INTERNATIONAL UNIVERSITY OF EAST AFRICA
'Learning to Succeed'

FACULTY OF SCIENCE AND TECHNOLOGY

END OF SEMESTER EXAMINATIONS - DECEMBER 2025

PROGRAMME: BSEM
YEAR/SEM: YEAR 2/SEMESTER 1
COURSE CODE: BSE2103
NAME: INTEGRATED WASTE AND POLLUTION MANAGEMENT

DATE:
TIME:

INSTRUCTIONS TO CANDIDATES:

SECTION A

Attempt all questions by circling the most correct answer

Question 1:

1. In the context of chemical wastewater treatment, which disadvantage is shared by Neutralization, Flocculation/Coagulation, and Oxidation processes? (2marks)

A. High energy consumption

B. Potential for over-treatment leading to scaling

C. Generation of sludge requiring management

D. Ineffectiveness against pathogenic microorganisms

Question 2:

2. Which type of waste is characterized by high moisture content, rapid decomposition producing leachate and methane, and is a key component of municipal solid waste? (2marks)

A. Inert Waste

B. Rubbish

C. Putrescible Waste

D. Ashes

Question 3:

3. The primary purpose of adding a coagulant like alum or ferric chloride in wastewater treatment is to: (2marks)

A. Adjust the pH to a neutral level.

B. Destabilize suspended particles by neutralizing their charges.

C. Serve as a primary disinfectant against pathogens.

D. Exchange calcium ions for sodium ions to soften the water.

Question 4:

4. A major advantage of ozonation over chlorination for wastewater disinfection is that ozonation: (2marks)

A. Is a much cheaper process to operate.

B. Does not produce significant amounts of disinfection byproducts.

C. Requires less sophisticated equipment for on-site generation.

D. Effectively removes all persistent organic pollutants.

Question 5:

5. In a facultative stabilization pond, the primary source of oxygen for the upper, aerobic zone is: (2marks)

A. Mechanical aerators

B. Diffused air systems

C. Wind-driven diffusion and algal photosynthesis

D. The breakdown of methane by anaerobic bacteria

Question 6:

6. A major disadvantage shared by both waste stabilization ponds and constructed wetlands for wastewater treatment is: (2marks)

A. The high consumption of electrical energy.

B. The requirement for a large land area.

C. The inability to remove nutrients like nitrogen and phosphorus.

D. The consistent production of significant foul odors.

Question 7:

7. In the context of landfilling, what is "leachate" and why is it a significant problem? (2marks)

A. It is the methane gas produced, which is highly explosive.

B. It is the settled sludge that reduces the landfill's capacity and requires frequent removal.

C. It is a colored liquid formed from rainwater seepage that can dissolve harmful compounds and contaminate groundwater.

D. It is the unpulverized solid waste that attracts insects and vermin.

Question 8:

8. Which waste type is defined as "material that is neither chemically nor biologically reactive" and includes concrete, bricks, and rubble? (2marks)

A. Putrescible Waste

B. Garbage

C. Inert Waste

D. Rubbish

Question 9:

9. A significant disadvantage of the Ion Exchange process is that it: (2marks)

A. Is ineffective at removing any ionic contaminants.

B. Consumes large amounts of energy for ozone generation.

C. Requires periodic regeneration, creating a waste stream.

D. Often leads to over-oxidation and formation of harmful byproducts.

Question 10:

10. In Advanced Oxidation Processes, the high effectiveness in breaking down pollutants is primarily due to the generation of: (2marks)

A. Ozone molecules (O3)

B. Chlorine gas (Cl2)

C. Sodium hypochlorite (NaOCl)

D. Hydroxyl radicals (•OH)

Question 11:

11. Based on the property-based classification, which pair of wastes is correctly categorized? (2marks)

A. Biodegradable: Plastics; Non-biodegradable: Food waste

B. Biodegradable: Paper waste; Non-biodegradable: Rubber tyres

C. Biodegradable: Nuclear wastes; Non-biodegradable: Sewage sludge

D. Biodegradable: Fiberglass; Non-biodegradable: Leather

Question 12:

12. The primary biological process occurring in the bottom layers of a facultative pond or in an anaerobic pond is: (2marks)

A. Aerobic decomposition by algae.

B. Anaerobic decomposition by bacteria, producing gases like methane and hydrogen sulfide.

C. Photosynthesis by submerged plants.

D. Nitrification of ammonia into nitrate.

Question 13:

13. What is a key operational difference between "Incineration" and "Pyrolysis" as methods for treating solid waste? (2marks)

A. Incineration produces clinker, while pyrolysis does not.

B. Incineration requires separation of waste, while pyrolysis does not.

C. Incineration involves combustion with oxygen, while pyrolysis uses heat in the absence of oxygen.

D. Incineration is suitable for coastal areas, while pyrolysis is not.

Question 14:

14. In a Vertical Flow constructed wetland, what is often a technical requirement due to the depth of the bed? (2marks)

A. Frequent replacement of the vegetation on top.

B. The use of air pumps to get air to the bottom.

C. A constant inflow of seawater to maintain salinity.

D. The addition of chemical coagulants to aid filtration.

Question 15:

15. The process of "Pulverization" in solid waste management primarily aims to: (2marks)

A. Convert organic waste into compost through bacterial action.

B. Burn waste at high temperatures to generate energy.

C. Reduce the volume and change the physical character of the waste, making it less attractive to insects.

D. Thermally break down waste in the absence of oxygen to produce fuel.

Question 16:

16. Which composting method is described as being ideal for apartment dwellers, using red worms to break down organic matter? (2marks)

A. Aerated Windrow Composting

B. In-Vessel Composting

C. Vermicomposting

D. Backyard Composting

Question 17:

17. A key risk associated with the "over-neutralization" of wastewater is: (2marks)

A. The complete sterilization of water, killing beneficial bacteria.

B. The formation of precipitates or scale that can clog pipes and equipment.

C. A significant increase in the biochemical oxygen demand.

D. The release of volatile organic compounds into the atmosphere.

Question 18:

18. The Aerated Static Pile composting method is characterized by: (2marks)

A. Forming organic waste into long rows that are periodically turned.

B. Using red worms to break down organic matter into castings.

C. Mixing waste in one large pile aerated by bulking agents or a network of pipes.

D. Processing waste in a controlled vessel like a drum or silo.

Question 19:

19. Which of the following is listed as a source of radioactive waste? (2marks)

A. The burning of fossil fuels in automobiles.

B. The decomposition of putrescible organic matter in landfills.

C. The non-ferrous metal mining industry.

D. The nuclear fuel cycle and medical wastes.

Question 20:

20. What is a stated limitation of using constructed wetlands for wastewater treatment? (2marks)

A. They require expert design and high operating costs.

B. They are highly sensitive to climate conditions and may have limited nutrient removal.

C. They produce significant amounts of sludge that require proper disposal.

D. They are ineffective at removing organic matter and suspended solids.

SECTION B

Choose any 3 questions

Question 1:

1. Discuss the major causes and consequences of thermal pollution (20marks)

Question 2:

2. a) Explain ways of managing industrial waste (10marks)

b) Explain the different types of radioactive waste (10marks)

Question 3:

3. Discuss the strategies of mitigating air pollution (20marks)

Question 4:

4. a) Explain the physical treatment of wastewater (10marks)

b) Explain the methods used in medical waste treatment (10marks)

Question 5:

5. Using an illustration, explain the waste hierarchy as the best option for waste management (20marks)

Question 6:

6. Discuss the methods of solid waste disposal (20marks)

Question 7:

7. Electronic waste has become one of the fastest-growing waste streams globally, posing significant environmental, health, and socio-economic challenges. Discuss the key strategies for effective e-waste management. (20marks)

Question 8:

8. Sanitation systems vary widely in their ability to protect public health and the environment. Distinguish between improved and unimproved sanitation systems by explaining their key characteristics and examples. (20marks)

Question 9:

9. Illustrate the F-diagram of disease transmission. Explain how diseases spread from faeces to a new host through different pathways. Discuss how the three main barriers are efficient in preventing disease transmission. (20marks)

Question 10:

10. Discuss the key principles and best practices involved in the safe storage and transportation of medical waste. (20marks)

Question 11:

11. Explain the different types of wastewater treatment ponds and describe in detail the treatment processes that occur in each. (20marks)

Question 12:

12. Discuss the major environmental, public health, and socio-economic effects of solid waste pollution. (20marks)