جامعة دمياط
Damietta University
Damietta University
Faculty of Science
Environmental Sciences Department

كلية العلوم جامعة دمياط

Semester: Jan. 2026
Date: Thursday 01/01/2026
Allowed Time: 2 hours

Final Exam of Wastes Management *(Course Code: 412 E)*

for 4th. Level Environmental Sciences Program

Answer All the Following Questions:

Total Mark: 70 Marks

Question [1]: (15 Marks)

a) Draw a schematic diagram for the different phases of anaerobic wastewater degradation, then deduce at which phase the organic load starts to be actually treated, and give the reason for your answer. *[5 Marks]*

b) Discuss the microbial growth pattern in batch culture of a biological wastewater treatment system. What do you think about the circumstances in which the lag phase does not occur? *[7 Marks]*

c) Give one example of an integrated solid waste management, which represents waste to energy technology, *and* refer to the form of the produced energy in the mentioned technology. *[3 Marks]*

Question [2]: (20 Marks)

a) Discuss in brief the concept of **"the international waste transport"**, and mention to the main recommendations of the Basel's meeting that held regarding to this issue. *[5 Marks]*

b) Compare between ***activated sludge*** and ***membrane bioreactor*** processes for wastewater treatment, and use the drawing for clarification. *[10 Marks]*

c) What is meant by **'the end of pipe measures'** under the context of the wastewater management? *[3 Marks]*

d) Attached growth and suspended growth of bacteria are two different kinds of biological processes that commonly used in waste water treatment. ***State*** only the name of an example for each process. *[2 Marks]*

Question [3]: (19 Marks)

a) What are the main roles of septic tanks that used for sewage treatment. *[3 Marks]*

b) What are the main differences between the current wastewater management system in the old cities, and the newly constructed cities. *[5 Marks]*

c) Which is the best option for the solid waste management among the following options: - *Sanitary landfill, Composting or Incineration?* ***[1 Marks]***

d) Choose the most appropriate answer for each of the following: ***[10 Marks]***

1- Nitrogeneous and phosphours fertilizers are among the main sources of ***(domestic liquid waste – nuclear liquid waste - sewage – municipal liquid waste – agricultural liquid waste)***.

2- The dissolved oxygen content of water is ***(decreased – depleted – enriched - increased)*** by rising the Biochemical Oxygen Demand of that water.

3- Priority pollutants are among the ***(radiological – microbiological – physicochemical)*** properties of liquid wastes.

4- COD is used to measure the amount of ***(biological – chemical – organic – inorganic – oxidant – TOC – colloidal)*** content of a liquid waste.

5, 6 - One of the drawbacks present in urban wastewater management system is the ***(population – dilution – pollution – evolution – option - concentration)***, which cases wastage of resources such as ***(suspended & dissolved solids – solid wastes – water, N, P & heavy metals - microorganisms)***.

7- In the liquid waste management system, substitution of a chemical fertilizer with organic fertilizer and substitution of phosphorus in detergents with a biodegradable matter are considered as ***(self purification – pollution prevention – reuse – abuse)*** option.

8- As an example of nutrient recovery from wastewater, ammonia can be recovered and reused – after several conversions and up taking by some organisms – as ***(carbohydrates – heavy metals – a protein – an organic fertilizer)***.

9- Activated sludge treatment system for the liquid wastes is considered as: ***(pollution prevention at source – a recycling of the wastewater within the same process - an end of pipe measures)***.

10- Pumping oxygen to a water stream will ***(decline – saturate – boost – diminish)*** the self-purification capacity of that stream.

Question [4]: (16 Marks)

a) What is the treatment rate of a wastewater treated biologically in an activated sludge unit working with a hydraulic retention time of 2.1 hours, and has an influent biochemical oxygen demand of 918 µg/ml and a mixed liquor suspended solid of 21134 ppm? ***[8 Marks]***

b) Calculate the TOC and COD of 7.8 mmoles of propanoic acid solution in ppm, knowing that the oxidation of propanoic acid occurs as follows:

$$CH_3CH_2COOH + 3\frac{1}{2}O_2 \longrightarrow 3CO_2 + 3H_2O$$ ***[8 Marks]***

---------- ***Best Wishes*** ----------

Assoc. Prof. Dr. Khaled H. El-Ezaby