

National Examination May 2015

04-Env-B5 Industrial & Hazardous Waste Management

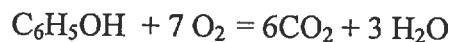
3 hours duration

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.

04-Env-B5 Industrial & Hazardous Waste Management

- 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).



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.

04-Env-B5 Industrial & Hazardous Waste Management

- 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