



THE OPEN UNIVERSITY OF SRI LANKA
B.Sc. Degree Programme / Stand alone courses 2006/2007
Level 5 – Continuous Assessment Test I
CHU 3129 – INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

Duration: One and half-hours Date: 21st January 2007 from 3.30 p.m. to 5.00 p.m.

Reg. No.

Question No.	Marks
1	
2	
Total	
Percentage	

Instructions to candidates

- * Answer all questions.
- * This question paper consists of two questions and six pages. Write down answers on this paper itself, attached sheets will not be graded.

1.
(i) Write down the number of significant figures in the following numbers. Write down your answer in front of the number.

(a) 5.10 (b) 0.0014 (c) 1.4×10^5 (d) 1346
(08 marks)

(ii) Write down the value of $\log(1.00 \times 10^8)$ with correct number of significant figures.
(02 marks)

(iii) Briefly explain why do atoms give rise to line spectra?
(10 marks)

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(iv) A $0.075 \text{ mol dm}^{-3}$ sample of $\text{Co}(\text{NO}_3)_2$ gives an absorbance of 0.38 at 505 nm in a 1.00 cm cell. What is the cobalt concentration of a solution giving an absorbance of 0.26 in the same cell at the same wavelength? Show your calculations clearly along with the derivation of units.

(10 marks)

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(v) Draw a schematic diagram of a UV-visible spectrophotometer, showing its five essential parts.

(10 marks)

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(vi) Write down the names of three devices that can be used as a transducer in a UV-visible spectrophotometer.

(10 marks)

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2.

(i) Define absorbance by using an equation relating intensity of the incident light and the intensity of the transmitted light.

(05 marks)

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(ii) Write down how I_0 and I_T are measured by the spectrophotometer.

(10 marks)

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(iii) What is a diamagnetic molecule?

(05 marks)

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(iv) What is the function of a transducer in a UV-visible spectrometer?

(05 marks)

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(v) A photon beam has an energy of 450 kJ mol^{-1} . Calculate the wavelength of a photon in nanometers. Show the derivation of units clearly. Planck's constant = $6.626 \times 10^{-34} \text{ Js}$, Speed of light = $2.998 \times 10^8 \text{ ms}^{-1}$, Avagadro's number = $6.023 \times 10^{23} \text{ mol}^{-1}$.

(15 marks)

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(vi) Triplet excited state of a molecule is more stable than the singlet excited state of a molecule. Explain why?

(05 marks)

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(vii) Atomic absorption spectroscopy (AAS) and atomic emission spectroscopy (AES), are two different spectroscopic methods. **Clearly write down** in which spectroscopic method you need to have the maximum number of atoms in the ground state and in which spectroscopic method you need to have the maximum number of atoms in the excited state.

(05 marks)

AAS -

AES -