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National Examination, December 2014

04-Env-B5 Industrial & Hazardous Waste Management

3 hours duration

NOTES:

1. This examination has **twenty (20)** 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.

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marks

4 1. Why do we collect data? Name 4 reasons.

2 2. Why use statistics to analyze data?

3 3. What does a normal probability curve show?

2 4. Define, standard deviation.

2 5. What is student's 't'?

2 6. Are there Canadian guidelines for the management of biomedical waste? – identify.

4 7. How do you manage biomedical wastes? Differentiate between liquid and solid wastes.

2 8. What is the biggest challenge in the management of biomedical waste?

7 9. What are the objectives of an industrial waste survey and what would you use the results for? Identify (in point form) the steps you would take in conducting an industrial wastewater survey? Give reason(s) for each step.

5 10. Under what circumstances would you consider using equalization basins in the design of an industrial wastewater treatment facility? Identify 5.

6 11. Under what circumstances would you consider the selection of any one or combination of the following basic process alternatives for the treatment of a liquid industrial waste: aerobic, anaerobic, chemical, physical?

3 12. Name 3 substances that may cause toxicity in biological oxidation systems.

3 13. Identify 3 strategies that can be used to reduce fish toxicity from wastewater treatment plant effluents.

5 14. Name 5 strategies you could use to reduce industrial liquid waste strength.

4 15. For an industrial wastewater process stream, what strategies would you consider for the removal of:
      1. inorganic dissolved solids
      2. organic dissolved solids

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15 **16.** A large industry wishes to locate in your community. A production process wastewater will be produced from their manufacturing process. You have been engaged by this industry to come up with a cost-effective wastewater management strategy.
   1. Outline the steps you would take for your assignment.
   2. Write an index to your report that you will prepare for your client.
   3. Once you have an index, write one brief sentence giving information about the content of what you will present under each report heading.

3 **17.** What is one of the critical issues in the long term management of hazardous compounds?

15 **18.** Identify in tabular form the important process design variables for:
   1. a primary settling tank
   2. an aerobic digester
   3. a membrane bioreactor
   4. a conventional activated sludge process
   5. an anaerobic digester
   6. a biological rotating contactor
   7. an advanced oxidation (photocatalytic) reactor
   8. granular activated carbon columns
   9. a granular media filter
   10. a dissolved air flotation (DAF) unit
   also state why each of the identified design variable(s) is important

7 **19.** You are asked to give an estimate of the footprint for a waste treatment technology that will handle a wastewater generated by 5,000 hogs. Outline the approach you would take.

6 **20.** Given the following information:

Temp.	°C	10	20	30
C_s	g/L	11.27	9.02	7.44
K_{La}	hr^{-1}	-	1.1	-
Theta	1.0241	-	-	-
alpha	0.55	-	-	-
beta	0.95	-	-	-

Calculate the minimum and maximum amount of oxygen (DO) that could be transferred to this wastewater.

100 TOTAL