

NATIONAL UNIVERSITY OF LESOTHO

FACULTY OF HEALTH SCIENCES

BSc NUTRITION

SUPPLEMENTARY EXAMINATIONS

NUT 3315- FOOD CHEMISTRY AND ANALYSIS II

DATE: AUGUST 2023

TOTAL MARKS: (100)

TIME: 3 HOURS

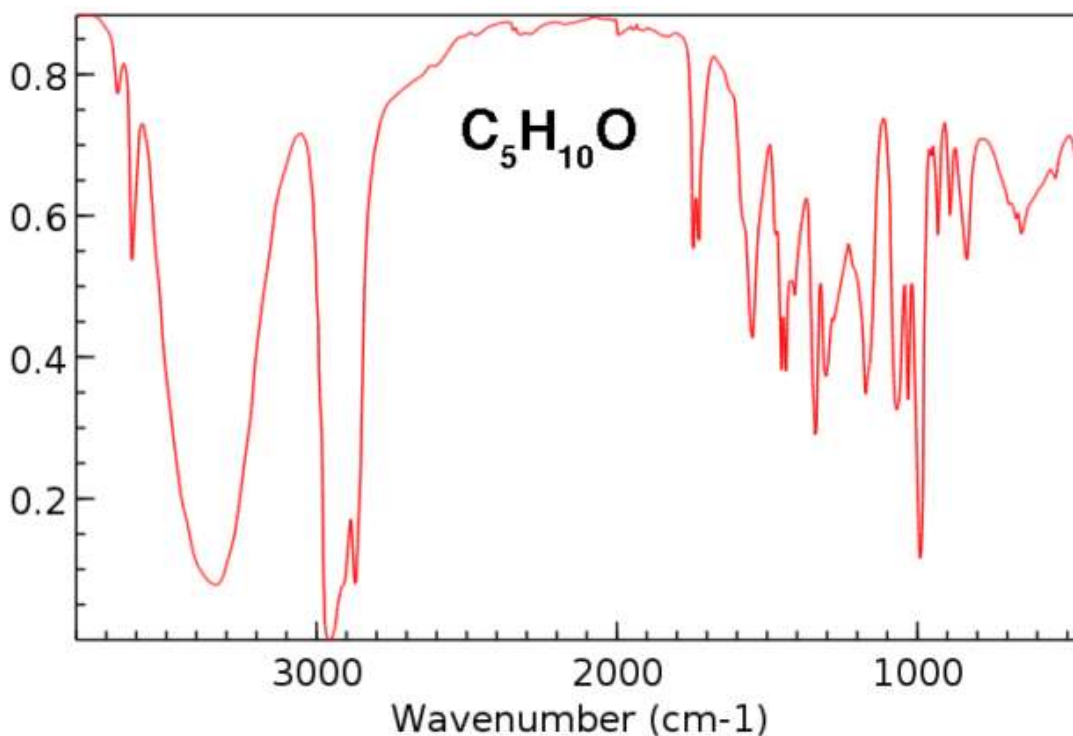
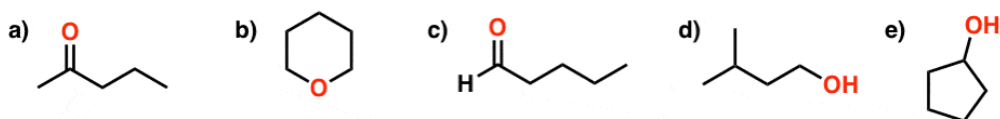
INSTRUCTIONS: ANSWER ALL QUESTIONS IN THIS QUESTION PAPER.

THE MARKS FOR EACH QUESTION ARE SHOWN IN THE BRACKETS.

Questions One

1. Describe the sample preparation in IR spectrophotometry. [8]
2. State four spectrophotometric errors and their corrections. [8]
3. The IR spectrophotometry spectrum below is for the unknown molecule with molecular formula $C_5H_{10}O$ in the analysis of food additives.
 - a. - [4]

Which of these molecules best corresponds to the IR spectrum below?



- b. What is the IUPAC name of the compound in (a) above? [2]

Questions Two

In the analysis of iron from the wheat flour using UV-VIS spectrophotometry, the complex $FeSCN^{2+}$ had the wavelength of its maximum absorption at 580 nm with a molar absorptivity of $7.00 \times 10^3 \text{ L cm}^{-1} \text{ mol}^{-1}$. Calculate

- a. The absorbance of a $3.75 \times 10^{-5} \text{ M}$ solution of the complex at 580 nm in a 1.00-cm cell. [8]

- b. The absorbance of a solution in which the concentration of the complex is twice that in (a). [6]

Questions Three

Give the numbers for a - l complete the following table.

Wavelength (m)	Frequency (s ⁻¹)	Wavenumber (cm ⁻¹)	Energy (J/molecule)
4.50×10^{-9}	(a):	(b):	(c):
(d):	1.33×10^{15}	(e):	(f):
(g):	(h):	3215	(i):
(j):	(k):	(l):	7.20×10^{-19}

Total [36]

Questions Four

Match the following;

[8]

Analytical Techniques	Definition
1. IR	A. Used for quantitative analysis of metals in the sample.
2. UV-VIS	B. Involves interaction between stationary phase and mobile phase to identify and quantify chemical components.
3. AAS	C. measurement of coloured reaction products
4. GC	D. Can be used to identify the functional groups of organic compounds.

Questions Five

The absorbance, A_o , of the fruit solution being tested for potassium is measured three times, giving replicate values, $A_o = 0.763, 0.741, 0.749$.

The calibration values of absorbances, A, of the six standard concentrations, C, are given in the table below:

C (mg L ⁻¹)	0	20	40	60	80	100	120
A	0	0.267	0.583	0.824	1.120	1.313	1.499

Molar mass of potassium permanganate, KMnO₄, M_m = 158 g mol⁻¹.

- a) Calculate a 'best-estimate' for the **molar absorptivity, ϵ** , of potassium permanganate at this wavelength, assuming that the path length of the cell used to hold the solution is 10 mm. [10]
- b) Use the experimental data to calculate a 'best-estimate' for the **concentration, C_0** , of the test solution. [10]

(You will need to consider the applicability of Beer's law for this particular set of experimental data.)

...End...