

BINDURA UNIVERSITY OF SCIENCE EDUCATION

DEPARTMENT OF ENVIRONMENTAL SCIENCE

BSc HONOURS DEGREE IN SAFETY, HEALTH AND ENVIRONMENTAL MANAGEMENT

ESM 408

BSC PART IV EXAMINATION Wastewater Management

2 HOURS

JUN 2023

INSTRUCTIONS

Answer all questions from SECTION A and any two from SECTION B

SECTION A (COMPULSORY)

1. (a) When is wastewater considered potentially hazardous? **[4 Marks]**
(b) Explain the following about wastewater:
 - (i) preliminary/primary treatment,
 - (ii) secondary treatment,
 - (iii) tertiary treatment. **[3 x 3 Marks]**
- (c) Distinguish aerobic digestion from anaerobic digestion of sludge. **[4 Marks]**
(d) Justify the need for research attention on contaminants of emerging concern (CEC). **[5 Marks]**
(e) Briefly describe how you can determine the following for a 100 ml sample of wastewater:
 - (i) mass of volatile dissolved solids,
 - (ii) concentration of thermo-tolerant faecal coliforms. **[2 x 4 Marks]**

SECTION B

2. (a) Briefly describe how you can determine the BOD₅ of a water sample without seeding. **[5 Marks]**
(b) A man working at domestic waste stabilisation ponds observed that the air smells of rotten eggs during the night and urine during the day. Explain this observation. **[5 Marks]**
(c) Describe the risk assessment for humans using partially-treated wastewater from a lead smelter to treat their vegetables. **[10 Marks]**
3. (a) Explain factors which influence the quality of effluent from a waste stabilisation pond. **[10 Marks]**
(b) Discuss applications of phytoremediation in wastewater treatment. **[10 Marks]**

4. (a) The water in Deka River which receives effluent from Hwange coal mine developed an orange colour with very low pH. Suggest a plausible explanation for this observation and how this could be managed. [10 Marks]
- (b) Discuss the importance of microorganisms in wastewater treatment. [10 Marks]
5. (a) (i) Describe the main characteristics of effluent from an ethanol distillery. [4 Marks]
- (ii) Explain the potential wastewater challenges that may be encountered at an ethanol distillery. [4 Marks]
- (b) Discuss land application of wastewater as a treatment method. [12 Marks]

End of paper