



Soil, Water and Environment Discipline, Khulna University
Third Year Second Term Examination-2026 Session: 2024-25
Course Code: **0888 13 SWE 3211** Course Title: **Soil Chemistry II**
Total Marks: 60 Time: 3 Hours

*The figures in the right margin indicate marks. *All questions are of equal value. * Use a separate answer script for each section.

Section-B

(There are 04 questions in this section. Answer any 03 questions from this section.)

- | | | |
|-------|--|----|
| 1. a) | How does cultivation affect the distribution of various forms of nitrogen? [L1; CLO3] | 02 |
| b) | Why is nutrient fractionation considered better than total content analysis for understanding nutrient dynamics? [L2; CLO4] | 02 |
| c) | Write down the principle for colorimetric N determination from soil and plant digest. [L3; CLO3] | 03 |
| d) | Describe the technique for soil S fractionation. [L3; CLO3] | 03 |
| | | |
| 2. a) | What are the main pools of phosphorus in soil? [L1; CLO3] | 02 |
| b) | Outline the steps of P fractionation according to Kuo et al. (1996). [L2; CLO3] | 03 |
| c) | Illustrate microbial P with its isolation from soil? [L2; CLO4] | 03 |
| d) | How does soil pH control the availability of K? [L3, CLO4] | 02 |
| | | |
| 3. a) | State a comparative study of using 0.1N and 0.5N NaOH for the isolation of humic substances in soil. [L1; CLO3] | 02 |
| b) | Compare and contrast humic acid, fulvic acid, humin and humates. [L2; CLO3] | 02 |
| c) | Describe the formation of humus according to Martin and Haider (1967). [L3; CLO3] | 04 |
| d) | How will you characterize humic substances through optical ways? [L4; CLO4] | 02 |
| | | |
| 4. a) | Describe the differences among alpha, beta and gamma radiation in terms of their penetration power and how they interact with matter. [L1; CLO2] | 04 |
| b) | How will you detect radioisotopes with the Geiger-Muller counter technique? [L2; CLO3] | 03 |
| c) | Radioactivity is a nuclear phenomenon – explain. [L3; CLO4] | 03 |

Levels of Bloom's Cognitive Domain:

[L1=Remember; L2=Understand; L3=Apply; L4=Analyze; L5=Evaluate; L6=Create]



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Section-A

(There are 04 questions in this section. Answer any 03 questions from this section.)

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|----|----|---|----|
| 1. | a) | Compare between fixation and retention of nutrient in soil. [L2; CLO3] | 02 |
| | b) | Analyze the differences between phosphorus fixation in acidic and alkaline soils. [L2; CLO3] | 03 |
| | c) | Predict the effects of liming and organic matter application on phosphorus fixation in soil. [L4; CLO3] | 05 |
| | | | |
| 2. | a) | "BSP is an indication of soil fertility". Explain. [L4; CLO3] | 05 |
| | b) | Analyze the relationship between potassium fixation and nitrogen fixation processes in maintaining soil fertility and sustainable crop production. [L3; CLO3] | 05 |
| | | | |
| 3. | a) | Classify CEC and define them. [L1; CLO2] | 03 |
| | b) | Describe the factors affecting CEC. [L2; CLO2] | 03 |
| | c) | Discuss the Donnan equilibrium equation of CEC. [L2; CLO2] | 04 |
| | | | |
| 4. | a) | Which soil component contributes most to buffering capacity? [L1; CLO3] | 02 |
| | b) | Discuss the role of clay minerals and organic matter in soil buffering. [L3; CLO3] | 04 |
| | c) | Differentiate between adsorption and co-adsorption in soil systems with suitable examples involving calcium and phosphate ions. [L3; CLO3] | 04 |

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Soil, Water and Environment Discipline, Khulna University
Third Year Second Term Examination-2026 Session: 2024-25
Course Code: 0888 13 SWE 3213 Course Title: Soil Erosion and Conservation
Total Marks: 60 Time: 3 Hours

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Section-A

(There are 04 questions in this section. Answer any 03 questions from this section.)

1. a) How does a good-quality soil support us? [L2; CLO1] 02
b) 'Soil is a basic and irreplaceable resource'. Justify. [L5; CLO1] 02
c) How can bad-quality soils impact our lives and environment? [L2; CLO1] 01
d) Analyze the 'population versus land resource base' of Bangladesh. [L4; CLO1] 05

2. a) 'Soil erosion can lead to famine'. Support the statement with the Kenya case. 04
[L4; CLO1]
b) How will you use acceptable limits of soil erosion as a key to soil protection? 03
[L3; CLO1]
c) Outline the harmful impacts of soil erosion and its consequences. [L2; CLO1] 03

3. a) We know that soil erosion is the function of erosivity and erodibility. Suppose we are encountering accelerated erosion from a given field. Your job is to control erosion to the acceptable limit. What will you do to reduce soil erosion? Make a feasible plan for the marginal farmers. [L6; CLO1] 03
b) How can you measure soil erosion by using a multi-slot divisor? Describe with necessary sketches. [L4; CLO1] 04
c) Estimate the kinetic energy of rain from the following data in the table. [L4; CLO1] 03

Time from start (min.)	Rainfall Intensity, (mm/h)	Rainfall amount, (mm)
0-15	6.08	1.52
15-30	5688	14.22
30-45	104.68	26.16
45-60	126.00	32.50
60-75	33.52	8.38
75-90	1.00	0.25

4. a) Differentiate between erosion and degradation. [L2; CLO2] 02
b) Name the hot spots and their type of land degradation in Bangladesh? [L1; CLO2] 02
c) Draw the diagram showing the vicious cycle of soil degradation with adverse impact on agricultural sustainability, environmental quality, social and political fabric of human society. [L3; CLO2] 03
d) How will you assess land degradation? Describe the methodology. [L4; CLO2] 03

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Section-B

(There are 04 questions in this section. Answer any 03 questions from this section.)

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|----|----|--|----|
| 1. | a) | What is the relation between soil slope and soil vulnerability? [L2; CLO1] | 02 |
| | b) | How will you stabilize a vulnerable slope? Explain. [L3; CLO1] | 04 |
| | c) | Write down the role of VCF as means of soil conservation and livelihood in hilly areas. [L2; CLO1] | 04 |
| | | | |
| 2. | a) | What is contour farming? [L2; CLO3] | 02 |
| | b) | Describe the role of contour farming in soil conservation. [L2; CLO3] | 04 |
| | c) | How does jute geo-textile technique help in the reclamation of degraded sloping land in hilly areas? Explain. [L4; CLO3] | 04 |
| | | | |
| 3. | a) | What is the basis of the USDA land capability classification (LCC)? [L2; CLO3] | 02 |
| | b) | Describe the land capability class (LCC) system developed by USDA. [L2; CLO3] | 04 |
| | c) | 'The knowledge of LCC is important for sustainable soil conservation'. Justify. [L5; CLO3] | 04 |
| | | | |
| 4. | a) | What do you know about three dimensions of sustainability? [L2; CLO4] | 03 |
| | b) | Compare soil resistance and soil resilience with examples. [L4; CLO4] | 03 |
| | c) | What steps should be considered in choosing the best conservation method for a specific area? [L5; CLO4] | 04 |

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Soil, Water and Environment Discipline, Khulna University

Third Year Second Term Examination-2026 Session: 2024-25

Course Code: 0888 13 SWE 3215 Course Title: Problem Soils of Bangladesh

Total Marks: 60 Time: 3 Hours

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Section-A

(There are 04 questions in this section. Answer any 03 questions from this section.)

1. a) Does sodicity has any effect on soil structure and permeability? Give your opinion with explanation. [L5; CLO2] 04
b) Sodic soil is easy to manage than saline soils. Do you agree or disagree? Justify your answer. [L 5, CLO2] 04
c) What could be the reasons for the development of sodicity in soils? [L2, CLO1] 02
2. a) Why and how does osmotic potential affect total soil water potential? [L4, CLO2] 04
b) Explain the effects of soil salinity on glycophytic plants. [L2, CLO1] 02
c) The general threshold electrical conductivity of the saturation extract value for paddy is 3.0 dS/m in Bangladesh. In some areas of Batiaghata region, EC of irrigation water is 4.1 dS/m, evaporation rate from soil is 70 cm per hector but transpiration rate for paddy is 25 cm per hector. Calculate the amount of water to be applied to meet crop needs and to leach salts. [L6; CLO3] 04
3. a) Briefly explain the effects of waterlogging on soil properties and plant growth. [L2, CLO1] 04
b) Do wetlands have any ecological importance? Illustrate briefly. [2L, CLO1] 03
c) Why do ploughpan soil is considered as “problem soil” in Bangladesh? [L4; CLO1] 03
4. a) Develop effective soil and water conservation measures for the management of hill soils in Bangladesh. [L6; CLO3] 06
b) Describe the mechanism of actual acid sulfate soil formation. [L4; CLO1] 04

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Soil, Water and Environment Discipline, Khulna University
Third Year Second Term Examination-2026 Session: 2024-25
Course Code: 0888 13 SWE 3215 Course Title: Problem Soils of Bangladesh
Total Marks: 60 Time: 3 Hours

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Section-B

(There are 04 questions in this section. Answer any 03 questions from this section.)

- | | | |
|-------|--|--------|
| 1. a) | What is the extent of S deficiency in Bangladesh? Point out the symptoms of S deficiency in plants. [L2; CLO1] | 1+2=03 |
| b) | Distinguish the problems for plants and humans due to S and Zn deficiency. [L3; CLO1] | 04 |
| c) | Explain the effect of pH, other cations and anions on the availability of Zn in soil. [L4; CLO1] | 02 |
| d) | Give your advice for emergency response to Zn deficiency in soil. [L1; CLO3] | 01 |
| | | |
| 2. a) | How are charlands spread around the main rivers of Bangladesh? Describe with their location and area. [L2; CLO1] | 03 |
| b) | Define drought in terms of Bangladesh. What are the types of drought prevalent in Bangladesh? [L1; CLO1] | 1+1=02 |
| c) | Break down the causes of drought in Bangladesh and the rest of the world. [L4; CLO1] | 02 |
| d) | Explain the management of drought-prone soils in terms of agriculture. [L3, CLO3] | 03 |
| | | |
| 3. a) | Relate the characteristics of coarse textured soil with its associated problems. [L5; CLO1] | 03 |
| b) | Elaborate the processes that reduce soil organic matter. [L3; CLO2] | 06 |
| c) | How does organic matter change soil chemical and biological properties? [L1; CLO1] | 01 |
| | | |
| 4. a) | Are all peat soils suitable for reclamation? Justify your answer. [L5; CLO2] | 03 |
| b) | Design a step-by-step guide for peatland restoration. [L6; CLO3] | 03 |
| c) | Describe the agricultural problems of peat soil and their mitigation strategies. [L4 ; CLO3] | 04 |

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Soil, Water and Environment Discipline, Khulna University

Third Year Second Term Examination-2026 Session: 2024-25

Course Code: 0888 13 SWE 3241 Course Title: Research Methodology

Total Marks: 60 Time: 3 Hours

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Section-A

(There are 04 questions in this section. Answer any 03 questions from this section.)

- | | | |
|-------|---|----|
| 1. a) | Define research. [L1; CLO1] | 02 |
| b) | What are the desirable qualities of research? [L2; CLO1] | 04 |
| c) | 'Motivation of research is an important factor of doing impactful research'. Justify. [L5; CLO1] | 04 |
| | | |
| 2. a) | Show the basic steps of research process in a flow chart. [L1; CLO1] | 02 |
| b) | How to develop research hypothesis and research methodology? [L3; CLO1] | 03 |
| c) | When will a problem qualify as a potential research problem? [L3; CLO1] | 03 |
| d) | How does literature review guide to conduct good research? Explain. [L4; CLO1] | 02 |
| | | |
| 3. a) | What are the basic components of a research proposal? [L1; CLO1] | 02 |
| b) | Which precautions should be considered in writing a good research proposal? [L3; CLO1] | 04 |
| c) | How does proposal writing differ from report writing? [L4; CLO1] | 04 |
| | | |
| 4. a) | What do you know about factorial experiment? [L2; CLO2] | 02 |
| b) | Differentiate between discrete and quantitative treatments. [L2; CLO2] | 04 |
| c) | 'SWOT analysis is an important part of developing research project proposal'. Justify. [L5; CLO2] | 04 |

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Course Code: 0888 13 SWE 3241 Course Title: Research Methodology

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Section-B

(There are 04 questions in this section. Answer any 03 questions from this section.)

1. a) Define the following terms: a. experimental error, b. experimental unit, c. experimental design, d. accuracy. [L1; CLO3] 02
b) Illustrate the principles of experimental design. [L2; CLO3] 04
c) Describe the importance of a valid experimental design in agricultural research. [L3; CLO3] 04
2. a) Define split-plot design and DMRT-test. [L1; CLO4] 02
b) Field trials in which the experimental area has a unidirectional fertility gradient but also has residual effects from previous trials. What types of experimental design you have to follow to get precise experimental results? Illustrate the randomization and layout of the experimental design. [L2; CLO4] 1+5=06
c) Differentiate between ANOVA and LSD. [L4; CLO4] 02
3. a) Design a ANOVA table. [L1; CLO4] 04
b) 'You are a fourth-year undergraduate student conducting a thesis experiment to evaluate the response of four rice varieties under five nitrogen levels with four replications'. Now answer the following questions.
1. Which experimental design would be most appropriate for this experiment? Justify your answer. [L1; CLO4] 02
2. Prepare the experimental layout with proper randomization for all replications. [L6; CLO4] 04
4. a) Define ANOCOVA? [L1; CLO4] 02
b) Suppose you want to conduct an experiment using four treatments with five replications. The study consists with pot experiment under the Greenhouse of Soil, Water and Environment Discipline in Khulna University. The treatments are four organic amendments like rice straw, alfalfa, cow dung, and sorghum straw. You have mixed the amendments with soil and kept in field condition for soil aggregation test. What type of experimental design is suitable for your current study, and why? Outline the randomization technique and display the layout using random number table. [L2; CLO4] 1+3=04
c) Grain yield of three rice variety with four replications from a complete randomized design under a pot experiment has been given in bellow table. Build ANOVA table and interpret the results (Tabular F value is 4.26 for 5% level of significance). [L3; CLO4] 04

Rice variety	Grain yield (kg/ha)			
	Replication 1	Replication 2	Replication 3	Replication 4
A	6	7	3	8
B	5	5	3	7
C	5	4	3	4

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Soil, Water and Environment Discipline, Khulna University

Third Year Second Term Examination-2026 Session: 2024-25

Course Code: 0811 13 Agr 3251 Course Title: Principles and Practices of Organic Farming

Total Marks: 60 Time: 3 Hours

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Section-A

(There are 04 questions in this section. Answer any 03 questions from this section.)

1. a) Analyze the key challenges faced by farmers in adopting organic farming practices in Bangladesh. [L4; CLO1] 02
b) Design a step-by-step conversion plan for shifting a conventional farm to an organic farming system. [L6; CLO1] 06
c) Suggest some practical strategies to overcome the major constraints of organic farming in Bangladesh. [L6; CLO1] 02
2. a) Define organic farming and explain why it is necessary. [L2; CLO1] 02
b) Differentiate between pure organic farming and integrated organic farming. [L4; CLO1] 03
c) Evaluate the effectiveness of organic farming practices in enhancing long-term soil fertility. [L5; CLO3] 05
3. a) Explain the concept of water use efficiency (WUE) and its importance in agriculture. [L2; CLO3] 02
b) What is decomposition? Explain why microorganisms decompose organic matter in soil. [L2; CLO3] 1+1=02
c) Apply your understanding of organic matter addition to explain the changes that occur in soil when fresh organic residues are incorporated. [L3; CLO3] 04
d) Describe how high and low C: N ratios affect the decomposition process. [L2; CLO3] 02
4. a) What is a biofertilizer? [L1; CLO3] 01
b) Narrate the hydroponic systems and root dipping methods of biofertilizers with suitable examples. [L2; CLO3] 03
c) Evaluate the advantages and limitations of biofertilizers compared to chemical fertilizers. [L5; CLO3] 03
d) Analyze the different types of organic residue management practices for improving soil fertility. [L4; CLO2] 03

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Soil, Water and Environment Discipline, Khulna University

Third Year Second Term Examination-2026 Session: 2024-25

Course Code: 0811 13 Agr 3251 Course Title: **Principles and Practices of Organic Farming**

Total Marks: 60 Time: 3 Hours

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Section-B

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1. a) What do you mean by Green Revolution Technology (GRT)? [L1; CLO2] 01
b) Illustrate how best management practices can reduce soil degradation and enhance soil fertility. [L3; CLO1] 04
c) How could you prevent pollution in an integrated organic farming approach? [L5; CLO2] 05
2. a) Define sustainability. [L1; CLO3] 02
b) Why do organic farming is important for rural livelihoods? [L3; CLO3] 03
c) Assess the environmental benefits of organic farming in controlling nutrient leaching and runoff and suggest some positive management practices to minimize these losses. [L5; CLO2] 05
3. a) How do IPM integrates biological, mechanical, and cultural methods in organic farming? [L4; CLO3] 05
b) Explain the risks associated with the use of synthetic herbicides on the environment and human health. [L3; CLO3] 05
4. a) What do you mean by Ecological footprint? [L1; CLO3] 02
b) Write down the international standards for a farm to be certified as organic. [L1; CLO3] 04
c) Is there any challenge that a farm has to face to obtain organic certificate? Give your opinion with explanation. [L5; CLO3] 04

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