National Examination May 2015

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 are 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.
3 1. In any waste treatment process selection, what are the 3 most important factors that you must consider?

4 2. Identify 4 basic waste treatment process options.

4 3. When sampling an industrial wastewater name 4 factors that can affect analytical results.

5 4. Name 5 undesirable waste characteristics in a liquid industrial or hazardous waste.

5 5. Name 5 steps you must consider for a realistic in-plant waste survey.

8 6. What are the important information must you collect for the design of an industrial waste management (including treatment) system,

10 7. What is:

7.1 BOD -
7.2 COD -
7.3 TOC -
7.4 TOD -
7.5 Zone settling -
7.6 Specific resistance -
7.7 a Freundlich isotherm -
7.8 F/M -
7.9 a Priority pollutant -
7.10 Plug flow -

5 8. Calculate the ThOD (Theoretical Oxygen Demand) of 100 grams of phenol (C₆H₅OH).

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C₆H₅OH + 7 O₂ = 6CO₂ + 3 H₂O
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Atomic weight: C = 12; H = 1; O = 16

10 9. An industry manufacturing widgets has engaged you as their consultant to guide and advise them in their management of the liquid waste generated from their operation. This industry represents a new industry in this community. Their production plant has not been built yet. They have no data.

Write (in point form) an index of a report that you will prepare which outlines their waste management options and identify the type of data you have to acquire to write this report.
3 10. Name 3 unit operations used in concentrating sludges.

10 11. A small municipality of 10,000 has two industries: a cannery producing 5,000 tonnes of whole tomatoes and other canned goods over a 7 month season, and a textile mill which produces 2,000 kg of cotton goods per day. Estimate the BOD₅ and SS content of the municipal wastewater:
   11.1 with and
   11.2 without these industries being served by the municipal system and
   11.3 determine the population equivalent (PE) of the cannery in terms of BOD₅.
   Wastewater: Residential is 400 L/capita/day, BOD₅ is 190 mg/L and SS is 225 mg/L
   Cannery 10,000L/tonne production, 1,200 mg/L BOD₅, 700 mg/L SS
   Textile 100,000L/tonne production, 400 mg/L BOD₅, 100 mg/L SS

7 12. Name:
   12.1 Five (5) industries and the hazardous material(s) in their production process residuals.
   12.2 What hazard reduction strategies would you consider for each of these industries?

6 13. Name 6 objectives of a monitoring system for the land disposal of hazardous waste.

6 14. Identify 3 principles of incinerator design.

2 15. Define biomedical waste.

6 16. Name 3 generators of biomedical waste.

3 17. Name 1 provincial, 1 national and 1 international convention or guideline.

3 18. Give 3 examples of situations where you would consider using flow equalization.

100 total possible mark