

“十二五”普通高等教育本科规划教材



EXERCISES IN CHEMISTRY OF THE
ENVIRONMENT

环境化学习题集

(双语教学用)

王海鸥 弓爱君 刘杰民 编著



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· 北京 ·

本书分“习题”和“答案”两部分，每部分均附有对应的中文翻译。习题可用于自学，也可以做随堂练习。所选习题涵盖大气环境化学、水环境化学、土壤环境化学、灾害和环境保护等内容。

本书可作为环境科学、环境工程专业本科生教材，也可作为相关专业师生的专业英语课教材。

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前 言

环境化学在高等教育中变得越来越受欢迎。许多高校的化学、环境科学、环境工程、土木工程和公共卫生等专业的教学大纲中增加了环境化学课程的学时。

本书是为系列丛书《环境化学》编写的配套练习集，适用于本科生和研究生的教学，也可以作为读者的自学教材和用于其他教材的随堂练习。本书包括绪论、大气环境化学、水环境化学、土壤环境化学、灾害和环境保护等章节。

本书还可以为工科、物理、生命科学以及地球学等专业的学生提供感兴趣的环境化学知识。

本书中可能会存在一些不足，欢迎大家批评指正。

编著者

2014 年 3 月

Preface

Environmental chemistry is becoming an increasingly popular subject in tertiary education. Courses in chemistry, environmental science, civil engineering, public health and environmental engineering all have added environmental chemistry in their syllabuses to a greater or lesser extent.

This book aims to supplement the textbook by providing exercises, and could be used to teach the practical components of undergraduate and postgraduate (diploma and masters) degree courses. Exercises can be used for selfstudy or for class assignments. Chapters contain introduction, environmental chemistry in atmosphere, aquatic environmental chemistry, soil environmental chemistry, disaster and environment protection.

This book will be valuable to students in the chemical and environmental sciences, as well as engineering, physical, life and earth science students interested in environmental chemistry. Some mistakes could be in the book, and all kinds of comments are welcomed.

Editor

2014. 3

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Part I

Questions

CHAPTER 1 INTRODUCTION

I . Fill in the blanks.

1. World Wetlands Day _____. World No-Tobacco Day _____. World Day for Water is _____. World Day to combat desertification _____. Environmental day is _____. Earth day is _____.
2. The pollution of _____ in the water resulted in Japan's Minamata Disease in the 50's 20th century.
3. The five metal elements which are the most toxic are _____.

II . Answer the following questions.

1. Please describe the environmental problems that human faced with today.
2. Describe the characteristic of chemistry of the environment.
3. Describe the conversant process to environmental problems in brief.
4. Describe the eight social effects of chemistry pollution occurred in the world.

CHAPTER 2 ENVIRONMENTAL CHEMISTRY IN ATMOSPHERE...

Answer the following questions.

1. Sketch the heat balance of Earth in watts per square meter ($\text{W} \cdot \text{m}^{-2}$), in several components.
2. What measures can we take to protect the ozone layer?
3. What is the function of renewable energy to climate change?
4. How sunspots affect global warming?
5. Does global warming have any effects on our forests?
6. What can you do to stop global warming?
7. How does global warming cause hurricanes?
8. How can the changes in the environment affect the weather and climate?

9. How does the average person prevent global warming?
10. Can ice form in ocean water?
11. What are the three major greenhouse gases?
12. What is the reason of the depletion of the ozone layer?
13. How did the ozone hole occur?
14. What would happen if the ozone layer vanished?
15. Can you build an artificial ozone layer in the troposphere?
16. Why is ozone gas at the top of atmosphere even it is heavy?
17. What causes too much CO₂?
18. What is climate?
19. How is proximity to water affect the climate?
20. Is low atmospheric pressure good or bad?
21. What is the difference between a typhoon and a hurricane?
22. Why does the sky sometimes seemed red and pink?
23. How is the humidex calculated?
24. Does the rainbow get in touch with the ground?
25. What is the relationship between rainfall and temperature?
26. Does it usually rain after a full moon or new moon?
27. What will happen when gravel touches water?
28. What is the difference between mechanical and chemical weathering?
29. What are the benefits of thunderstorms?
30. Does acid rain have harm on people?
31. How does acid rain damage the environment?
32. What contained in the atmosphere?
33. Can water pollution cause air pollution?
34. What are some of the harmful gases being poured into the atmosphere?
35. What are some ways a traffic jam affects the environment and society?
36. How can you describe the air pollution?
37. What is the radiation pollution and how can it causes and effects?
38. Is natural gas a renewable resource?
39. What was the different of earth's climate between now and 50 years ago?
40. How do greenhouse gases keep us warm?

CHAPTER 3 AQUATIC ENVIRONMENTAL CHEMISTRY...

I . Fill in the blanks.

1. The definition of aquatic ecological system is: _____
2. The water cycle refers to: _____

3. The important role in the process of the harmful chemical waste hydrosphere transformation and the final destination is _____
4. We can divide water self purification into three main parts: _____

II. Chose the best answer for each question.

- In the 1950s the bitterly disease appeared in Japan is caused by water after the _____ pollution.
A. Pb B. Cd C. Hg D. Cu
- The main existing forms of Hg^{2+} in the sea is
A. $\text{Hg}(\text{OH})_2$, HgCl_2 B. HgCl_2 , HgCl_3
C. HgCl_3^- , HgCl_4^{2-} D. HgCl_4^{2-}
- Normally, fish would die when DO _____ water.
A. $< 4.0 \text{ mg} \cdot \text{L}^{-1}$ B. > 0
C. $> 8.0 \text{ mg} \cdot \text{L}^{-1}$ D. $> 4.0 \text{ mg} \cdot \text{L}^{-1}$
- Commonly the main water salinity is _____.
A. carbonate B. sulfate
C. calcium bicarbonate D. sodium chloride
- The toxicity of heavy metal ions and monovalent metallic ion would _____ in hard water.
A. remains unchanged B. largen
C. lessen D. disappear
- We can use _____ index to express the organic content in water.
A. ALK B. TH C. DO D. COD
- The content of _____ is higher in hard water.
A. H^+ and NO_3^- B. OH^- and CO_3^{2-}
C. Ca^{2+} and Mg^{2+} D. Na^+ and K^+
- The water of sulfur compounds _____ has the greatest toxicity to fish.
A. SO_4^{2-} B. S^{2-} C. H_2S D. HS^-
- The consist of the water basicity is _____ (pH of the water is 7.5) .
A. HCO_3^- and CO_3^{2-} B. HCO_3^-
C. CO_3^{2-} D. OH^-
- In the water as the salt content growth, the solubility of oxygen is _____ at the certain temperature and pressure.
A. unchanged B. increasing
C. not effected by the content of salt D. decreasing

III. Try to explain the nouns below.

- What means "red tide"?
- What the main index to detect the quality of water?
- What means water eutrophication? List the main harms and the controlling meas-

ures.

4. Tell the definition of BOD_5 , TOC and TOD.
5. Try to explain the surface adsorption, ion exchange adsorption and specialistic adsorption separately, and explain the differences hydrous oxide causes between specialistic adsorption and nonspecialistic adsorption of metal ions.
6. Try to explain the scientific terms below: partition co-efficient, normal distribution co-efficient, octanol-water partition co-efficient, biological concentration factor, Henry's constant, hydrolysis rate, direct photolysis, quantum yield, growth substance metabolism and co-metabolism.
7. Please describe the important processes of transfer and conversion of compounds in water environment.
8. Explain the organic pollution of water and tell the classification of them.
9. What is the water alkalinity referred to? Please tell the main forms of water alkalinity.
10. Describe the process of water circulation, the forming and the harm of acid rain.
11. Explain the adsorption isotherm.
12. What is alkalinity of natural water?
13. Tell Partition coefficients of octanol-water (That is the proportion of concentration of chemicals in the octanol to in the water) .

IV. Analyze and Argument.

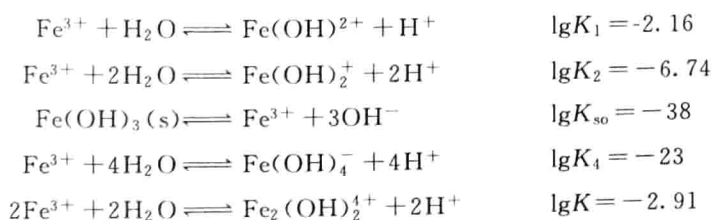
Try to explain the phenomenon bellow: There is a company that smelt zinc and lead, and it usually disposed waste water which has lead in it before they poured it into lake. After the detection, lead concentrations near the outfall is $0.4 \text{ mg} \cdot \text{L}^{-1}$, while it is just $3 \sim 4 \text{ } \mu\text{g} \cdot \text{L}^{-1}$ in the place 500 meters away from the lower reaches.

V. Answer the following questions.

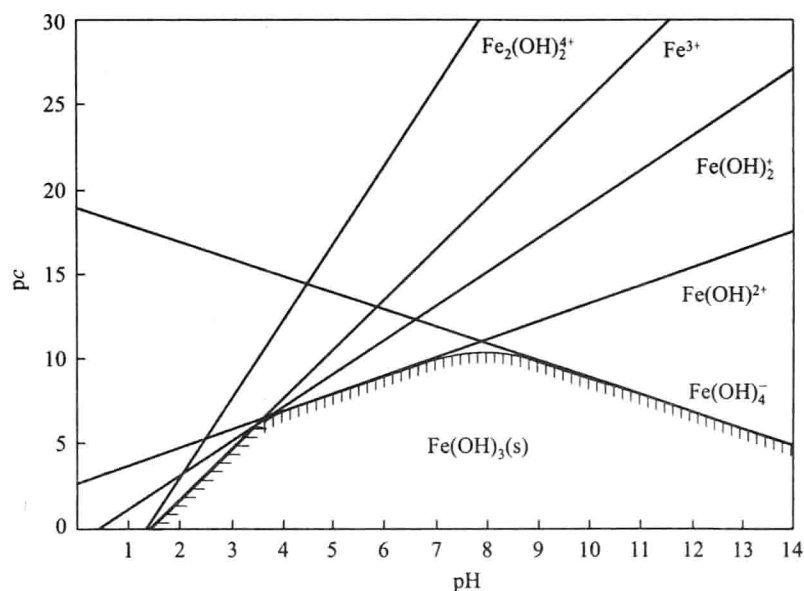
1. The COD of a sewage sample is 360 ppm.
 - a. How many milligrams of O_2 per liter of water is this equivalent to?
 - b. Calculate the value for the equivalent O_2 molarity.
 - c. What volume (in mL) of $0.0032 \text{ mol} \cdot \text{L}^{-1} \text{ Na}_2\text{Cr}_2\text{O}_7$ would be required to titrate a 20 mL aliquot of this sewage water?
2. A lake is stratified which caused both aerobic and anaerobic conditions be present. And the lake water contains several trace metals including copper. Copper (II) has a standard reduction potential of 0.16 V when reduced to copper (I) .
 - a. Calculate the ratio of Cu^{2+} to Cu^+ ions available at a pE of -4 and a pE of $+14$.
 - b. Which oxidation state of copper ions would you think to dominate under anaerobic conditions?
 - c. Supposing that oxygen determines the electron availability near the surface of a lake, how would the decrease in pH affect pE?
 - d. What is the ratio of Cu^{2+} to Cu^+ ions available at a pH of 5 near the surface?

3. The purity of ground water is often highly regarded and the water is often pumped to the surface, bottled, and sold commercially. Ground water is usually cooler (5°C) than surface water (25°C) and is often held in solid rock aquifers possessing carbon dioxide partial pressures of up to 0.01 atm.

- a. What is the pH of pure surface water exposed to air that has 365 ppm CO₂?
($K_H(\text{CO}_2) = 3.4 \times 10^{-2} \text{ mol} \cdot \text{L}^{-1} \cdot \text{atm}^{-1}$ and $K_{a_2}(\text{H}_2\text{CO}_3) = 4.5 \times 10^{-7}$ at 25°C)
- b. What is the pH of pure ground water assuming no access to mineral carbonates?
($K_H(\text{CO}_2) = 6.5 \times 10^{-2} \text{ mol} \cdot \text{L}^{-1} \cdot \text{atm}^{-1}$ and $K_{a_2}(\text{H}_2\text{CO}_3) = 3.0 \times 10^{-7}$ at 5°C)
- c. Sometimes bottled water has a sparkle or fizz to it. Try to explain it?
4. The concentration of aluminum in a sample of lake water is 0.72 ppb.
 - a. Calculate the maximum pH at which this concentration of aluminum will stay in solution.
 - b. Fish gills have a pH of about 7.3. Tell the potential relationship between fish and aluminum levels in water.
 - c. Are fish safe in the lake? Give the reason.
5. Water inflowing into a purification plant has a hardness which equivalent to 100mg • L⁻¹ of calcium carbonate.
 - a. What is the total concentration of Ca²⁺ and Mg²⁺?
 - b. Assuming [Ca²⁺] = [Mg²⁺] and there are available bicarbonate ions, what minimum mass of sodium hydroxide must be added to precipitate Ca²⁺ and Mg²⁺ in this water?
6. In purification of drinking water aeration can oxidize watersoluble Fe²⁺.
 - a. What pH conditions would favor removal of iron? ($K_{sp}(\text{Fe}(\text{OH})_3) = 2.0 \times 10^{-39}$)
 - b. What is the maximum residual amount of iron (ppm) that could be present in a thoroughly aerated water sample at pH 8.0?
 - c. Assuming that the rate of oxidation from Fe²⁺ to Fe³⁺ is given by the equation below. What is the half-life of Fe²⁺ at pH 8.0?
Rate = $7.2 \times 10^{13} [\text{Fe}^{2+}] [\text{OH}^-]^2 p(\text{O}_2) (\text{L}^2 \cdot \text{mol}^{-2} \cdot \text{atm}^{-1} \cdot \text{min}^{-1})$
7. Calculate how many Na₂CO₃ (mmol • L⁻¹) should be used if we want turn the pH6.5 water (basicity is 1.6mmol • L⁻¹) into pH8.0.
8. Write down the expression of [H₂CO₃*], [HCO₃⁻] and [CO₃²⁻] in close and opening systems. Then discuss the differences between the two systems.
9. The flowing is the complexes of Fe³⁺ and water reaction and their equilibrium constant:



Use pc-pH chart to express the connection between the solubility of Fe(OH)₃ (s) and pH in pure water.

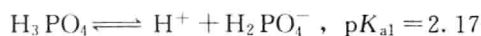


10. Please state the migration process of organic in water.
11. Determine the equivalent weight of the following materials in grams: a. H_2SO_4 ; b. HCl ; c. $\text{Ca}(\text{OH})_2$; d. CH_3COOH .
12. Calculate the mass of AgNO_3 to prepare 250 mL of a $0.1\text{mol} \cdot \text{L}^{-1}$ solution to be used in a precipitation reaction.
13. A 100mL sample containing $\text{Ca}(\text{OH})_2$ requires 10 mL $0.02\text{mol} \cdot \text{L}^{-1}$ $(\text{NH}_4)_2\text{SO}_4$ to reach the equivalence point in an acid-base titration. Calculate the concentration ($\text{mg} \cdot \text{L}^{-1}$) of $\text{Ca}(\text{OH})_2$ in the sample.
14. A drinking water sample is analyzed colorimetrically for ammonia nitrogen concentration. If the sample color when viewed through a depth of 5.5 cm corresponds in intensity to a $1\text{mg} \cdot \text{L}^{-1}$ standard sample when viewed through a depth of 40 cm, what is the concentration of ammonia nitrogen in the sample?
15. Please calculate the concentration of CO_2 , HCO_3^- and CO_3^{2-} in water. (The $[\text{Alk}]$ of water is $2000\text{mol} [\text{H}^+] \cdot \text{L}^{-1}$, the pH is 7.00)
16. The diameter of the particle is 0.06mm and the density is $2.5\text{g} \cdot \text{cm}^{-3}$, the sticker of water is $1.005 \times 10^3\text{Pa} \cdot \text{s}$, please calculate the subsidence rate of this particle in water.
17. Known the pH of water is 7 and $K_{\text{sp}} = [\text{Ca}^{2+}][\text{F}^-]^2 = 5 \times 10^{-11}$, $K_1 = [\text{CaF}^+]/([\text{Ca}^{2+}][\text{F}^-]) = 10$, $K_2 = [\text{CaOH}^+]/([\text{Ca}^{2+}][\text{OH}^-]) = 25$, please calculate the concentration of CaF^+ and CaOH^+ in the water.
18. Known the following equation

$$\frac{1}{8}\text{NO}_3^- + \frac{5}{4}\text{H}^+ + \text{e}^- \rightleftharpoons \frac{1}{8}\text{NH}_4^+ + \frac{3}{8}\text{H}_2\text{O}$$
 Please calculate the E (electrode potential) and pE .
19. In the water, the pH is 7.4, the concentration of Cr^{3+} is $0.5\text{nmol} \cdot \text{L}^{-1}$ and Cr^{6+} is $0.3\text{nmol} \cdot \text{L}^{-1}$. Known the equation $\text{CrO}_4^{2-} + 6\text{H}^+ + 3\text{e}^- \rightleftharpoons \text{Cr}(\text{OH})_2^+ + 2\text{H}_2\text{O}$, $K = 1066.1$, please calculate the pE .
20. Known the equation $\frac{1}{4}\text{O}_2 + \text{H}^+ + \text{e}^- \rightleftharpoons \frac{1}{2}\text{H}_2\text{O}$ ($E = 1.229\text{V}$), please write

down the relation of pE , pH and pO_2 .

21. Discuss the causes of color in water.
22. Explain the hardness in water and by what is it caused?
23. List the different between permanent and temporary hardness.
24. Calculate the pH of a $0.1 \text{ mol} \cdot \text{L}^{-1}$ solution of acetic acid ($K_a = 10^{-4.75} \text{ mol}^2 \cdot \text{L}^{-2}$).
25. Calculate the pH of a $0.1 \text{ mol} \cdot \text{L}^{-1}$ solution of sodium acetate? ($K_a = 10^{-4.75} \text{ mol}^2 \cdot \text{L}^{-2}$)
26. Known the following pK_a values:



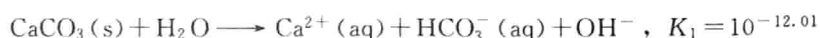
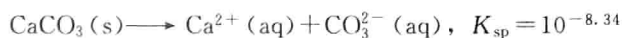
- a. What is the dominant form of the phosphate ion in a lake at a pH of 5.0?
- b. Sea water with $pH = 8.0$, calculate the ratio of this form to the next most abundant form.

27. Calculate the solubility of barium sulfate in

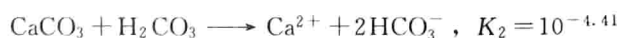
- a. pure water.
- b. water which has one millimolar sodium sulfate ($K_{sp} = 10^{-10} \text{ mol}^2 \cdot \text{L}^{-2}$).

28. Calculate the CaCO_3 solubility and the pH :

- a. in the case of calcium carbonate in contact with water (but not with the atmosphere), there are two reactions to consider:



- b. a solution exposed to the atmosphere, (H_2CO_3) is fixed by the atmospheric CO_2 concentration at $10^{-4.9} \text{ mol} \cdot \text{L}^{-1}$, and the reaction is:



Compare these values, what can we see?

29. Calculate the BOD of water in which 10mg of sugar (empirical of formula CH_2O) is dissolved in a liter. How does this compare with the O_2 solubility at 20°C ?

30. The standard potential of $\text{Fe}^{3+}/\text{Fe}^{2+}$ is 0.77 V. Known the K_{sp} (10^{-37}), calculate $E^\ominus(\text{w})$ for the reduction of $\text{Fe}(\text{OH})_3$ to Fe^{2+} .

31. Discuss the nature of materials which caused the turbidity in river water during a flash flood and polluted river water.

32. _____ are called the water and waste materials washed down toilets and sinks.

- A. Pesticides B. Industrial chemicals C. Sewage D. Herbicide

33. True or false.

- a. Fresh water accounts for more than 90 percent of Earth's water.
- b. Fish can eventually break down oil in the sea.

34. Why non-point-source pollution is more difficult to control than the point-source pollution? Please give us two examples, one in city, the other in country and describe their characteristics.

35. Define the "phosphate trap" in the estuary of Chesapeake Bay, and discuss the rea-

son why a local ban on phosphorus in detergents was not so much helpful in mitigating eutrophication in the estuary?

36. What is the maximum of Fe^{2+} in clear solution that present in water containing $0.001 \text{ mol} \cdot \text{L}^{-1} \text{ HCO}_3^-$ ($K_{\text{sp, FeCO}_3} = 10^{-10.7}$), H_2CO_3 ($K_{\text{a}_1} = 4.2 \times 10^{-7}$, $K_{\text{a}_2} = 4.7 \times 10^{-11}$)?

37. Carbonic acid effective is an important factor in lake acidification, but not the factor of soil rock. Please discuss and tell us why.

38. If the concentration of dissolved oxygen is $10.0 \text{ mg} \cdot \text{L}^{-1}$, what is the mole fraction of oxygen in water?

39. Determine the saturation of oxygen in water in contact with dry air at 1 atm and 20°C .

40. A 25 mL sample of treated wastewater needs 175 mL of distilled water to reduce the order to a perceptible level. What is the threshold order number (TON)?

41. What is the 5-day BOD (BOD5) of the water sample according to the following information? 15 mL of the sample was added directly into a 300mL BOD incubation bottle. The initial DO of the diluted sample was $8.8 \text{ ng} \cdot \text{L}^{-1}$ and final DO of the seeded dilution water was 9.1 and $7.9 \text{ ng} \cdot \text{L}^{-1}$, respectively. Determine the 1-day BOD and ultimate first-stage BOD for water whose 5-day 20°C BOD if the test had been conducted at 25°C ?

42. Determine the ThOD for glycine ($\text{CH}_2(\text{NH}_2)\text{COOH}$) using the following assumptions?

a. In the first step, the organic is converted to carbon dioxide (CO_2) and the nitrogen is converted to ammonia (NH_3).

b. In the second and third step, the ammonia is oxidized sequentially to nitrite and nitrate.

c. The ThOD is the total amount of the oxygen needed for all three steps.

43. Suppose the value of the BOD first-order reaction rate constant is 0.23 d^{-1} (base e) (0.10 d^{-1} base 10). Try to tell the theoretical BOD/COD, BOD/TOC, and TOC/COD ratios for the following compound $\text{C}_5\text{H}_7\text{NO}_2$.

44. Untreated waste water from a damaged collection system pipeline leaks into a nearby lake. The leakage is about to be $10,000 \text{ L} \cdot \text{d}^{-1}$. If the initial coliform count is 10^7 organisms/100mL and the wastewater is diluted by 1000 to 1, then what increase in concentration of organisms can be expected in the lake? Assume the number of coliform organisms in the dilution water is zero.

45. Consider a corn yield of 7,400kg per hectare (equivalent to 120 bushels per acre). Consume 25kg (one bushel) of corn consumes about 20 m^3 of water during the growing season, what is the ratio of the weight of corn to the weight of water consumed? Where does most of the water end up? Assuming a rainfall of $30 \text{ cm} \cdot \text{yr}^{-1}$, calculate the minimum quantity of irrigation water required per hectare to grow the corn ($1 \text{ hectare} = 10^4 \text{ m}^2$)

46. The boiling point of H_2S , H_2Se and H_2Te are -61°C , -42°C and -2°C , respectively. Base on this trend, what is the expected boiling point of water? Why does water boil

at a much higher temperature?

47. If we doubled the concentration of atmospheric CO_2 to 740 ppm, what would be the calculated pH of rainwater (assuming that CO_2 were only acidic input)? With respect to rising CO_2 levels, do we have to pay more attention on enhanced acidity of rain in addition to potential climate warming?

48. Given the $\text{p}K_a$ values, what is the dominant form of the phosphate ion in a lake with $\text{pH}=5.0$? What about in seawater with $\text{pH}=8.0$, and what is the ratio of this form to the next most abundant form?

49. What is the solubility of barium sulfate in pure water? What about in bone millimolar sodium sulfate in water?

50. What is the oxidation state of nitrogen element in the nitrite ion NO_2^- ?

51. Write the chemical equation for the reduction of NO_2^- to NH_3 by H_2 .

52. Dissolve 10mg of sugar (empirical formula CH_2O) in a liter of water. What is the BOD of the water? How does this compare with the O_2 solubility at 20°C ?

53. According to the K_{sp} , calculate E^\ominus (w) for the reduction of $\text{Fe}(\text{OH})_3$ to Fe^{2+} . (The standard potential of $\text{Fe}^{3+}/\text{Fe}^{2+}$ is 0.77V)

54. How does the acid rain affect the ecosystem?

55. Try to describe the concept of anoxia and its effects on coastal marine waters.

56. Why we consider the process of acid deposition at the point of view of air quality? How does this process transfer a short-term air-pollution problem into long-term problems of soil and water pollution?

57. What toxic gas can be generated and by which reaction (name reactants and products) in anaerobic marine environments?

58. What class of molecules takes the most responsibility to reduce power in aqueous environment?

59. What parameter do we use to measure the reducing power?

60. Get water from the lake, $\text{pH}=7.0$, oxygen concentration $0.32\text{mg} \cdot \text{L}^{-1}$, please calculate the $\text{p}E$ and E_h .

61. Why most of the water on Earth's surface can't be used by people?

62. Name four types of human activities that can cause water pollution.

63. Explain why is it difficult to find the source of water pollution.

64. What is sewage? Why should we purify it before releasing it to the environment?

65. How can heat pollute a body of water?

66. There are two basic ways that can technology help control water pollution, what are they?

67. Alternatives to toxic fertilizers and pesticides for crops. What is biochemical oxygen require? How is it related to water quality?

68. Respectively, describe primary, secondary, and tertiary sewage treatment.

69. Explain why waters on the surface of the sea are exhausted in N and P and will remain in this state in an indefinite duration.

V. Open questions

1. Describe a few methods you might do to help save freshwater in your daily life. Would the savings be worth the costs?
2. The BOD is an index to measure the oxygen-reducing capacity of a wastewater which contains organic matter. If k_1 is 0.1 day^{-1} , what fraction of the total or ultimate BOD is measured by the BOD_5 (BOD measured over 5 days)?
3. As we know, sulfur plays an important role in the growth of aquatic plants as a kind of micronutrient. Explain, in chemical terms, why this element is required.
4. From a stratified lake's surface to bottom, there are distinct vertical profiles for the different chemical forms of plant nutrients. Draw out the vertical profile that would be expected for the element phosphorus (PO_4^{3-}) in a stratified eutrophic lake and explain why this profile would be expected.

CHAPTER 4 SOIL ENVIRONMENTAL CHEMISTRY

I. Answer the following questions.

1. Why environmental chemistry of soil is important?
2. What does the soil constitute?
3. Describe the important properties of Soil.
4. Explain the specialized Terms of Soil Density & Porosity.
5. What are the origins of Soil CEC?
6. List the main categories of soil OM.
7. Please enumerate the major soil pollutants.
8. What are the conditions when Biodegradation occurs?
9. Explain the glossary: Bioremediation.
10. What is Soil Chemistry?
11. What are the properties of Soil Colloids?
12. Enumerate the Types of Soil Colloids.
13. Use your knowledge to talk about Toxicity of heavy metals.
14. How does mercury from dental amalgam get into the environment?
15. What is being done to reduce Hg emission?
16. RfD (Reference Dose) for methylmercury is $0.1 \mu\text{g} \cdot \text{kg}^{-1} \text{ body weight day}^{-1}$. What mass of fish can a 60 kg person safely eat each week if the average methylmercury level in the fish is 0.15 ppm?
17. Use your knowledge to explain the process of the lead salts dissolution.
18. Carbon tetrachloride is a relatively common halogenated hydrocarbon that is moderately toxic. A long-term study using rats shows that below 0.311mg per day of ingested car-