

**SULIT**

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Second Semester Examination  
2021/2022 Academic Session

July/August 2022

**EAP414 – Industrial Waste Management**

Duration : 1 hour

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Please ensure that this examination paper consists of **FIVE (5)** pages of printed material before you begin the examination.

**Instructions:** This paper contains **THREE (3)** questions. Answer **TWO (2)** questions.

All questions **MUST BE** answered on a new page.

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**SULIT**

1. (a) The hazardous waste compatibility must be managed in any activity in which waste is handled, used or stored. The mixing of incompatible chemicals can result in sudden and unexpected hazards and may cause significant personal injury and property damage. Hazardous waste compatibility is usually referred to on a chart as shown in **Figure 1**.

1	Oxidizing Mineral Acid	1																E	Explosive		
2	Casutics	H	2															F	Fire		
3	Aromatic Hydrocarbons	H,F		3														GF	Flammable Gas		
4	Halogenated Organics	H,F	H		4													GT	Toxic Gas		
5	Metals	GF			H	5												H	Heat Generation		
6	Toxic Metals	S	S							6								S	Stabilsation of Toxins		
7	Saturated Aliphatic Hydrocarbons	H																			
8	Phenols And Cresols	H																			
9	Strong Oxidizing Agents		H	H,F		H,F		H													
10	Strong Reducing Agents	HF, GT			H,GT													GF,H	H,F,E	10	
11	Water & Moistures Containing Water	H			H,E			S												GF,GT	11
12	Water Reactive Substances	Extremely reactive; do not mix with any chemical or waste material														12					

**Figure 1:** Hazardous waste compatibility chart

- i) Based on chemical group in Figure 1, describe the reaction between oxidizing mineral acid and halogenated organics.

[5 marks]

- ii) Briefly describe **FIVE (5)** of the reactivity from chemical groups that will create flammable gas and toxic gas.

[5 marks]

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(b) Acid sludge from manufacturing and acid recovery industry are specified as SW316 under FIRST SCHEDULE (Regulation 2). Determine:

i) The characteristic label that best describes the acid sludge.

[2 marks]

ii) The appropriate container that can be used to store the acid sludge.

[2 marks]

iii) The proper method in handling the acid sludge during the transportation from waste generator to the waste handler premises. Describe the selected process.

[6 marks]

iv) Suitable materials that can be used to control acid sludge involved in the spill or accidental discharge. Give reason for the choice.

[5 marks]

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2. Incineration is a thermal waste treatment technique that can be understood as a controlled combustion process with the primary objective of volume reduction and energy recovery from the waste stream.

- i) Sketch a diagram of a basic incinerator system and explain the functions of each component as well as the critical parameters that must be monitored during its operation.

[12 marks]

- ii) Select and discuss **ONE (1)** pre-treatment method for ash before it can be reused or recycled.

[5 marks]

- iii) Differentiate **TWO (2)** potential use of ash residue generated by the incineration process.

[8 marks]

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3. Muafakat Batik Sdn. Bhd. is a company produce batik for local market. The water sample of effluent is collected at a point **X** shown in **Figure 2**.

i) Explain the main characteristics of wastewater generate from the company.

[5 marks]

ii) Identify the specific standard that Muafakat Batik Sdn. Bhd. needs to comply with Environmental Quality (Industrial Effluent) Regulations, 2009.

[2 Marks]

iii) Propose and justify **TWO (2)** advanced technologies to substitute their current treatment system.

[18 marks]

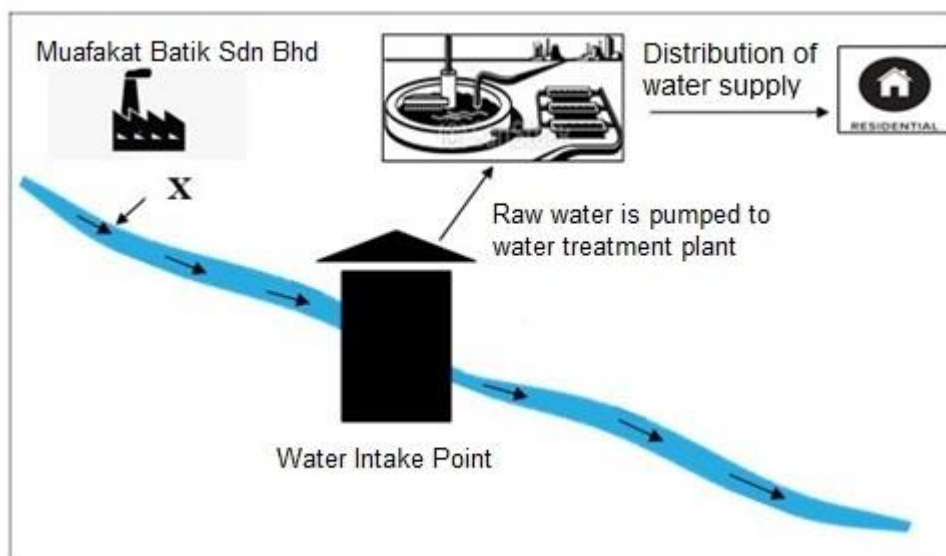


Figure 1

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