.: 16BCE0789

Slot: E2 + TE2

Introduction:

Water is the vital resource, necessary for all aspects of human and ecosystem survival and health. Depending on the quality, bore water may be used for human consumption, irrigation purposes and livestock watering. The quality of bore water can vary widely depending on the quality of ground water that is its source. Pollutants are being added to the ground water system through human and natural processes. Solid waste from industrial units is being dumped near the factories, which react with percolating rainwater and reaches the ground water. The percolating water picks up a large number of heavy metals and reaches the aquifer system and contaminates the ground water. The usage of the contaminated bore water causes the diseases. Mercury, Arsenic, Lead and Cadmium are used or released by many industries.



Objectives:

General objectives:

- To study the Hazards of heavy metal contamination in ground water

Specific objective:

- To identify types of Hazard metal contamination of ground water
- To understand the health effect of heavy metal contamination

Heavy Metals Report:

Table 1. Comparison of the Result with Recommended Standard

Element	Mean	Range	Standard deviation	leachate	W.H.O (2006) ppb	E.P.A (2009) (ppb)	SON (2007) (ppb)
Ba	65.10	14.20-152.37	41.23	336.50	700	2000	700
Cd	0.80	0.09-1.59	0.55	4.40	3	5	-
Cr	1.1	0.5-5.2	1.1	1171.0	50	100	-
Cu	12.0	2.3-41.3	10.4	605.0	2000	1300	1000
Mn	69.51	6.96-184.75	50.25	643.60	400	50	200
Pb	5.8	1.2-26.9	6.3	485.0	10	15	10
Zn	19.6	4.1-73.7	16.0	3777.0	3000	5000	3000
Fe	2019	11-21675	5828	16753	50	300	300

Table 2. Correlation of Heavy Metals

	Ba	Cd	Cr	Cu	Fe	Mn	Pb	Zn
Ba	1							
Cd	**0.77**	1						
Cr	**0.84**	**0.85**	1					
Cu	**0.84**	**0.82**	**0.99**	1				
Fe	0.00	0.00	**1.00**	0.49	1			
Mn	**0.92**	**0.84**	**0.94**	**0.94**	**0.52**	**1**		
Pb	**0.83**	**0.84**	**0.99**	**0.99**	**0.76**	**0.90**	**1**	
Zn	**0.84**	**0.83**	**0.99**	**0.99**	**0.51**	**0.90**	**0.99**	1

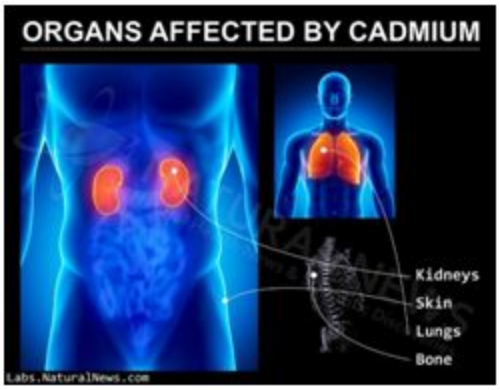
Heavy Metal:

Heavy metals are metals that have density morethan 5g/ml. the name heavy metals means it doesn't mean that they are havier than other rather to show their effect. In very small concentration since they are toxic in nature the name heavy metal will be given to them. Then, here are the lists of heavy metals which are prominent in ground water as well as in other water and land body.

Cadmium (Cd^{2+}):

Cadmium does not exist in nature as native metal but principally as sulfide ore namely greenokite, which is strongly associated with the zinc sulphide as salphalerite, and is recovered from some copper ores during smelting and refining. It is rarely found in natural water. Cadmium is considered to be toxic if its concentration exceeds 0.01 mg/L both in drinking and irrigation water (Hem, 1989). The effects of acute cadmium are high blood pressure, kidney damage, destruction of testicular tissue as well as destruction of red blood cells (Taha, 2004). In industry, cadmium is used mainly for electroplating on other metal to prevent corrosion, for paint, printing ink, plastics, electrical batteries and fluorescent, as well as video tubes. Many of these uses tend to make the element available to water that comes in contact with buried wastes. Another factor of importance is the tendency for cadmium to enter the atmosphere through vaporization at high temperature. Therefore, cadmium may be liberated to the environment in metallurgical processes and in the combustion of fossil fuel. Pollutant cadmium in water may arise from industrial discharges and mining wastes (Taha, 2004). The concentration of cadmium content in groundwater of the Quaternary aquifer ranges between 0.010 and 0.062 ppm with an average of 0.039 ppm whereas it varies between 0.054 and 0.082 ppm with an average of 0.06 ppm for Miocene aquifer. Cadmium content of irrigation canals ranges from 0.012 to 0.017 with an average of 0.15ppm. It varies from 0.025 to 0.09 with an average of 0.07ppm for drainage channels. In oxidation ponds, it varies from 0.068 to 0.207ppm with an average of 0.1ppm (Taha, 2004). The above results indicate that, the concentration of cadmium content in groundwater, surface water, drainage channels and oxidation ponds is high relative to the recommended values of cadmium in drinking and irrigation water. The high content of cadmium in different water samples is attributed to plating bath or industrial discharges or through the deterioration of galvanized plumbing (Taha, 2004). A cadmium objective occurs naturally in ores together with zinc. Lead and copper. Cadmium Compounds are used as stabilizers in PVC products, Color pigment, several alloys and, now most commonly, in rechargeable nickel - Cadmium batteries. Metallic Cadmium has mostly been used as anticorrosion agent (cadmiution). Cadmium is also present as a pollutant in phosphate fertilizers. Cadmium containing products are rarely re-cycled, but frequently dumped together with house hold waste, there by contaminating the environment, especially if the waste is incinerated. Natural as well as anthropogenic sources of Cadmium, Including industrial emissions and the application of fertilizer and sewage to farm land, may lead to

contamination of soils, and to increased Cadmium up take process of soil Cadmium by plants is enhanced at low PH. Graph, Berglund M, Linder CG, Nordberg G vaster et w; 1998;24 (Taha, 2004). Legate smoking is a major source of Cadmium exposure. Biological monitoring of Cadmium in the general population has shown that cigarette smoking may cause significant increases in blood Cadmium B – Cod levels the concentrations in smokers being on average 4 up to 5 times higher than those in non-smokers. Food is the most important source of Cadmium exposure in the general nonsmoking population in most countries. The Cadmium is present in most food stuffs, but concentrations vary greatly, individual in take also varies considerably due to difference in dietary habits: women usually have lower daily cadmium intakes, because of lower energy consumption than men gastro intestinal absorption.



Health effects:

In halation of Cadmium fumes or particles can be life threatening, and although acute pulmonary effects and dates are uncommon, sporadic cases still occur: Cadmium exposure may cause kidney damage. Cancer the LALC has classified Cadmium as a human carcinogen (group) on the basis of sufficient evidence in both humans and experimental animals. IARC however, noted that the assessment was based on few studies of lung cancer in occupationally exposed population, often with imperfect exposure data, and without the capability to consider possible can founding by smoking other associated exposures (such as nickel and arsenic).

Mercury (Hg):

Mercury compound cinnabar (rigs) was used in pre-his tonic cave paintings for red colors, and metallic mercury was known in ancient Greece where it (as well as white lead) was used as cosmetic to lighten the skin. In medicine, a part from the previously mentioned use of mercury as accrue for syphilis, mercury critic's compounds have also been used as dui critics [calomel (Hg_2Cl_2] and mercury amalgam is still used for filling teeth in many countries. Inorganic mercury is converted to organic compounds, such as metal mercury, which is very stable and accumulates in food chain. Until 1970s metal was commonly used for control fungi on seed grain

Health effect organic mercury:

Methyl mercury poisoning has latency of month or longer after acute exposure and the main symptoms relate to nervous system damage: was B, eta; 2002; 110 (supple): 851-4

Inorganic mercury:

Inorganic acute mercury exposure may give rise to lung damage. Chronic, poisoning is characterized by neurological and psychological symptoms, such as tremor, changes in personality, result lenses, and piety, sleep disturbance and depression. The symptoms are reversible after cessation of exposure. B/c of the blood –brain barrier there is no central nervous involvement related to inorganic mercury exposure.

Lead(Pb):

The general population is exposed lead from air and food in roughlyefual proportions. Earlier, lead in food stuff originated from pots used for cooking and storage, and lead acetate was previously used to sweeten wine, during the last century, lead emissions to ambient air have further polluted our environment, over soil of lead emissions are igniting from petrol.

Health effect of lead:

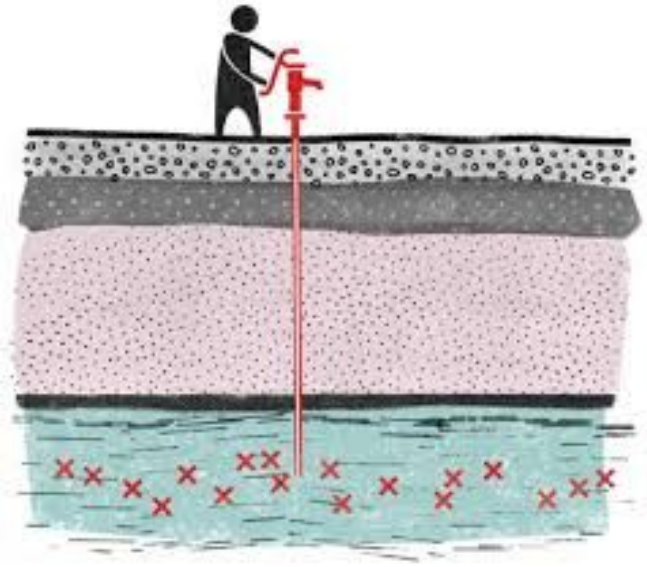
The symptoms of acute lead poison in gore headache, irritability, admiral pain and various symptoms related to the nervous system. Lead enlephalopatayis characterized by sleeplessness and restlessness. Children may be affected by behavioral disturbances, learning and concentration difficulties.

Arsenic(Ar^{2+}):

Arsenic is a widely distributed metalloid, occurring in rock, soil, water and air. In organic arsenic is present in ground water used for drinking in several countries all over the world (e.g. Bangladesh, Chile and chain) where as organic arsenic compounds (such as arsenobetabaine) are primary found in fish, which may pavers to human exposure.

Health effect of Arsenic:

In organic arsenic is acutely toxic and intake of large quantities leads to gastrointestinal symptoms, severed disturbances of the cardiovascular and central nervous systems, and eventually delta.



Summary:

The objective of this study to determine the negative effect or the hazardness of heavy metals found in the natural ground water. Heavy metals in their nature they persist in the natural water due to different reactivity of the soil. The source of these heavy metals was from the ground rock found nearest to the natural water. Specially, natural water sources nearest to rift vally places are known by the presence of heavy metals. Heavy metals such as Mercury (Hg), Cadimium (Cd), Arsenic (As) as well as Lead (Pb) are the common known heavy metals that they may found in the ground water.Ground water is water body found in internal body of the land that can be face contamination using different heavy metals coming from different elements found in the form of elemental rock. Having entrance of those heavy metals in the body of peoples my leads to different health problems such as cancer, kidney problem, nausea, high blood pressure ingeneral series health problems will bring for the healthy person as being they are carcegonic in small concentration.

Conclusion:

The geo chemical study of the metals reveals that pub, man and fee have values above the recommended standards unite virtually all the elements from the same anthropogenic source from the inter elemental study while the contamination assessment showed fee to have contaminated the waters most quality of the water in the study area could be termed contaminated and unhealthy for consumption. Thus, the effect of fend pub to man could lead to delays in physical and mental development and light difficult in attention span and learning abilities in infants and children; kidney problems and high blood pressure in adult, while fee and man that was high in the groundwater cause cosmetic effect such as test, odor, color in drinking water which may also lead to nausea, vomiting, diarrhea, as well as blood clotting and if exceeding high in human system threatens life.

Recommendation:

According to findings of different of different literatures Cadmium (Cd^{2+}) , Mercury, Lead and Arsenic causes substantial groundwater contamination. Salt, salinity, seawater intrusion, lateral migration, underground storage tanks, urban stormwater runoff, mine drainage, wells and oil-field brines are assumed to be the major sources of heavy metals for groundwater contamination. Thus, the dosage of heavy metals should be at optimum condition before taking water for consumption or other related purposes. Furthermore, through disposal of different wastes which could be sources of groundwater contamination could result in minimizing of groundwater contamination. The unsafe and un-recommended use of different agrochemicals should also be taken into consideration in order to minimize groundwater contamination. Therefore, as being we are developing countries everyone should control his environment by keeping our water from any flood, waste water moving from the city should be measured enough and water treatment facility should be developed enough.

Reference and Bibliography:

- https://www.google.co.in
- https://en.wikipedia.org
- Jain & Jain
- O. G. Palana
- Teacher's Notes

Thank You