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| Name: Junbiao Li | UOL Student Number/ DUT student number:209050796/20203293012 |

# Part 1

On Blackboard, find the lecture “Point-Source Controls on Surface Water Quality (Part 1) by Mick Whelan at the University of Leicester. Watch from 2.05 to 12.28 and identify the 10 signpost phrases that he uses. (The first one has been given as an example.) The signpost phrases occur in the lecture in the order given below. **Write your answers in these boxes**.

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| b | e | f | g | i | k | n | p | q | r |

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| 1. The first thing I want to talk about today is … | 1. We’re going to start with … |
| 1. One of the most significant aspects of this is … | 1. I want to spend a short time talking about … |
| 1. I kind of did that already on Tuesday but I’ll just go over that again … | 1. I won’t talk about those today |
| 1. Imagine a factory … | 1. Let me give you an example of a factory … |
| 1. And then, finally, we’ve got … | 1. My last example of this is … |
| 1. That’s really what we mean by … | 1. A good definition of this is when … |
| 1. This is one of the most important points in this module | 1. But you should really know this very well by the end of the module |
| 1. One way of doing this is to … | 1. In order to …., you’d have to … and then you’d have to … |
| 1. All of these concepts … are concepts that you will meet in … | 1. One of the things that I’d like you to get out of this module is … |
| 1. These are all very important concepts for you to learn | 1. My final point on this subject, and you should take a note of this, is that … |

# Part 2

Write your notes here:

**Important words: trade affluent, sustainable urban journey system**

1. Point source pollution is **pollution where the source of the pollution can be identified**

From:

* 1. Factory (Industry). E.g., food processing
  2. Power Station
  3. Accidental Spillage
  4. Combined Sewer Overflows (CSOs)
  5. Treated Effluents
  6. Surface water drains from urban areas separate sewers

1. The volume of water coming in per day =

50, 000 people \* 150L per capita per day +

All water got from the road runoff +

Comes from border companies (called trade affluent)

1. The Direct Discharge
   1. 2,000L per sec. per day (Dry weather)
   2. There are about people discharging sewage.
2. Sewage Treatment Works
   1. Remove the **large material** (Called **Screening**)
   2. Reduce **BOD (Biochemical oxygen demand).** One way is activated sludge aeration basin
      1. Since there is organic matter
      2. Something like oxygen being consumed by the bacteria
   3. Secondary settling basin **(Removal of dissolved solids)**
      1. To remove any solids that there would be dissolved (**Since we add bacteria before**)
      2. Remove the sludge on the bottom (microbial process can also generate methane; **to recycle energy**)
         1. Dry it out
         2. And digest it by anaerobic digestion
   4. Liquid discharge into tap water. **Primary Settler**
   5. Anaerobic digestion consumes sludge. **Primary Settler**
   6. Aerobic digestion for producing methane (general metering) **Aeration Tank**
   7. Metering to control oxygen assurance aerobic digestion
   8. By-products, subsidised production
   9. Final clarifier
   10. Tertiary treatment (or back to aeration Tank after discharge). **Removal of nitrogen and phosphorus**
   11. Final effluent **(Drainage to the big pond)**

# Part 3

***In a sewage treatment plant, what are the challenges for the chemist / the engineer / the mathematician? \****

***\** Choose the academic field that is appropriate to you.**

Write your answer here:

In the mathematician, the biggest challenges are the volume of the tank and how to use mathematical models to treat wastewater more efficiently.

The first challenge is how many volume tanks we need to ensure that we have enough drums to store 2000 litters per second of wastewater or some additional product of wastewater treatment. We need to find a balance between the volume of the tank, if too much may lead to waste of the tank and increase the cost, while too little will lead to no way to treat the effluent properly.

The second challenge is how to use mathematical models to improve the efficiency of wastewater treatment. For example, how to choose the right reaction temperature, how to choose the right oxygen concentration, etc.

Words count: 127

Reference: Paweł Ziółkowski, *Mathematical modelling of gasification process of sewage sludge in reactor of negative CO2 emission power plant,* 244, 122601, <https://doi.org/10.1016/j.energy.2021.122601>.