

National Examination November/December 2016

04-Env-B5 Industrial & Hazardous Waste Management

3 hours duration

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)**. **One of two calculators is permitted – any Casio or Sharp approved models**.
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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- 5 1. What factors govern your choice of treatment process(es) for any industrial wastewater?
- 3 2. Using a bar graph, illustrate the general relationship between TOD, COD, BOD_u and BOD₅.
- 3 3. What is the ultimate goal of an industrial in-plant waste survey for any industry?
- 5 4. Identify in point form, the various components of an in-plant waste survey.
- 3 5. What is the purpose of sampling? Why?
- 5 6. In point form, identify important factors that can affect your survey results.
- 4 7. Under what circumstances would you take: grab samples, composite samples?
- 5 8. State 5 circumstances under which you would select a chemical treatment technology?
- 5 9. Identify 5 circumstances under which you would use flow equalization.
- 3 10. How can municipal services control industrial waste waters?
- 5 11. How do you differentiate between a hazardous- and an industrial wastewater? Would you use different waste treatment strategies? If so, outline in point format one (1) example of each.
- 6 12. 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.
- 10 13. An industry is being established and they must treat their wastewater generated from their production of unicorns. 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 liquid and solid waste generation rates and waste characteristics?
- 3 14. How do you manage liquid radioactive wastes?
- 6 15. 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 state in point form how you handle this problem.
- 3 16. How do you manage biomedical wastes? Differentiate between liquid and solid wastes.
- 9 17. When we talk about hazardous wastes, hazardous to what? to whom? Identify 6 industries that generate hazardous wastes, liquid and/or solid, the type of hazard they represent and potential management strategies for them.

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10 18. An industrial wastewater has the following characteristics:

PARAMETER	UNITS	50 percentile	90 percentile
Flow	m ³ /d	2,000	4,500
BOD ₅	mg/L	2,000	3,000
COD	mg/L	4,500	6,500
TKN	mg/L	80	140
TP	mg/L	20	40
Temperature	°C	24	30
pH	-	8	9

18.1 What is the significance of the 50 and 90 percentile information?

18.2 How would you approach the design of a wastewater treatment plant?

7 19. A new pharmaceutical industry wishes to locate 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.

100 total possible marks