

National Examination May 2017

**04-Env-B5, Industrial & Hazardous Waste Management**

*3 hours duration*

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**NOTES:**

1. This examination has **NINETEEN (19)** 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 one of two calculators is permitted; any Casio or Sharp approved model.
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.

- 10 1. An industry is planning a 50% expansion, but they do not have any more land available for treating their wastewater. The options of acquiring land nearby or relocating are not available. You are their environmental consultant. Identify in point form how you would devise a plan of action.
  
- 10 2. Identify in tabular form the important process design variables for:
  - 2.1 a conventional Activated Sludge Plant
  - 2.2 a secondary settling tank
  - 2.3 a membrane separator
  - 2.4 an aerobic digester
  - 2.5 an anaerobic digester
  
- 5 3. A widget manufacturing industry is being built. They must treat their production wastewater. You have been retained as their environmental consultant. Outline in point form your proposal of addressing this challenge. How would you go about getting the information you need to arrive at waste generation rates?
  
- 6 4. How do you manage biomedical wastes? Differentiate between liquid and solid wastes.
  
- 6 5. You are asked to advise on a management strategy for waste pharmaceutical products. In point form list the steps you would take. Are there any treatment options? If so, identify them in point form.
  
- 6 6. A particular industrial waste contains a bio-inhibitory compound. You have determined that biological treatment would be the best process option if this bio-inhibitory compound were not present. Identify, and discuss in point form how you would handle this problem.
  
- 3 7. What are the minimum nutrient requirements for biological treatment?
  
- 3 8. Under what circumstances would you select a physical-chemical wastewater treatment process train to treat an industrial waste?

- 4 9. What are 4 properties of a hazardous waste?
- 3 10. Name 3 common strategies to minimize the improper disposal of household hazardous waste.
- 5 11. Name 5 strategies you could use to reduce industrial waste strength.
- 6 12. What are the biggest challenges in the management of biomedical waste?
- 2 13. What is the most effective way to eliminate the small quantities of hazardous wastes found in municipal solid waste?
- 6 14. Give an example when:  
14.1 **plug-flow** for a biological treatment process would be a good choice.  
14.2 **complete-mix** for a biological treatment process would be a good process choice.
- 3 15. Identify 3 common water quality problems in cooling tower systems.
- 10 16. You have been retained by an industry as their environmental process consultant. The industry is generating a wastewater as the result of their seasonal production operation. There is a municipal wastewater treatment plant in the community. You have to advise your client on the most cost-effective wastewater treatment option available to them. Outline in some detail (but point form) the steps you would take to fulfill this assignment.
- 4 17. How do you manage the treatment and ultimate disposal of liquid radioactive wastes?
- 5 18. An industrial wastewater contains 200 mg/L ethylene glycol (C<sub>2</sub>H<sub>6</sub>O<sub>2</sub>). Calculate the COD and TOC. (C = 12; H = 1; O = 16)
- 3 19. Who in Canada administers the National Guideline for Biomedical Waste? Management?