**National Open University of Nigeria**
**Plot 91, Cadastral Zone, Nnamdi Azikiwe Expressway, Jabi - Abuja**
**Faculty of Sciences**
**2021_2  EXAMINATION** 45678

**COURSE CODE: CHM413**
**COURSE TITLE: Analytical Chemistry II**
**CREDIT: 2 Units**
**TIME ALLOWED: 2 Hours**
**INSTRUCTION: Answer Question ONE (1) and any other Three (3) Questions**

**Question 1**

a. Define systematic error and state the consequence of this type of error on experimentally generated results or data?                                                                             **4 marks**

b. How are systematic error corrected?                                                          **2 marks**

c. State three commonly encountered systematic errors during the course of laboratory experiments

                                                                                               **3 marks**

d. Describe the three types of electrode in a Voltammetric cell.                          **6 marks**
e. What are the relevance of Differential scanning calorimetry to the scientific society?
                                                                                               **5 marks**

**f. State** how the inherent low concentration yielding of radionuclide could be avoided. **3 marks**
**g.** Identify the two main processes that would favour the formation of precipitate   **2 marks**

**Question 2**

 The following data refer to the concentration of albumin, in the blood sera of 16 healthy adults;

   37, 39, 37, 42, 39, 45, 42, 39, 44, 40, 39, 45, 47, 47, 43, 41

   The first eight figures are for men and the second eight for women. If the mean and standard deviations for men are 40.0 and 2.778 while the mean and standard deviation for the women are 43.25 and 3.059 respectively.

   Test whether the mean concentrations for men and women differ significantly. *(Attached below is the values of t for confidence intervals)*

**Table 1   Values of t for confidence intervals**

| Degrees of freedom | Values of t for confidence interval of | | | | |
|---|---|---|---|---|---|
| | 80% | 90% | 95% | 99% | 99.9% |
| 1 | 3.08 | 6.31 | 12.7 | 63.7 | 637 |
| 2 | 1.89 | 2.92 | 4.30 | 9.92 | 31.6 |
| 3 | 1.64 | 2.35 | 3.18 | 5.84 | 12.9 |
| 4 | 1.53 | 2.13 | 2.78 | 4.60 | 8.60 |
| 5 | 1.48 | 2.02 | 2.57 | 4.03 | 6.86 |
| 6 | 1.44 | 1.94 | 2.45 | 3.71 | 5.96 |
| 7 | 1.42 | 1.90 | 2.36 | 3.50 | 5.40 |
| 8 | 1.40 | 1.86 | 2.31 | 3.36 | 5.04 |
| 9 | 1.38 | 1.83 | 2.26 | 3.25 | 4.78 |
| 10 | 1.37 | 1.81 | 2.23 | 3.17 | 4.59 |
| 11 | 1.36 | 1.80 | 2.20 | 3.11 | 4.44 |
| 12 | 1.36 | 1.78 | 2.18 | 3.06 | 4.32 |
| 13 | 1.35 | 1.77 | 2.16 | 3.01 | 4.22 |
| 14 | 1.34 | 1.76 | 2.14 | 2.98 | 4.14 |
| $\infty$ | 1.29 | 1.64 | 1.96 | 2.58 | 3.29 |

**Question 3**

(i) What is a glass membrane electrode?                **(2 marks)**

(ii) List the two types of glass membrane electrode        **(1 mark)**

(iii)  Compare and contrast the two types of glass membrane electrodes    **(12 marks)**


**Question 4**

Conductance of electrolyte solution may be influenced by a number of factors. Discuss

**Question 5**
(a) State the three main features of Differential Pulse Voltammetry. 3 marks
(b)  Differentiate between the principle of thin layer chromatography and Column chromatography.

(12 marks)