



NATIONAL OPEN UNIVERSITY OF NIGERIA
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ABUJA.

FACULTY OF SCIENCES
DEPARTMENT OF PURE AND APPLIED SCIENCE
SEMESTER EXAMINATION 2021_2⁴⁵⁶⁷⁸

COURSE CODE: CHM391
COURSE TITLE: PRACTICAL CHEMISTRY V – INORGANIC AND ANALYTICAL
TIME: 2 HOURS
INSTRUCTION: Answer question one and any other three questions.

QUESTION ONE

- 1a. Outline the principle of potentiometric titration 6 mks
- 1b. Explain how vibrational transition occurs in a compound 4 mks
- 1c. What is finger print region and its significance in infra red analysis? 6 mks
- 1d. HgS is confirmed by the formation of HgCl₂ when HgS is added to aqua regia
- (i) What is aqua regia? 2 mks
 - (ii) Write a balanced equation of reaction involved in the confirmation of HgS using aqua – regia 5 mks
- 1e. Write the full meaning of ‘HOMO’ and ‘LUMO’ 2 mks

QUESTION TWO

- 2a. Draw a hypothetical curve for potentiometric titration using e.m.f. readings with volume of titrant. Indicate the rough estimate of end point on the curve (7 mks)

2b. Give a brief description of the determination of wavelength of maximum absorption (λ_{\max}) and state main analytical importance of λ_{\max}

(8 mks)

QUESTION THREE

3a. A sample of hard water was analyzed for its calcium content by atomic absorption spectroscopy at 422.7 nm in nitrous oxide acetylene flame. The following readings were obtained . Concentration mg/L (absorbance) 0(0); 0.066(0.051); 0.130(0.103); 0.200(0.161); 0.275(0.221); 0.325(0.262); 0.388(0.312) unknown (0.143). What is the concentration of calcium in the unknown sample?

Hint: The different absorbances at different concentrations are the values in bracket while the concentrations are the values outside or before each absorbance in bracket.

(9 mks)

3b. Convert the following transmittances to percent absorbance (i) 0.79 (ii) 0.28 (iii) 0.31 (iv) 0.08

(6 mks)

QUESTION FOUR

4ai. With the aid of mathematical expression state the Beer – Lambert Law and define the terms

(9 mks)

4aii. What is the relevance of Beer – Lambert Law to spectroscopy UV- Visible spectroscopy?

(3 mks)

4b. Give an overview of the applications of uv/visible spectroscopy

(3 mks)

QUESTION FIVE

5a. Explain the unit in which IR spectral is reported

(4mks)

5b. Enumerate the types of vibrations found in organic molecules

(7mks)

5c. Write short note on the radiation or light source of a UV- Visible spectrophotometer

(4 mks)