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Environmental effects of pollution with heavy metals and bacterial pollutants in the rivers of the Amara district

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Abstract: Drinking water has a vital role in human life, so it must be within international standards. Due to the many problems of pollution, this study was conducted to evaluate the water in the district of the city of Amara.

The results of the study revealed an increase in turbidity. Electrical conductivity, total dissolved substances, total suspended solids, pH, alkalinity, total hardness, sulfate, chloride, calcium, phosphate, nitrate, nitrite, ammonia, aluminum, and the total bacterial count in the winter and its decrease in the summer. While the concentration of pollution by colonic and fecal bacteria and coliform bacteria decreases in summer and increases in winter in river absorbing plants. The research found that pollution standards were high in a way that did not comply with what the Iraqi standards allowed. Several locations were chosen on the course of the Tigris River in Maysan Governorate, Amara District, which are (Al-Orouba area) (Awasha area, Al-Jumhuriya Bridge), as well as (Al-Dafas area, passing through Al-Sadr Teaching Hospital area near Al-Manara College and the Yugoslav Bridge). Also (Al-Sada area, Second Cairo neighborhood, near Silo). Finally (the old Safat area near Sayed Ashour). Water samples were collected for the period from (2022 until September 2023) and the average of the measured values was taken for every three months, divided into the seasons of the year, and chemical tests were conducted on them. The study concluded that heavy metals such as copper, cadmium, lead, manganese, and nickel came mainly from industrial activities, and industrial discharges increase their concentration. In the water. Concentrations of heavy metals in the sediment were examined: lead, copper, cadmium, manganese and nickel. The study showed that the concentrations of these metals are at high levels. The research aims to know the environmental dimensions of pollution of the Amara River water and the concentration of heavy metals in it, in order to link the relationship between the concentration of heavy metals and high rates of disease, in addition to calculating the water quality index, and the accumulation of heavy metals in This water may lead to the possibility of cancer.The study also included measuring some of the physical and chemical characteristics of the study samples, namely (air temperature, which ranges from 15-40°C and water temperature from 11-30°C), pH (6.3 - 7.6), electrical conductivity (953.5 - 1515) macromins/cm, and hardness. Total (255-492.5) mg/L, total dissolved solids (635.5-1008.9) mg/L, total suspended solids (0.22-9.12) mg/L, calcium (55-375) mg/L, magnesium (40.2-90) (mg/L). Liters, nitrates (0.33 – 6.04) mg/L, phosphates (0 to 40.2 (µg/L), dissolved oxygen) 4 – 6.77 (mg/L), and vital oxygen requirement (0.6 – 4.4) (mg/L). The results were that the concentration of lead and chromium was higher. Among the limits permitted by the Iraqi specifications for the Conservation of Rivers and Polluted Waters System No. 25 of 1967, the US Environmental Protection Agency (EPA) of 1992, and the International Limits of Drinking Water (WHO) of 1996.

Keywords: pollution, Amara River, sewage, heavy metals.

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Chapter one
The introduction

Water is one of the most important natural resources for life on the surface of the Earth. One of the main health problems in drinking water sources is the presence of heavy metals in concentrations exceeding the permissible limits according to international water specifications. Heavy metals are considered a potential and effective factor in the suffering of fresh, various types of diseases. The most dangerous are cancer and heavy metals, which are those elements whose density is more than five times the density of water, from 3 to 5 mg/cm3, and they have negative effects on the environment when overused, and they also affect the health of humans, animals, and plants.

The effect of different compounds polluting the environment varies according to the type of pollutant, its concentrations, and the time of exposure to it. In general, the effects of chemical and physical pollutants are many, including infectious poisoning, damage to the digestive system, the nervous system, the respiratory system, the liver, the kidneys, and skin allergies, including the incidence of cancerous diseases. .

Heavy metals are considered dangerous pollutants that enter the freshwater environment, causing an imbalance in the environmental balance that directly or indirectly affects humans, because river water, including the Tigris River, is rich in heavy metals. A group of pollutants, including many heavy elements such as zinc, copper, copper and cadmium, as well as lead from industrial waste introduced into it, as well as various chemical fertilizers, have a greater impact on the level of river pollution (aquatic environment). The main cause of water pollution is believed to be direct discharge. For untreated wastewater in rivers and groundwater reservoirs, these pollutants include heavy metals, pesticides, etc. (1).

Heavy metals are present in the aquatic environment, whether in water or in suspended matter or bottom sediments, but short-term estimates of their concentrations in water do not give an accurate indication of the degree of pollution due to differences in water discharge, suspended loads, imbalance, stability and irregularity of pollution sources. Therefore, for the local release of these pollutants, the focus is on bottom sediments, as they are a more consistent indicator of these elements since these sediments are traps for different elements.

Pollution of rivers and water systems with these elements in populated areas and industrial activities is manifested by high concentrations of the elements in sediments. Sediments reflect the degree of pollution of the aquatic environment (polluted water), and for these reasons the concentration of heavy metals in sediments in the study area was studied. The facility responsible for sanitation in the city of Amara discharges large amounts of liquid waste every day, which must be pushed to the water treatment unit, but some hospitals neglect the maintenance of the water treatment unit, which is often broken or does not have a complete discharge. These institutions lead to the discharge Its liquid waste enters the main public sewage network, which in turn reaches the river directly, so most of the wastewater in the city of Amara, including hospital liquid waste, is discharged without treatment in secondary drains. Thus, it causes many environmental problems that lead to an increase in Determining factors of pollution of the aquatic environment. Through qualitative and quantitative examination of hospital wastewater samples twice in the months of March and June 2023, it was found that suspended solids (TSS), dissolved substances (T.D.S), chloride, and sulfates were present in the hospital waste liquid. Phosphates and acidity (PH) and nitrates (NO_3) did not exceed the permissible value for the environment. Waste and by-products

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Hospitals discharge their waste and chemicals found in industrial sewage into nearby rivers and lead to water pollution with heavy metals such as mercury, lead and others such as cadmium and zinc. Also, many factories dispose of liquid waste directly into the sewers with this garbage, which contains polluting materials. It is dangerous that the properties of water have changed a lot in the past few years because some factories in the governorates throw their waste directly into the Tigris without treating it in a correct scientific manner (2).
The maximum permissible concentrations of some heavy metals in water recommended by the World Health Organization (WHO) and the Environmental Protection Organization (EPA) are shown in the table

EPA	WHO/FAO	
50-200 mcg/L	100 -200 mcg/L	(AL) Aluminium
0.005 mg/L	3 mcg/L	(Cd) Cadmium
1.3 mg/L	2.000 mcg/L	(Cu) Copper
0.015 mg/L	10 mcg/L	(Pb) Lead
0.002 mg/L	6 mcg/L	(H)Hg

The study showed high concentrations of turbidity, salinity, total dissolved substances, dissolved oxygen, sulphates, phosphates and nitrates. Biological tests were conducted to determine the type of bacteria present in the water. By obtaining the results and comparing them with the drinking water guidelines issued by the World Health Organization and the specifications of the Central Organization for Standardization and Quality Control, three international classifications were used to evaluate the suitability of water for agriculture 1954. The first classification is the American Salinity Laboratory classification for the year 1954, the most prominent of which is C3-S1. The second is the Food and Agriculture Organization of the United Nations guide for the year 1985. These waters fall into the category of waters that suffer from problems of light to moderate urgency, expressed in terms of conductivity. The last was the guidelines issued by the Food and Agriculture Organization of the United Nations in 1992, which fall under the category of brackish water and irrigation water, while the water within the classifications mentioned above falls under the category of brackish water. The possibility of damage resulting from increased concentrations of sodium ions, the danger of sodium absorption rates, and its effect on the permeability of the soil when used for irrigation. Regarding bacterial contaminants of Al-Sadr Teaching Hospital water, microbiological analysis showed contamination with E. coli, salmonella, and fecal coliform, in accordance with the standards and recommendations of the 1998 World Health Organization guidelines for evaluating biological water. The severity of contamination of river water with heavy metals was assessed using the Pollution Index (PI), which showed that the degree of contamination of heavy metals in water samples was average for the sites. The severity of contamination of river sediments with the heavy metals studied was also evaluated by using indicators of sediment contamination, which are both the ground accumulation index (I - geo - Index), pollution load index (PLI - Index), pollution factor index (CF - Index), degree of pollution (Cd - Index) and enrichment factor index (EF - Index). With regard to assessing sediment pollution using environmental indicators, the results showed The ground accumulation index (I-

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geo) calculated for the studied elements indicates that the studied sites are not polluted with copper and zinc, but they are very strongly polluted with cadmium (6).

The study Problem:
Calculations confirm that the total wastewater flowing into the Tigris River within the city limits of Amara alone and without any treatment amounts to more than four times what is provided by liquefaction and filtration units in the city. These wastes have become a major cause of pollution in the river's water, and perhaps the people of the city of Amara are the best to feel this, to the point that the water there has almost become an unpalatable taste and may not even be suitable for home use. But there is no trick in hand, as they say, as people are helpless and are drinking poisons in front of the eyes and ears of officials and decision-makers. Pollution of the waters of the Tigris and Euphrates rivers over the past twenty years, as a result of the population growth and population density that occurred in the district of Amara after (2003), which led to an increase in the use and consumption of quantities of water for various purposes, which was reflected in an increase in liquid wastes loaded with microbes and viruses that cause diseases that are transmitted through water to humans. Due to the lack of a sewage system, the water levels of the Tigris and Euphrates rivers also decreased as a result of the policies of the upstream countries represented by Turkey and Iran, and the stagnation of this water for long periods, making it more like pools of stagnant water and a fertile habitat for biological pollution.

The aim of the research:
1. Determine the total content of some heavy elements in river water.
2. Study of biological pollution

Boundaries of the study area:
The city of Amara is located in the middle of Maysan Governorate (the center of the governorate) between two latitudes (31.42°-32°) north, and two arcs of longitude.
(46.52°-47.22°) east (5) Al-Amarah is an Iraqi city and the center of Maysan Governorate, about 320 kilometers to the southeast of the capital, Baghdad, and about 180 kilometers from Basra. The city is located on the banks of the Tigris River, about 50 km from the Iranian-Iraqi border, a few kilometers from the marshes area, and 100 km to the east from the city of Qalaat Sukkar. Its population is estimated at about 550 thousand people in 2014, while the population of the Amara district is about 625 thousand people.

Climatic data for the city of Amara													
The month	January	February	March	April	May	June	July	August	September	October	November	December	annual rate
Average maxim	16 (60)	19 (66)	24 (75)	31 (88)	38 (100)	41 (105)	45 (113)	44 (111)	40 (104)	35 (95)	25 (77)	18 (64)	31 (88)

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um temperature °C (°F)					)	)							
Average minimum temperature °C (°F)	6 (43)	8 (47)	12 (54)	17 (63)	23 (74)	27 (80)	27 (81)	27 (80)	24 (75)	19 (67)	12 (54)	9 (48)	18 (64)
Precipitation mm (inch)	23 (0.9)	15 (0.6)	20 (0.8)	18 (0.7)	7.6 (0.3)	0 (0)	0 (0)	0 (0)	0 (0)	2.5 (0.1)	13 (0.5)	20 (0.8)	119.1 (4.7)

Materials and working methods:

The field method was followed in this research by collecting data from relevant authorities, as well as collecting samples from the five specified locations, and taking wastewater samples for the summer and winter seasons between the years 2022/2023 and sending them to laboratories to know the characteristics of that water and estimate the concentration of heavy metals in it.

The concentrations of heavy metals were estimated in the water and sediments of the Amara River. A quarterly study was conducted to estimate the concentrations of heavy metals in water samples taken from areas relevant to the research study, as mentioned above, during the four seasons (summer, fall, spring, and winter) and over the course of an entire year. The concentrations were estimated Heavy elements (zinc, copper, cadmium and lead). Based on the method mentioned in (APHA 1985), (20) samples were collected from the water of the study sites, including the wastewater of Al-Sadr Teaching Hospital in Al-Amarah, at a rate of 1-2 samples per month, where (50 ml) of water was taken after collecting samples from five sites for the purpose of conducting The tests were analyzed and placed in a clean 100 ml glass beaker, and 5 ml of concentrated nitric acid was added to it. Heat the beaker on a hot plate and leave it on the hot plate to continue heating until the pre-drying stage. Then 5 ml of concentrated nitric acid was added to the sample while continuing to do so. Heating to obtain a precipitate (3).

After cooling, the volume was completed to 25 ml with deionized distilled water, and filtered using a 0.20 μm filter so that the sample was ready to estimate the concentrations of heavy metals in it. The absorbance of these digested samples was then measured using a Spectrophotometer Absorption Atomic Spectrometer. PYE 9sp model Unicom. He determined the wavelength and current used for each heavy element and the concentration of zinc, lead and cadmium in it, taking the average values for three months according to the seasons of the year(3).

The second part of the study was to conduct biological analyzes to diagnose bacteria present in water samples, and the following tests were conducted:

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First: Measure the concentration of elements using an atomic absorption spectrophotometer - 211VGP-Buck Scientific.
Second: Chemical tests: The acid function, electrical conductivity, and positive and negative ions were measured (4).
Third: Isolation and diagnosis of microorganisms
The sample was mixed well, and six decimal dilutions were made for each sample. (0.1) ml of each dilution was taken and planted in the nutrient agar medium, the blood agar medium, and the MacConkey culture medium using the spreading method, with two plates for each medium. The plates were then incubated in the incubator at 37 degrees Celsius for 24 hours, and they were diagnosed. The growing colonies were conducted by conducting microscopic examinations using the Gram stain, by taking a growing colony from blood agar and MacConkey plates, staining it, then examining it under an optical microscope (oil lens), and one bacterial isolate (the dominant one) was selected (4).
Microscopic and biochemical examinations were conducted based on internationally recognized scientific sources to diagnose bacteria
The diagnosis included the following steps:

- The cultural properties-
- The Microscopic test.
- Sporlation 3
- Mannitol fermentation and Motility test
- The Biochemical test

Results and discussion

Laboratory tests revealed that the rate of salinization in the Tigris water, specifically in the city of Amara, is much higher than the degree of salinization according to the study prepared by the Regional Water Center in 2001, especially after the period of decline in the Tigris water levels due to the limited water share from the source. The level of phosphate poisoning resulting from liquid waste is considered an additional factor. One of the factors of environmental pollution, as the water contains chemically analyzed residues of fertilizers added to crops. The use of phosphate and nitrogen fertilizers in agricultural projects and the use of other agricultural pesticides to combat the effects of agricultural diseases and insect pests led to a sharp increase in the rate of phosphate pollution. Also, as a result of the use of detergents (cleaning powders), families' consumption of them increased, which increased their concentrations in wastewater and these uses. The values were within the permissible limit for wastewater, which is (3000) micrograms/liter.
The percentage of phosphate pollution has also increased greatly, to the point that it reached high levels of pollution in some seasons in the months of January, February, and March of each year, which are the peak seasons for irrigation operations and the addition of these fertilizers. So, the total amount of water that drainage projects sometimes pour into the rivers and during the season of scarcity is even greater than the water of the Tigris River itself. The phenomenon of using poisons and pesticides in the process of hunting fish and birds has begun to worsen recently in light of the absence of law and conscience.

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First: Characteristics of wastewater:

The wastewater in the city of Amara is opaque, yellowish, and turbid, and due to biochemical reactions, it emits various gases, the most important of which is Iraqi. Toxic hydrogen, methane, and ammonia, and this water contains different concentrations of chemical elements. The results of laboratory analysis show that the quality of wastewater has exceeded the environmental pollution limit permitted by the Iraqi water resources maintenance system.

Standards	**Iraqi Standard No. 417/2001**	**American standard USEPA, 1994, CDPHE – WQCD, 2000, 2006**	**WHO specifications, 1997**
pH	8.5 – 6.5	8.5 – 6.5	8.5 – 7
Electrical conductivity microsiemens/cm	-	-	2000
So4 mg/L	400	250	400
Ca mg/L	200	-	50
C1 mg/L	600	-	250
Mg mg/L	150	-	50
Na mg/L	200	20	-
	Bacteria		
Total Plate count 100ml	10/ml Colonies	-	-
Coli form group 100ml	0	1	3<
Faecal Coli form 100ml	0	0	0

Table (1)
Chemical and physical tests of wastewater (mg/L) in the city of Amara 2023

Property	**code**	**Environmental determinant***	**Summer season**	**Winter season**
pH	PH	9,5-6	7,3	7,1
Chlorides	CL	600	1922,5	709,6
Sulfates	SO4	400	972,8	620
Phosphate	PO4	3	95,7	47,9
Calcium	Ca	200	332	175
Magnesium	Mg	50	48,9	33,3
Suspended materials	TSS	60	79	61

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dissolved substances	TDS	1500	2588	1775
Electrical conductivity	Es	0,4dsi/m	7,1	5,6
Fats and grease	O&G	10	213	231
Nitrates	No3	10	15,7	8,1

*General specifications for drinking water according to (local specifications, World Health Organization, and American specifications).
* The concentration of the lead element ranged between (ppm 0.1 - 0.5) in the summer and (ppm 0.3 - 0.12) in the winter. As for the element chromium, its concentrations ranged in the summer (ppm 0.01 - 0.05) and in the winter (ppm 0.01 - 0.06). The concentrations of the nickel element ranged In the summer (ppm 0.01-0.02) as well as in the winter (ppm 0.01-0.02) according to Iraqi standards for irrigation purposes. Regarding cadmium, its concentrations ranged in the summer (ppm 0.01 - 0.05) and its concentrations in the winter reached (ppm 0.07 - 0.09), which is higher than the permissible limit according to the Iraqi standard specifications for irrigation purposes, and this is consistent with the reference study according to (Eman Al-Sarraj et al., 2019) . The results of the analysis of the sodium element in stream water in the winter and summer seasons. When comparing the concentrations of this element between the two seasons, it was found that the concentrations of the sodium element were higher in the winter than in the summer, as follows (51-78) mg/L in the summer and in the winter (90-98).) in winter, while readings for potassium showed that its concentrations range in summer (9-13) mg/L
In winter (8-10), it is higher than the permissible limits according to Iraqi standard specifications. The results of the analysis of phosphorus in stream water were very high. The values in the summer were (12-21) mg/L, and in the winter they ranged between (21-27) mg/L and are
These concentrations are higher than the permissible limits according to Iraqi measurements, and its high concentration in the winter is due to its dissolution. These concentrations are much higher than the permissible limits, which are between (0-2) mg/L, due to its greater dissolution in the summer, so this element is stabilized and its presence is high as a result of fertilization, so it is considered This stream is within cultivated lands.
The wastewater that is discharged into the Amara River on its sides contains organic and inorganic substances. The organic substances consist of (40%) nitrogenous substances, (50%) carbohydrate substances, and (10%) fatty substances, while the inorganic substances consist of chlorides.
And nitrogen, phosphate, potassium, and some mineral salts. In the study area, there is a wastewater network with a length of (592,043 metres) distributed into main and subsidiary lines between the three sectors of the city, where the western sector acquired the largest length, amounting to (272,087 metres), thus constituting (46%) of the total The length of the sewage network amounted to (592,043 m), while the eastern sector constituted (35.8%) of the total network lengths, while the northern sector was satisfied with (18.2%) of the network lengths.
***Results of analysis of some chemical tests (BOD - COD)**

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The electrode method was used to calculate the oxygen and vital requirement of oxygen (Membrane Electrod Method), as this method depends on the permeability property of oxygen through the membrane used in the electrode using the APHA method. The results showed that the COD values in the summer ranged between (100-890) mg/L and in In winter, it ranged between (18-118) mg/L, and the reason is the vital activity of bacteria and high temperatures, where oxidation processes mainly take place. As for BOD, the value ranges between (100-167) mg/L in summer and (6-22) mg/L in winter.

***Electrical connection:**

The results of water analysis to measure electrical conductivity (EC) showed that the electrical conductivity of raw wastewater recorded the lowest value during the month of December 2022, while the highest value during the month of April 2023. It has been found that throwing raw sewage into the river can change the electrical conductivity depending on its type. The conductivity values of raw sewage water were high, reaching higher than 2000 microsiemens/cm during the months of January, March, April, and July. This is due to the chemical composition of the raw sewage water, which is It varies from month to month. It has been found that an inefficient sewage system may increase conductivity due to the presence of chlorides, phosphates and nitrates.

***Bacterial tests:**

As for bacterial analyses, the numbers of (SS_ E -coli_ Bac) in the summer were greater than in the winter due to the conditions suitable for their growth and reproduction. The population values of (Salmonella and Shigella) ranged in the summer from (2000-3200) eggs and in the winter (2000-3000) eggs, which is outside the permissible limits. .

The number of E-coli in summer (2000-3000) and winter (8000-33000) was bacillus, which is outside the permissible limit according to Iraqi standard specifications.

Lengths of the sewage network (meters) in the city of Amara by sectors and number of beneficiary population for the year 2010.

sector	The network length	%	Beneficiaries (portion)	% of the beneficiary population	% of the sector's population	Total population (portion)
North	107744	18,2	56712	15,8	50,6	101861
western	272087	46	225630	62,7	100	225630
Eastern	212212	35,8	77630	21,5	60,1	129214
the total	592043	100	359972	100	-----	456705

Source: Iraqi Ministry of Municipalities and Works, General Directorate of Maysan Governorate Sewerage, Technical Section 2010.

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Injury/diseases	1- Bacteria
• Urinary tract infection • Meningitis • Intestinal Disease	*Escherichia coli*
Typhoid	*Salmonella typhi*
Paratyphoid	*Salmonella paratyphi*
Enteric fever	*Salmonella enteritidis*
Dysentery (Bacillary)	*Shigella dysentria*
(Gastro) Intestinal disease	*Streptococcus* sp.
Cholera	*Vibrio cholera*
Leptospirosis	*Leptospira ieterohaemorrhayla*
Tularaemia	*Francisella tularensis*
Tubcrculosis	*Mycobacterium tuberculosis*
Injury/diseases	**2- Viruses**
Hepatitis	Hepatitis A virus
Poliomyelitis	Polio Virus
Injury/diseases	**3- Protozoa**
Amoebic (Dysentery)	*Entamoeba histolytica*
Giardiasis	*Giardia lambli*
Injury/diseases	**4-Worm**
Bilharzia	*Schistosoma haematobium*

Conclusions:

* Throwing raw wastewater into the river caused an increase in the numbers of fecal coliform bacteria, a decrease in the values of dissolved oxygen, an increase in the values of turbidity, electrical conductivity and the living requirement for oxygen, and an increase in the levels of organic and bacterial pollution in the river, represented by the increase in concentrations of organic matter. The release of raw wastewater has a clear impact on the biodiversity of the Amara River and zooplankton, as well as its density and quality. It also became clear that most of the concentrations of some water elements fell outside the permissible limits according to the specified standards, which made residents rely on purchasing mineral water (or what is known as RO) or installing home desalination devices.

All water from the stations in the study area is considered, on the basis of the concentration ratio of elements (EC, TH, SO_4, T.D.S), to be non-compliant with specifications and unfit for drinking, during the hot and cold seasons.

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Suggestions:

1-Work with the concerned authorities to reduce the sources of water pollution by imposing penalties and fines on those who cause pollution, especially industrial factories, by throwing waste and debris directly into the river.

2- Repairing the sewage network system to provide possible protection for the river and biodiversity, and trying to repair and create a correct and sound sewage pipe system and building appropriate units to fully treat sewage to reuse it for various purposes.

3- Resorting to biological methods in removing heavy elements from industrial wastewater as an alternative to the chemical methods currently used, which are characterized by their high cost and the large number of solid wastes resulting from them.

• Chemical materials, tools, and agricultural media used in the study.

N	the device name	
1	Fine filter papers with holes 0.45 micrometer in diameter	Micro Filter paper
2	Sitter	Incubator
3	Mercury thermometer	Thermometer
4	Electrical conductivity measuring device	EC- Meter
5	PH measuring device	pH- Meter
6	PH measuring papers	Indicator paper
7	Water bath	Water bath
8	Turbidity measuring device	Ratio – Turbid Meter
9	Electric oven	Oven
10	Incineration furnace	Muffle Furance
11	Spectrophotometer	UV Specterophotometer
12	Sensitive balance 2410 gm	Sensitive Balance
13	Sensitive balance 220 gm	Sensitive Balance
14	Optical microscope	Light microscope
15	Colony counting device	Colony Counter

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16	Distillation device	Distiller
17	Micropipette	Micro Pipette

N	The material name	
1	Sodium azide	NaN3
2	Formalin	Formaldyhde solution
3	Starch	Starch (Soluble)
4	Sodium thiosulfate	Na2S2O3.5H2O
5	Ascorbic acid	Ascorbic acid
6	Sulfuric acid	H2SO4
7	hydrochloric acid	HCl
8	Evidence of phenonphthalein	Phenolphthalene
9	Meroxide guide	Meroxide reagent
10	Detector (EBT)	Eriochrom Black-T
11	Manganese sulphate	MnSO4- 4H2O
12	Ethyl alcohol	Ethanol
13	Potassium chromate	K2CrO4
14	Barium chloride	BaCl2. 2H2O
15	Local distilled water	
16	Aqueous ammonium molybdate	$(NH_4)6MO_7O_{24}.4H_2O$
17	Silver nitrate	Ag NO_3
18	SODUIM hydroxide	NaOH

The Agricultural medias	
Akar-Akar	Agar-Agar
Iron trisaccharide agar	Triple Sugar -Iron agar
Agar of blood	Blood Agar
Acar Simon Strat	Simon Citrate
Acar Salmonella	S.S Agar

The Agricultural medias	
Shikella	
Akar Al-McConkey	MaCcokey
Nutrient agar	Nutrient Agar
Urea agar	Urea Agar
AkarTCBS	TCBS Agar
Methyl Red Broth - Fox Proscure	MR - VP
Peptone water	Peptone water

Appendix (A-1) Specifications of the System for Preserving Rivers and Public Waters from Pollution No. (25) of 1967 and the amendments attached to it.

Arabic references

- Farouha, Sabri Mikhail and Qanbour Fouad Ibrahim. (1989). Environmental Pollution . First edition, University of Mosul.
- Al-Saadi, Hussein Ali, Najm Qamar Al-Daham, Laith Abdel Jalil. (1986). Aquatic ecology. Ministry of Higher Education
- And Scientific Research, University of Basra.
- Mahmoud, Tariq Ahmed. (1988). Environmental science and technology, Dar Al-Kutub for printing and publishing. University of Al Mosul .
- Aoun, Ahmed Muhammad (2002). Water from source to landfill. Environment Public Authority, Tripoli, Great Jamahiriya
- Abdel Rahman, Ibrahim Abdel Karim, Ibtihal Ahmed Mouloud, Marwan Moneim Saud (2009). Evaluation of drinking water quality and efficiency
- Fallujah water filtration station. Iraqi Journal of Civil Engineering.
- The Central Organization for Standardization and Quality Control. Iraqi Standard Specifications for Drinking Water No. 417 of 2001
- The standard was amended in 2009, and the standard was amended in 2006
- Aziz, Rahim Jaafar, 2008, Evaluation of the quality of drinking water in the area of Seven Qusour in the Rusafa side / Baghdad,
- . Breeding quantity magazine, frozen 22
- Vaid, Harith Jabbar and Adel Mishaan Rabie, 2008, Water Pollution, Its Sources and Risks of Treating it, Community Library, Al-Arabi, Amman.
- Al-Azami, Hussein Ali. (1987). Effect of heavy metal pollution. The second scientific symposium of the College of Education for Girls, University of Baghdad
- Al-Jubouri, Ali Hassoun Adham. (2005). Study of the microbial evidence of biological pollution and some physical and chemical factors on the waters of the Tigris River and the Lower Zab River in the city of Hawija and Tikrit, Master’s thesis, College of Education, Tikrit University.

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Foreign references

- APHA (1985). "Standard Methods for Examination of Water and Waste Water". 16th ed., U.S.A.
- Banat, K.M.; Al-Rawi, Y. (1981). Heavy metals distribution in the sediments of Euphrates river.
- Iraqi. J.Sci
- APHA (1998). Standard method for the examination of water and waste water, 16th Ed. American Public Health Association, American water works association and water pollution control federal, Washington, D.C.
- Webster, (1980), Introduction to fungi.2nd ed. Cambridge University Press, New York 13
- Roane, Miller, and Pepper,. (2009). Microbial remediation of metals. Bioremediation: Principles and Applications. Cambridge, UK, Cambridge University.
- Teskova,. and Petrov,. (2008) Removal of heavy metals from aqueous solution using Rhizopus delemar mycelia in free and polyurethane-bound form. Z. Naturforsch.
- Al-Qaisi, R. K. J. (2005). Residual Chlorine Concentration In Baghdad Water Supplies, M.Sc., Thesis Building And Constriction, Uni Of Technology.