Contents

	No
Chapter I Introduction	
1. General outline	1
2. Ground water	1
3. Geography location	4
4. Climatic conditions	5
4.1. Rainfall intensity (mm/year)	5
4.2. Air temperature (T.°C)	5
4.3. Evaporation intensity (mm/day, month, year)	5
4.4. Relative humidity (%)	6
4.5. Degree of aridity	6
5. Aquifer characteristics	6
6. Physical and chemical properties of ground water	8
6.1. Physical characteristics.	8
6.2. Chemical characteristics (Hardness of ground water)	11
7- Environmental isotopes	11
7.1. Deuterium (² H)	12
7.1.1. Applications of deuterium	12
7. 2. Oxygen -18 (¹⁸ O)	13
7.3. Stable isotope signature of oxygen and deuterium	13
7.4. Radioactive isotopes for water circulation and age dating	15
7.4.1. Tritium (³ H)	15
Aim of the study	13
Chapter II Experimental	
1. General.	19
2. Field work	19
3. Water sampling	19
4. Chemical analysis of ground water	۲.
4.1. Measuring of the pH-Value	71
4.2. Determination of total dissolved salts (T.D.S.)	7 4
4.3. Determination of cations	23
4.4. Determination of anions	23
4.5. Determination of uranium (VI) by Arsenazo-III in water samples (Marczenco, 1986)	۲ ٤
4.6. Determination of thorium (IV) by Arsenazo-III in water samples (Marczenco, 1986)	70
5. Instrumentation.	70
5.1. General	70
5.2. Spectrophotometer	70
5.3. Flame photometer	77
5.4. Atomic Absorption	77
5.5. Isotope Ratio Mass Spectrometer.	77
2.2. IDUIQPO IXIIIO ITIIIDD DPOCIIOIIICICI	, ,

	age lo.
Chapter III Results and discussion	
1. Ground water salinity (T.D.S.)	,
2. Ground water hardness 27	
3. Hydro-geochemistry of ground water	
3.1. pH values	
3.2. Salinity or Total Dissolved salts (T.D.S.)	
33. Major chemical constituents of ground water	
3.3.1. Cations and their variability	
3.3.1.1. Concentration of sodium and potassium	
3.3.1.2. Concentration of calcium	3
3.3.1.3. Concentration of magnesium	
3.3.2. Anions and their variability	
3.3.2.1. Concentration of chloride	í
3.3.2.2. Concentration of sulfate	
3.3.2.3. Concentration of carbonate and bicarbonate	5
3.4. Hydro-chemical characteristics of the investigated water samples 38	
3.5. Hydro-chemical coefficients (ion ratios) of the studied water samples 40	
3.6. Water type	
3.7. Genesis of the studied water samples, Eastern Desert	
3.7.1. Sulin's graph classification, (1948)	
3.7.2. Ovitchinikov's graph, (1963)	
3.7.3. Piper's graph, (1944)	
4. Evaluation of water quality for different purposes	
4.1. Evaluation for drinking purposes	
4.2. Evaluation for Laundry purposes (water hardness)	
4.3. Evaluation for irrigation purposes	
4.3.1. Classification according to salinity content (T.D.S.)	
4.3.2. Classification according to sodium ion percentage (Na %)	
4.3.3. Classification according to sodium adsorption ratio (S. A. R.)	
4.4. Evaluation of ground water for livestock and poultry 59	
4.5. Evaluation of ground water for industrial purposes 59	
4.6. Evaluation for building purposes. 61	
5. Trace elements concentrations 62	
5.1. Iron	
5.2. Lead (Pb ²⁺)	
5.3. Cadmium (Cd ²⁺)	
5.4. Zinc (Zn ²⁺)	
5.5. Nickel (Ni ²⁺)	
5.6. Copper (Cu ²⁺)	
5.7. Manganese (Mn ²⁺))

P	age
	No.

References	93
Summary and conclusions	
Conclusion	87
5. Oxygen-18 and ionic strength relationship	84
4. Oxygen-18 and tritium relationship.	84
1. Overgon 19 and tritium relationship	83
3. Oxygen-18 and T.D.S. relationship.	81
2. Oxygen-18 and d- parameter relationship.	01
1. Deuterium (δD) and Oxygen -18 relationship.	77
II-I-Environmental isotopes results	77
II- Environmental Isotopes	75
8.2. Effect of thorium on health	74
8.1. Effect of uranium on health	73
8. Radioactivity Effects	73
7. Uranium content in water	71
6. Chemistry of uranium and thorium.	70

الملخص العربي

List of Tables

Table	Pa]
No.	,
1: Water wells selected from South Eastern Desert, Egypt	·
3: Chemicals and reagents used	,
4: Hardness classification according to Peavy et al., 1986.	,
5: Chemical analysis of water samples collected from sSouth Eastern Desert, Egypt	,
Cont.: Chemical analysis of water samples collected from South Eastern Desert, Egypt	
6: Hydro-chemical formula and hypothetical salt combination (%) for studied water samples	
7: Hydro-chemical ratio in sea water and their corresponding values in the studied	
samples	
9: Origin of studied water wells, South Eastern Desert, Egypt	
10: Classification of water type based on Ovitchinikov's graph, (1963)	
11: Characteristics features of water samples based on ECAFE and UNESCO (1963)	
and WHO (1984)	
12: Characterization of drinking water consumption by the WHO (1984) based on	
Chebotarev classification (1955)	
13: Hardness ranges with water classification type (Hem, 1989)	
14: Hardness of the studied water samples.	
15: Classification of irrigation water based on salinity values (College of Agriculture Science,	
2002 and U.S. Salinity Laboratory Staff (1954)	
16: Guide for the use of water for irrigation as proposed by Ayers, (1977)	
17: Type of water depending on Na % parameter	
18: Water type according to sodium adsorption ratio (S.A.R.) of the studied water samples	
19: International standards of water used for livestock and poultry as proposed by National	
Academy of Science and National Academy of Engineering (1972)	
20: The quality requirement of water for some industrial purposes by National Academy of	
Science and National Academy of Engineering (1972)	
21: Trace elements analysis for the studied ground water samples (ppb), South Eastern	
Desert, Egypt	
22: Isotopic analysis of water samples collected from South Eastern Desert, Egypt	
23: Recharging source, origin of ground water and evaporation line of the samples collected	
from South Eastern Desert, Egypt	
24: Chemical and isotopic analysis for different sources, Egypt	
= : = = = = = = = = = = = = = = = = = =	

List of Figures	
Figure	Page No.
No.	
1: The location of wells 1 - 9 selected from Southern Eastern Desert, Egypt	9
2: The location of wells 10 - 14 selected from Southern Eastern Desert, Egypt	10
3: Total dissolved salts of studied ground water samples	28
4: Concentration of Na ⁺ in the studied water samples	32
5: Concentration of K ⁺ in the studied ground water samples	32
6: Concentration of Ca ²⁺ in the studied ground water samples	33
7: Concentration of Mg ²⁺ in the studied ground water samples	34
8: Concentration of Cl ⁻ in the studied ground water samples	35
9: Concentration of SO_4^{2-} in the studied ground water samples	37
10: Concentration of CO ₃ ²⁻ in the studied ground water samples	37
11: Concentration of HCO ₃ in the studied ground water samples	38
12: Bar graph of the hypothetical salt combination of South Eastern Desert	
samples (Palmer, 1911)	41
13: Sulin's graph for the studied ground water samples	46
14: Ovichnikov's graph for studied ground waterm samples	48
15: Trend of ions distributions on piper's diagram (1944) for the investigated water	
samples, of Eastern Desert, Egypt	50
16: Concentration of Iron in the studied water samples	64
17: Concentration of Pb ²⁺ in the studied water samples	65
18: Concentration of Cd ²⁺ in the studied water samples	66
19: Concentration of Zn ²⁺ in the studied water samples	67
20: Concentration of Ni ³⁺ in the studied water samples	68
21: Concentration of Mn ²⁺ in the studied water samples	69
22: Relationship between oxygen-18 and deuterium of studied water samples	79
23: Relationship between oxygen-18 and d- parameter of studied water samples	82
24: Relationship between oxygen-18 and T.D.S. analysis of studied water samples	83
25: Relationship between oxygen-18 and TU of studied water samples	84
26: Relationship between oxygen-18 and ionic strength of studied water samples	85