

National Examination May 2011

04-Env-B5 Industrial & Hazardous Waste Management

3 hours duration

NOTES:

1. This examination has **EIGHTEEN (18)** questions on 3 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 a Casio or Sharp approved 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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- 3 1. Identify 3 common water quality problems in cooling tower systems.
- 2 2. What is the greatest challenge in managing industrial wastewaters?
- 5 3. Define liquid industrial wastes, and give 3 examples which have widely varying characteristics.
- 3 4. How can municipal services control industrial waste waters?
- 7 5. A new pharmaceutical industry wishes to locate in your city. Outline the information that you as the city engineer must have from the applicant in order to make some intelligent comments on the forthcoming liquid waste discharge application.
- 4 6. Name 4 items that must be considered in obtaining proper neutralization of an industrial wastewater.
- 7 7. Name 7 factors which control the aerobic digestion process.
- 5 8. Describe what happens during the process of biological nitrification. What controls the rate of nitrification?
- 5 9. Sketch a schematic process diagram of a biological process with nitrification and denitrification.
- 10 10. You are the wastewater process consultant for an industry. The industry is generating a wastewater as the result of their production operation. There is a municipal wastewater treatment plant in the community. You have been retained to advise your client on what the most cost-effective wastewater management option is available to them. Outline in some detail (but point form) the steps you would take to fulfill this assignment.
- 5 11. What steps would you take to characterize a wastewater generated from an industry?
- 10 12. Construct a table that shows the differences between municipal, industrial (brewery) and a hazardous wastewater. Would you use different waste management strategies? If so, outline in point format what they are.

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- 10 13. An industry is being established and they must treat their wastewater generated from their product production process. 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 and liquid flow rates?
- 4 14. Give an example when:
14.1 Plug-flow for a biological treatment process would be a good process choice.
14.2 Complete-mix for a biological treatment process would be a good process choice.
- 5 15. Your industry produces a high-strength BOD wastewater. List the investigative steps you would take to minimize the cost of managing this wastewater.
- 5 16. Outline in point form the procedure you would use for the calculation of total treatment costs for an industrial wastewater treatment plant.
- 6 17. What is the biggest challenge in managing biomedical wastes? Differentiate between liquid and solid wastes.
- 4 18. How do you manage the treatment and ultimate disposal of liquid radioactive wastes?

100 TOTAL POSSIBLE MARK

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