**RECORD YOUR RESPONSE IN THE SPACE PROVIDED UNDER EACH SUBQUESTION**

**AQ5: Adsorption: 20 Marks**

A batch of wastewater from an industrial process has a volume of 10.0 m3 and is contaminated with phenol at a concentration of 1 g phenol per litre of solution. To reduce the phenol concentration to an acceptable level for discharge, it is mixed with granular activated carbon that contains 0.05 kg phenol per kg of adsorbent. Table AQ5 shows the adsorption isotherm.

**Table AQ5:**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| C (kg phenol/m3 solution) | 0.001 | 0.02 | 0.08 | 0.16 | 0.2 | 0.28 | 0.36 | 0.44 | 0.5 |
| q (kg phenol/kg adsorbent) | 0.045 | 0.08 | 0.11 | 0.13 | 0.14 | 0.15 | 0.16 | 0.17 | 0.175 |

a) Analytically or graphically show which model can apply to the adsorption isotherm. The three models including linear isotherm, the Langmuir isotherm, and the Freundlich Isotherm should be discussed. (Note: you must include your graphs in the response if you solve graphically) **8 Marks**

|  |
| --- |
| Response: |

b) Determine the equation of the isotherm in the form of . **2 Marks**

|  |
| --- |
| Response: |

c) If the safe concentration of phenol in water for discharge is 0.008 g/L, determine the mass of activated carbon (kg) required in this batch adsorption process. **3 Marks**

|  |
| --- |
| Response: |

d) Determine the percentage of phenol adsorbed. **2 Marks**

|  |
| --- |
| Response: |

e) In a few sentences and using your own words, illustrate some of the advantages and disadvantages of batch adsorption process. (100 words maximum) **5 Marks**

|  |
| --- |
| Response: |

**END OF QUESTION AQ5 (Go to next page)**