THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

SECOND SEMESTER EXAMINATION

CH 442 – APPLIED ANALYTICAL CHEMISTRY

MONDAY 26TH OCTOBER 2020 – 12:50 PM

TIME ALLOWED: 2 HOURS

INFORMATION FOR CANDIDATES: -

1. You will have 10 minutes to read the question paper. You **MUST NOT** begin writing in the answer book during this time.
2. **ANSWER ALL QUESTIONS IN EACH SECTION.**
3. All answers **MUST** be written on the separate answer books provided.
4. Calculators are permitted in the examination room. Lecture notes, notebooks plain papers and textbooks are **NOT** allowed.
5. Mobile phones are not allowed. **SWITCH OFF THE MOBILE PHONES.**
6. Show all workings and calculations in the answer books.
7. **DRAW the STRUCTURES** clear and visible.
8. **DO NOT** over write.
9. Write your name and student ID number clearly on the front page of the answer books. **DO IT NOW.**

MARKING SCHEME:

SECTION A: [25 MARKS]

SECTION B: [15 MARKS]

SECTION C: [20 MARKS]

TOTAL 60 MARKS

SECTION A

ANSWER ALL QUESTIONS

1. (a) Give the rationale for implementing quality assurance in the analytical chemistry laboratory. [2 marks]

   (b) Give ONE **ISO** definition of quality. [2 marks]

   (c) Define laboratory accreditation and discuss its benefits. [3 marks]

   (d) Name THREE quality systems. [3 marks]

   (Total = 10 marks)

2. (a) Give ONE definition of method validation and discuss its benefits. [2 marks]

   (b) List the key performance characteristics of a method that are determined in the method validation process. [4 marks]

   (c) Explain how you would calculate the limit of detection (LOD) of a method. [2 marks]

   (Total = 8 marks)

3. In an experiment, Bumbu River water sample was analysed in duplicate by Flame AAS for copper concentration and the following results were obtained.

   Sample = 2.01 mg Cu/L (ppm).
   Duplicate = 1.89 mg Cu/L (ppm).
   A sample spiked with a 5 mg Cu/L standard and analysed gave a result of 6.95 mg Cu/L.

   (a) Calculate the mean mg Cu/L. [1 mark]

   (b) Calculate the relative percent difference (RPD) of the duplicates. [2 marks]

   (c) Calculate the % recovery of the spike. [2 marks]

   (d) If the accepted RPD for duplicate samples is 5% and the recovery is between 90-110%, comment on the accuracy and precision of the method based on the calculated results. [2 marks]

   (Total = 7 marks)

SECTION B

ANSWER ALL QUESTIONS

4. (a) Differentiate between ferrous and non-ferrous metals.

   (b) What makes ferrous metals vulnerable to corrosion?

   (c) Give a reason for the resistance of stainless steel to corrosion.

   (3 marks)

5. (a) Name the THREE types of stainless steels. [1.5 marks]

   (b) Explain why austenitic stainless steels are expensive? [2 marks]

   (c) Briefly describe high speed steel used in high speed cutting, milling and drilling operations. [1.5 marks]

   (Total = 5 marks)

6. (a) Give FOUR advantages of using non-ferrous metals in metal alloys. [2 marks]

   (b) Name the TWO types of brasses available commercially and give the percent composition of alloying metals. [3 marks]

   (c) What are the main alloys of aluminium? [2 marks]

   (Total = 7 marks)