Damietta University
Faculty of Science
Environmental Sciences Department

Semester: Jan. 2023
Date: Saturday 31/12/2022
Allowed Time: 2 hours

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

for 4th. Level Environmental Sciences Students

Answer <u>All</u> the Following Questions:

Total Mark: 70 Marks

Question [1]: (18 Marks)

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

1- Cross flow filtration prevents thicker particles from building up a ***(tangential flow – dead end – filter cake – enzymatic cleaning)*** on the membrane surface.

2- Phosphours and nitrogeneous fertilizers are among the main sources of ***(sewage – municipal liquid waste – agricultural liquid waste – domestic liquid waste - nuclear liquid waste)***.

3- ***(Incineration - Composting - Landfill)*** is the worst option for the solid waste Management.

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

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

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

7, 8 - One of the drawbacks present in urban wastewater management system is the ***(pollution – concentration – population – dilution – evolution – option)***, which cases wastage of resources such as ***(<u>water, N, P & heavy metals</u> – <u>microorganisms</u> – – <u>suspended & dissolved solids</u> – <u>solid wastes</u>)***.

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

10- The dissolved oxygen content of water is ***(depleted – decreased – increased – enriched)*** by rising the BOD of that water.

b) At which phase of anaerobic wastewater degradation, the organic load of a dairy wastewater starts to be actually treated? What is the reason for your answer? *[5 Marks]*

c) A sample of a medium strength industrial liquid waste was analyzed, and the results showed that 14% of its content of solids is coarse suspended solids, 8% is dissolved solids and 78% is colloidal solids. According to your knowledge, what will be the first choice for treating this investigated wastewater? Is it *chemical, biological* or *physical* treatment? and why? *[3 Marks]*

Question [2]: (14 Marks)

a) 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]*

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

c) Discuss the microbial growth pattern in batch culture of a biological wastewater treatment system, then answer the following: - *[8 Marks]*

i. What is optimum stage for the biological treatment of wastewater and why?
ii. What will happen if wastewater is supplied again to the media before the completion of the last phase?

Question [3]: (16 Marks)

a) Calculate the COD and TOC of 5.4 mmoles of butanoic acid solution in ppm, knowing that the oxidation of butanoic acid occurs as the following: -

$$CH_3CH_2CH_2COOH + 5O_2 \longrightarrow 4CO_2 + 4H_2O$$ *[8 Marks]*

b) What is the organic loading rate and the sludge loading rate of an activated sludge plant treating sewage water and working with a hydraulic retention time of 5.3 hours and has an influent biochemical oxygen demand of 411 ppm and a MLSS of 3749 mg/l? then deduce the treatment rate of this treatment plant. *[8 Marks]*

Question [4]: (22 Marks)

a) Compare between ***submerged MBR*** and ***activated sludge*** processes for wastewater treatment, and use the drawing for clarification. *[10 Marks]*

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

c) Oxidation ponds have diverse characteristics in waste water treatment. Comment on this statement. *[4 Marks]*

d) 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]*

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

Dr. Khaled H. El-Ezaby