

National Examination, May 2014

04-Env-B5 Industrial & Hazardous Waste Management

3 hours duration

NOTES:

1. This examination has **eighteen (18)** questions on 2 pages.
2. Each question is of the value indicated. There are **100 possible** marks for the examination.
3. This is a **CLOSED BOOK EXAM**. An 8 ½" x 11" aid sheet (both sides) and any non-communicating calculator is permitted.
4. *If doubt exists as to the interpretation of any examination question, the candidate is urged to submit with the answer paper, a clear statement of any assumption made for the solution of the examination question.*
5. Clarity and organization of the answers are important.

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- 10 **1. Define**
- 1.1 KL_a
 - 1.2 biomedical waste
 - 1.3 e-waste
 - 1.4 hazardous waste
 - 1.5 β (beta)
- 5 **2.** What would you investigate in order to determine whether an industrial wastewater could be treated by adding it to a municipal activated sludge plant without violating its effluent discharge permit..
- 3 **3.** Identify 3 possible causes of toxicity in biological oxidation systems.
- 3 **4.** Are there Canadian guidelines for the management of biomedical waste? – identify.
- 4 **5.** Name 4 types of facilities that may generate biomedical waste.
- 10 **6. Industrial Waste Survey**
- 6.1 Identify the basic components of an industrial waste survey?
 - 6.2 What information is generated by each component?
 - 6.3 For each component state the reason why it is important.
- 5 **7.** An industrial wastewater sample contains 150 mg/L ethylene glycol ($C_2H_6O_2$). Calculate the COD and TOC. ($C = 12$; $H = 1$; $O = 16$).
- 4 **8.** In general, what does the selection of a wastewater treatment process or a combination of processes depend on?
- 3 **9.** What is the purpose of equalization for industrial wastewater treatment facilities? Identify 3.
- 4 **10.** How can you remove metals from an industrial wastewater? Illustrate this by using an example.
- 6 **11.** Identify 3 industries where anaerobic biological processes are the preferred alternative. State the reasons why they are the preferred choice.

52 Sub-total

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- 6 12. Construct a table identifying and the advantages and disadvantages of Plug-flow and Complete-mix biological systems. (example Table structure)

PLUG-FLOW	
Advantages	Disadvantages
COMPLETE-MIX	
Advantages	Disadvantages

- 10 13. You are the wastewater process consultant for an industry which must treat their wastewater generated from their production of widgets. Since the industry has not been built yet, there are no waste generation data. How would you go about getting the information you need to arrive at waste generation rates?
- 5 14. An industry that is unable to dispose of its hazardous waste on-site or into municipal sewers has three options for off-site disposal. Name these options.
- 4 15. You have just completed an inventory of hazardous waste sources and their amounts at an industry and you are now in a position to develop the other necessary components of a hazardous waste plan. What are they?
- 6 16. How do you manage biomedical wastes? Differentiate between liquid and solid wastes.
- 10 17. What is the difference between an industrial wastewater and a hazardous wastewater? Would you use different waste management strategies? If so, outline in point format what they are.
- 7 18. A leachate from an abandoned secure hazardous landfill site requires treatment. How would go about developing information that will guide you to a solution?

100 TOTAL