

**University of Salahaddin
College of agriculture
Dept. of Soil and Water**



**Academic year 2023-2024
second -year Students
Spring Semester**

soil chemistry L1

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Syllabus

Introduction.....,,,,,,,,,,,,,,,,,,,,,

The equilibrium between soil phases Soil organic matter .

Soil minerals, derivation of different clay minerals, Role of clay minerals in agriculture and soil pollution.

Surface chemistry Surface charge, Adsorption / Desorption phenomena.....

Surface exchange reactions

Cation exchange. Anion exchange.

Ion exchange models ion paring and activity.

Chemistry of macronutrients and micronutrients.

Phosphorus chemistry.....

Potassium chemistry.....

Iron chemistry.....

Definition of soil chemistry:

It is a branch of edaphology that deals with studying of the chemical reactions, properties and processes of the soil pertaining to plant and animal growth and human development environments.

The chemistry of the soil plays a vital role in the development of natural resources, the protection of the environment, and the sustainability of ecosystem health.

The position of soil chemistry in soil science: The following diagrams explain the position of soil chemistry in soil science

Edaphology

- 1 Soil chemistry**
- 2 Soil physics**
- 3 Soil microbiology**
- 4 Soil fertility**

Pedology

- 1 Soil classification.**
- 2 Soil morphology.**
- 3 Soil genesis.**
- 4 Soil geography**

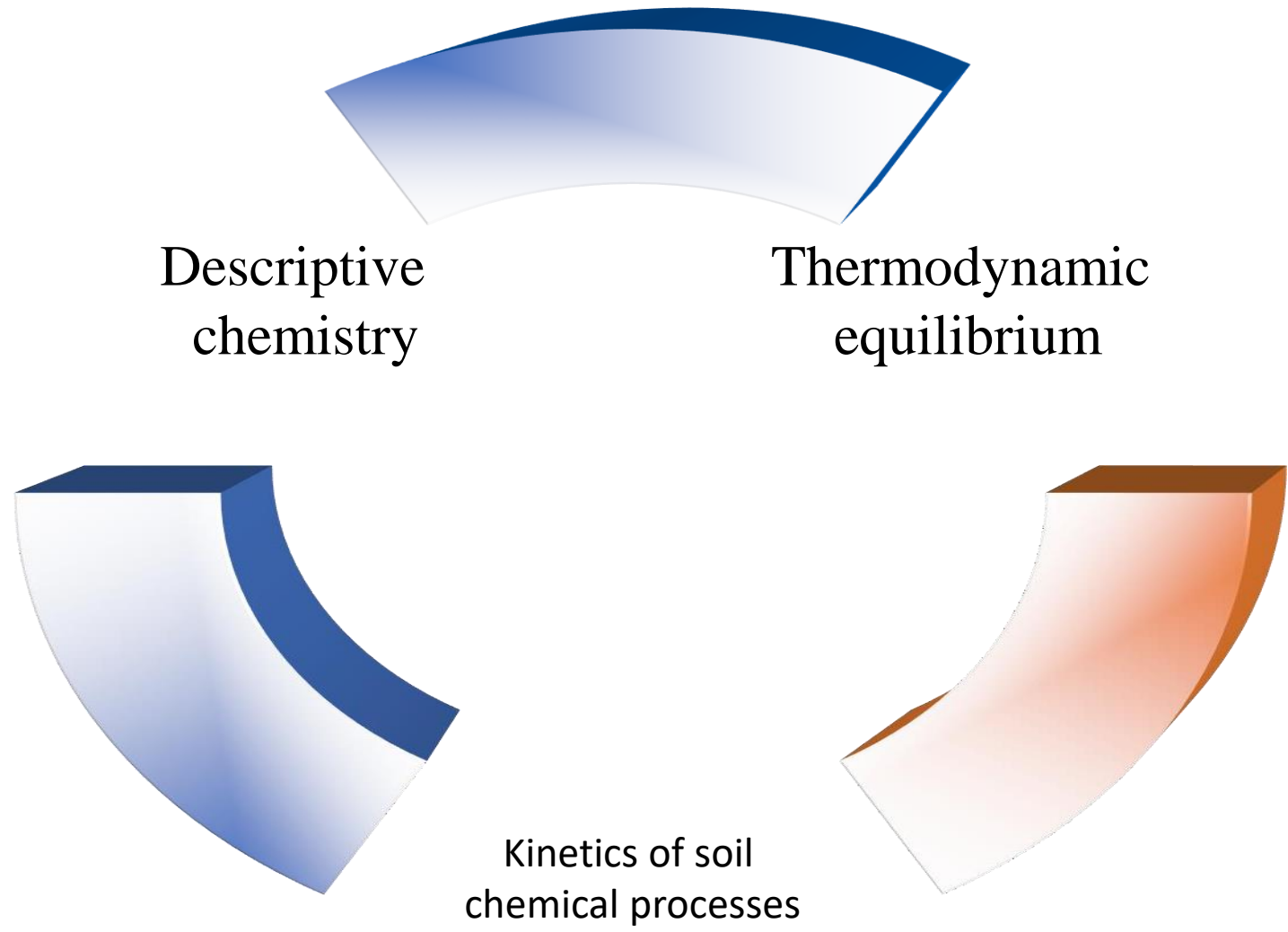
Modern soil chemistry

Modern soil chemistry involves three points.

1-Descriptive chemistry of the soil components.

2- Thermodynamic equilibrium among soil phases (or between nutrients in soil phases)

3- Kinetics of the movement rate of elements between phases.



Descriptive
chemistry

Thermodynamic
equilibrium

Kinetics of soil
chemical processes

Soil chemistry traditionally had two branches:

- 1 Inorganic soil chemistry like :soil chemistry ,soil physics ,soil pollution ,soil genesis.....etc
- 2 Organic soil chemistry :like soil biochemistry ,soil microbiology....etc.

But strict separation of the mentioned two branches or fields is difficult and may be rather pointless in many cases.

Fill the following blanks with the suitable terms:

Soil chemistry had two branches which are -inorganic and-organic but strict separation between them is –difficult or point less.

IUSS Divided soil science to four Divisions at 20/4/2002 in Bangkok: (D1, D2, D3 and D4) as follow:

D 1. 1- Soil in space and time	C1. 1. Soil Morphology
	C1. 2. Soil Geography
	C1. 3. Soil Genesis
	C1. 4. Soil Classification
D 2. 2- Soil properties and processes	C2. 1. Soil Physics
	C2. 2. Soil Chemistry
	C2. 3. Soil Biology
	C2. 4. Soil Mineralogy
D 3. 3- Soil use and management	<u>C3.</u> 1. Soil Evaluation and land use planning
	C3. 2. Soil and water conservation
	C3. 3. Soil fertility and plant nutrition
	C3. 4. Soil engineering and technology
	C3. 5. Soil degradation control, remediation and reclamation.
D 4. 4- the role of soils in sustaining society and the environment	C4. 1. Soil and the environment
	C4. 2. Soil, food Security and human health
	C4. 3. Soil and land use change
	C4. 4. Soil education and public Awareness
	C4. 5. History, philosophy and sociology of soil science.

The main goals of studying soil chemistry :

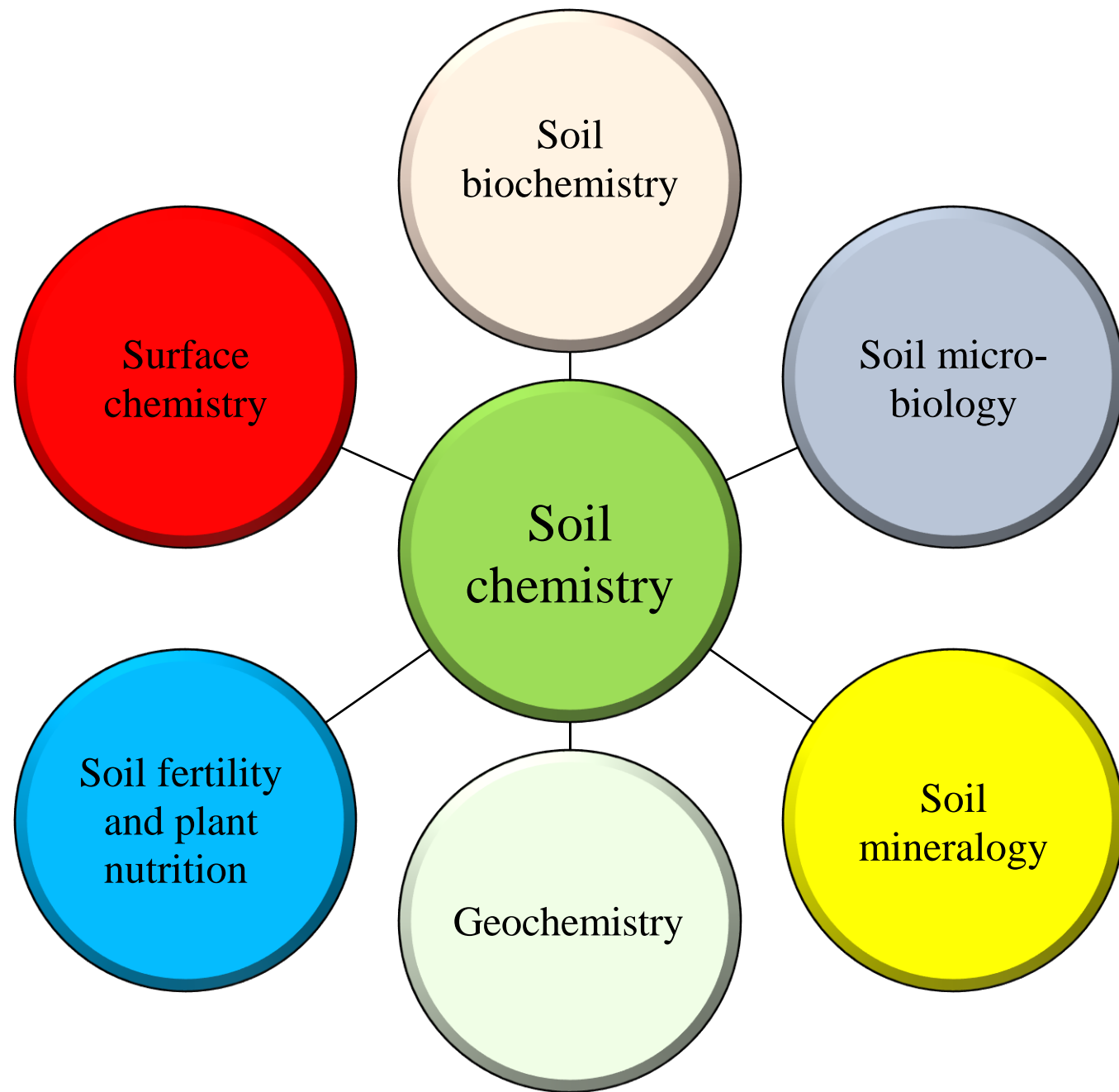
- 1 Studying the chemical properties of the soil, like EC, pH, CEC, concentration of cations, anions soil organic matter content, soil CaCO_3 content, and soil gypsum content...etc.
- 2 Studying the availability of nutrients for plants or determining the amount of available nutrients for plants.
- 3 Determining the total concentration of nutrients in the soils.
- 4 Studying micronutrient status in the soils.
- 5 Studying mineralogical properties of the soils.
- 6 Reclamation the soil that is not suitable for agricultural purposes.
- 7 Understanding soil chemistry reactions and how the soil relates chemically with the environment.
- 8 Studying the applications of thermodynamic concepts in soil science.
- 9 Studying the soil pollution.
10. Studying the relation between soil chemistry and other sciences.

11. Studying soil supplying power.
12. To ensure and increase the production of food and fiber crops.
13. Increasing the efficiency of fertilization or fertilizer use efficiency.
14. To study the toxicity of nutrients that harm plant growth and then control them depending on soil chemistry concepts.
15. To predict the accumulation and leaching of nutrients in the irrigation field.
16. Quality of cereals and their relation to soil chemistry,
17. To explain the role of soil chemistry in **Ecolabeling**.
18. Comparison between different methods of soil chemical analysis for selecting the best one.
19. Studying the half-life of organic matter decomposition, half the life of fungicides, pesticides, and metals in the soil.
20. Studying the role of microorganisms in solving nutrient availability.

The relation between soil chemistry and Other sciences:

The soil chemistry is closely related to :

- 1 Soil mineralogy (it is the structural chemistry of solid phase).
- 2 Colloidal chemistry or surface chemistry.
- 3 Geochemistry.
- 4 Soil fertility and plant nutrition.
- 5 Soil microbiology or Soil biochemistry (it includes biochemical reactions)



The relation between soil chemistry and other branches of soil science.

