



Department of Chemistry
College of Education
University of Salahaddin-Erbil

Course Book – (Stage 2)

Subject: Chemical Pollution

Lecturer's name: Sirwan fadhil shawket / PhD

Academic Year: 2022/2023

Course Book

1. Course name	Chemical pollution
2. Lecturer in charge	Dr. Seerwan Fadhil Shawket
3. Department/ College	Department of Chemistry/College of Education
4. Contact	e-mail: sirwan.fsh@gmail.com Tel: (0750 4548883)
5. Time (in hours) per week	Theory: 3
6. Office hours	Wednesday 8:30-10:30
7. Course code	
8. Teacher's academic profile	<p>Dr. Seerwan Fadhil Shawkat, he finished his PhD in 2002 at Baghdad university college of science, and master degree in analytical chemistry in 1991, and bachelor degree in 1983 from Salahaddin university.</p> <p>He is interested in studying and analyzing of different environmental of pollutants organic and inorganic. In addition he did some research in relation to the determination of pharmaceutical compounds.</p> <p>Dr. Sirwan has taught different topics of analytical chemistry, chemical pollution and nuclear & radiation chemistry.</p> <p>He has published a number of articles in a local and international journals and presented his work in many international conferences.</p> <p>He is the head of chemistry syndicate of Erbil branch , Iraqi Kurdistan region</p>
9. Keywords	Environmental pollutants

10. Course overview:

The importance of studying the subject of environmental chemistry is to interesting the scientists engaged in various scientific and engineering activities , also to the personnel involved in resource planning and material management . It is now universally realized that any future developmental activity has to be viewed in the light of its ultimate environmental impact. Recently the most sever issue in the world is as a result of indusrtrial activites as well as economic c developments is pollution ,the chemical residues pollute the rivers .this critical circumstances may lead to variety contaminations such as chemical fertilizer or pesticide for pollution of water ,smoke along with emission from automotive lead to pollution of air ,and for land pollution is solid waste. pesticides and chemical fertilizer applications in agricultural industry causes contamination of herbs product by heavy metals consequently diminishes health quality.

Heavy metals are naturally occurring elements of the Earth. They are widely spread in nature, particularly in water and soil, and cannot be degraded or destroyed. Any heavy metals such as copper,zink ,selenium are needed as trace elements to keep the human human metabolisms running. . They will, nevertheless, cause toxicity at large concentrations. To a lesser degree, they join our body through diet, drinkable water, as well as the air. Heavy metals are harmful when they(bio-accumulate) in parts of the body, causing a variety of health issues(Sobukola et al., 2010) . bio-accumulation is described as a rise in the concentration of a chemical inside organisms over time when compared to the concentration of the these elements in the environment. When compounds are picked up and processed quicker than they are broken down, they collect in living things. These metals are classified as major toxic chemicals in plants designed for human use

Understanding of the fundamental of all type of air and water pollution

Principles of how controlling treatment of pollutant and a brief knowledge about some phenomena like global warming, ozone hole and the photo- chemical smog

The air pollutants may be classified according to origin or according to chemical composition and according to state of matter like gaseous pollutants which get mixed with the air and do not normally settle out, e.g., CO, NO_x and SO₂.ad particulate pollutants which comprise of finely divided solids or liquids and often exist in colloidal state as aerosols, e.g.,-smoke, fumes, dust, mist, fog, smog and sprays. An important knowledge are

understanding the Characteristics & Biochemical effects these pollutant presented in our environment.

Sufficient knowledge and understanding about The acid rain and how its caused extensive damage to materials and terrestrial ecosystems such as water, fish, vegetation, stone, steel, paint, soil and mankind .we foxed on behaviour of air pollutant in a crowded and busy city.

Some important knowledge with water pollution, Classification of water Pollutants and Alkalinity, acidity ,Hardness, Organic Pollutants(Oxygen-demanding wastes).

Biochemical Oxygen Demand and the modified Winkler's method together also with the Chemical Oxygen Demand(COD)

Sufficient knowledge and understanding to secure employment about inorganic industrial waste and water Pollution and the sources of heavy metals, physiological role of Mercury ,Lead ,Chromium & Cadmium .

11. Course objective:

Human activity generates a tremendous amount of waste materials. These are discharged in various components in which they bring about undesirable changes in our environment. The phenomenon is termed as environmental pollution which has been defined as undesirable change in physical, chemical or biological characteristics of air , water or land that will be harmful to human and other life, industrial process. Environmental Chemistry deals with the study of the various chemical phenomena taking place in the environment. In a broader perspective, it comprises of the study of the chemical species existing in the various segments of the environment, their sources, pathways, reactions and their consequences on the activities of human beings and other life-forms. Thus, environmental chemistry may be considered as a multi-disciplinary study, involving physical and life-sciences, meteorology, agriculture, public health, engineering etc. The basic concepts of environmental chemistry is interesting not only to the scientists engaged in various scientific and engineering activities but also to the personnel involved in resource planning and material management It is now universally realized that any future developmental activity has to be viewed in the light of its ultimate environmental impact. The tremendous increase in industrial activity during the last few decades and the release of obnoxious industrial wastes into the environment, have been of considerable concern in recent years from the point of view of environmental pollution. Environmental pollution on one hand and deforestation and population explosion

on the other, are threatening the very existence of life on the earth. This situation can improve only if people from all walks of life realize the importance of environmental protection.

12. Student's obligation

The students are required to do closed book exam at the mid of the semester besides other assignments including daily quizzes, classroom activities, exams and report. Constructive classroom participation, submitting assignments, and attending class will be evaluated by the lecturer over the semester and used in borderline cases to determine the final grad

13. Forms of teaching

Different form of teaching will be used to reach the objectives of the course, discussion and conclusion. power point presentations for the head titles and definitions and summary of conclusions, classification of materials and any other illustrations, besides worksheet will be designed to let the chance for practicing on several aspects of the course in the classroom, furthermore students will be asked to prepare report on selective topics and summarizes articles contents published in English language, those articles need to be from printed media or internet articles. There will be classroom discussions and the lecture will give enough background to solve, analyze, and evaluate problems sets, and different issues discussed throughout the course.

To get the best of the course, it is suggested that read the required lectures, teacher's notes regularly as all of them are foundations for the course. Lecture's notes are for supporting and not for submitting the reading material including the handouts.

14. Assessment scheme

The exam has 30 marks, with the attendance, classroom activities and quiz exam all account 10 marks. There will be a final exam on 60 marks. So that the final grade will be based upon the following criteria:

Mean of at least two-semester exam. ,

included quiz, classroom participation& assignments : 40%

Final exam : 60%

15. Student learning outcome:

The aim of this lecture is to prepare the students to become capable and qualified teachers of chemistry in the basic and preparatory schools.

16. Course Reading List and References:

Required book:

1-"A text book of Environmental Pollution control"

By S.S.Dara

2-" Environmental Chemistry"

By Colin Baird & Michael C'ann

3- Chemistry of the Environment

By Sonja Krause, Herbert ,\1. Clark, James P. Ferris

4- Environmental Chemistry

By Vladimir N. Bashkin

5- Urban Traffic Pollution

By Dietrich Schwela and Olivier Zali

The core materials of the course consists of : Book, lecture's notes articles from media and internet, before going for the exams.

17. The Topics:

Lecturer's name

- Week / 1 , ex: (3 hrs)

Course outline, general observations, Introduction to chemical pollution

Dr.Seerwan

- Week / 2 , ex: (3 hrs)

Environmental Segments, Composition of the atmosphere.Lapse rate, A Temperature Inversion

Dr.Seerwan

- Week /3 , ex: (3 hrs)

Radiation balance of the earth, global warming ((Greenhouse effect))

Dr.Seerwan

Formation and Depletion of Ozone in the Stratosphere and chemical reactions in the atmosphere.

<p>- Week / 4 , ex: (3 hrs) Air Pollution, Classification of air-pollutants and their Effects, Characteristics & effects of important air pollutants.</p>	<p>Dr.Seerwan</p>
<p>- Week / 5 : (3 hrs) Carbon monoxide & treatment of exhaust gases , Reactions involving Oxidation of Nitrogen oxides</p>	<p>Dr.Seerwan</p>
<p>- Week / 6 : (3 hrs) Photochemical Smog" peroxy acetyl nitrate , Reactions involving Oxidation of Sulphur dioxide & there effect</p>	<p>Dr.Seerwan</p>
<p>- Week / 7 : (3 hrs) Hydrocarbons (volatile organic compounds) Reactions involving Oxidation of Organic Compounds. Particulate Matter and health effect, Atmospheric sampling and Analysis</p>	<p>Dr.Seerwan</p>
<p>- Week / 8 : (3 hrs) Gravity techniques .Filtration techniques. Precipitation Techniques , Sources of Radionuclide's in the Environment and health Effect of radiation</p>	<p>Dr.Seerwan</p>
<p>- Week /9 : (3 hrs) Air-pollution control system (Combustion, Absorption & Adsorption method) , Air Monitoring, Collecting techniques employed for Air pollutants</p>	<p>Dr.Seerwan</p>
<p>- Week / 10 : (3 hrs) Water Pollution, Classification of Water Pollutants) Alkalinity, acidity &Hardness</p>	<p>Dr.Seerwan</p>
<p>- Week / 11: (3 hrs) Organic Pollutants(Oxygen-demanding wastes). Dissolved oxygen (DO), Biochemical Oxygen Demand, modified Winkler's method , Chemical Oxygen Demand</p>	<p>Dr.Seerwan</p>
<p>- Week / 12 : (3 hrs) Inorganic industrial waste and water Pollution , Essential and non-essential trace elements</p>	<p>Dr.Seerwan</p>
<p>- Week / 13 : (3 hrs) . Sources of Heavy Metals, Physiological role of Mercury ,Lead ,Chromium & Cadmium , Biochemical effects, Toxicology and Toxicity</p>	<p>Dr.Seerwan</p>

<p>- Week / 14 : (3 hrs) Fertilizer , Detergents & Eutrophication in ecosystem., Petroleum pollution & methods for controlling , Pesticide the Physiological role , health effect</p> <p>- Week / 15 : (3 hrs) Energy from Nuclear reactor & Environment effect, Thermal Pollution Renewable Energy(Solar Energy, Wind electric Energy , Geothermal Energy & fuel –cell , Production of bio-fuel (ethanol A methane from biomass)</p> <p>- Week / 16 : (3 hrs) Solid Wastes-Pollution & Recycling , Noise pollution</p>	<p>Dr.Seerwan</p> <p>Dr.Seerwan</p> <p>Dr.Seerwan</p>
<p>18. Practical Topics (If there is any) - Practical is not included</p>	<p>-----</p>
<p>19. Examinations:</p> <p>1. Compositional:</p> <ul style="list-style-type: none"> • Explain the following (Support your answer by chemical reactions). Ozone, in the stratosphere is found to be destroyed by chlorofluorocarbons (CFC's)? • Most natural CO gas is from marshes? • Winkler's-method for determination of dissolved Oxygen <p>Write all photochemical <u>reaction</u> for the formation and depletion of Ozone, in the stratosphere</p> <p>- Discuss" Heating balance on the earth's by a phenomenon, called the "Greenhouse effect"?</p> <p>- Compare between BOD₅ and COD test.</p>	

2. True or false type of exams:

Write " T " for true and " F " for the false sentences and then correct the false sentences:

- a- Oceans are the major sinks for the atmospheric CO₂ which convert it into soluble bicarbonates
- b- The photosynthetic activity in the green plants increases with increase in CO level in the atmosphere.
- c- Forests maintain a balance of the CO₂ level. Therefore, deforestation decreases the CO₂ level.
- d- Some scientists fear that the concentration of the ozone in the atmosphere may double within the next 50 years. If this happen the average global temperature increase and influence the climatic changes.
- e- Ozone is an important species present in the stratosphere and its concentration is about 10 ppm.
- f- Ultra-violet radiations from the sun in the region 280-315 nm called UV-B.
- g- Inorganic particulate matter emitted from automobile exhausts, certain particulates contain (PAH) which are carcinogenic.
- h- Aerosol mists are generated from oxidations of sulfur dioxide which in presence of water vapour forms droplets of HCl.

Multiple choices:

Chooses only one alternative that complete best and suitable answer:

- a- Environmental pollution on one hand and -----on the other, are threatening the very existence of life on the earth. a- industrial activity, b- activities of human, c- deforestation and population explosion
- b- The inorganic mineral of the ----- constituents include complex mixture of silicates of sodium , oxides of iron and carbonates of Ca and Mg. a- Soil , b- Rocks , c- Lithosphere
- c- The relative weights of , Biosphere : Atmosphere : Hydrosphere are of the following order : -----.
a- 1 : 900 : 6900 , b- 1 : 300 : 69,100 , c- 69,100 : 300 : 1
- d- The atmosphere screens the dangerous U.V radiations but transmits the radiations in the range-----: a-200nm to 16500nm , b- 300 nm to 2500 nm , c- 400nm to 16500nm

e- The decrease of temperature with increasing altitude in the troposphere is called -----
-----.

a-positive lapse rate , b- Tropopause , c- Temperature inversion, d- negative lapse rate

f- The region above the stratosphere, in the altitude range of 50 km to 100 km, is called "-----".

a-Mesosphere , **b-Ionosphere** , c- Thermosphere

g- ----- emitted from automobile exhausts, certain particulates contain (PAH) which are carcinogenic.

a- Inorganic particulate matter , **b-** Organic particulate matter , **c- Solid** particulate

20. Extra notes: - Non

21. Peer review

پیداچونہوہی ھاوہل

Dr. N. A. Fakhri