Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2017/2018

COURSE NAME	:	ANALYTICAL CHEMISTRY
COURSE CODE	:	DAS 12403
PROGRAMME	:	DAU
EXAMINATION DATE	:	JUNE / JULY 2018
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	ANSWER **FOUR (4)** QUESTIONS ONLY

TERBUKA

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

AIDA BT MUHAMAD
Penyelia
Jabatan Sains Dan Matematik
Pusat Pengajian Diploma
Universiti Tun Hussein Onn Malaysia

Q1 (a) (i) Explain the terms quantitative and qualitative analysis in Analytical Chemistry. Give example for each.

(4 marks)

(ii) Differentiate between classical and instrumental methods. Give examples.

(4 marks)

(b) State the steps in quantitative analysis. Discuss briefly each steps.

(10 marks)

(c) Correct acquiring sample techniques and preservation methods are very important when performing quantitative analysis. Discuss.

(7 marks)

Q2 (a) A solution was made by dissolving 25.25 g of KOH (56.1056 g/mol) into 250 ml of distilled water. Assume the density of solution d = 1.0186 g/ml.
Calculate the concentration in

(i) molarity

(3 marks)

(ii) molality

(3 marks)

(iii) ppm

(2 marks)

(iv) % w/w

(2 marks)

(v) % w/v

(2 marks)

(b) A solution was prepared by dissolving 27.50 ml of concentrated sulfuric acid (molar mass = 98.08 g/mol, d = 1.84 g/ml, 97% w/w) in 100 ml volumetric flask. The solution is then further diluted to 0.2 M. Explain the procedure to prepare the solution.

(8 marks)

(c) (i) Define the terms accuracy and precision.

(2 marks)

(ii) Draw the pattern of the data if the data obtained were low accuracy low precision, high accuracy high precision and low accuracy high precision.

(3 marks)

Q3 (a) (i) Define the term titrimetry.

(1 mark)

(ii) State the categories of titrimetry based on type of reactions.

(2 marks)

(iii) Differentiate between end point and equivalence point.

(2 marks)

TERBUKA

(b) (i) Explain what you can understand with 'titration curves'.

(1 marks)

(ii) Draw the titration curves for strong acid-strong base, strong base-strong acid, weak acid-strong base and weak base-strong acid titrations.

(4 marks)

(c) 4.06 g of impure magnesium oxide (MgO) was completely dissolved in 100 ml (in excess) 2.00 M hydrochloric acid (HCl). The excess acid required 19.7 ml of sodium hydroxide (NaOH) 0.200 M for neutralisation using phenolphthalein indicator and the end-point is the first permanent pink colour. Answer the following questions. Given atomic masses: Mg = 24.3, O = 16.

(i) Explain the purpose of using excess acid.

(1 marks)

(ii) Write the balanced equations for all reactions.

(2 marks)

(iii) Calculate the moles of HCl added to the MgO.

(2 marks)

(iv) Calculate the moles of excess HCl.

(2 marks)

(v) Determine the percent purity of the MgO

(8 marks)

Q4 (a) Draw and explain the energy transition between two states.

(2 marks)

(b) **Table Q4(b)** shows the UV/Vis analysis of **five (5)** standard solutions at different concentration. Answer the following questions.

(i) Redraw the table and fill in the table completely. Show all the calculations.

(20 marks)

(ii) Plot the graph of absorbance versus concentration.

(2 marks)

(iii) Determine the concentration of unknown sample labeled as Sample A if the absorbance detected is 2.5.

(1 mark)

Q5 (a) Explain the followings.

(i) infrared spectroscopy

(2 marks)

(ii) functional group

(2 marks)

(iii) the **four (4)** types of vibration modes in infrared spectroscopy.

(4 marks)

TERBUKA

(b) Draw the structure of alcohol, carboxylic acid and alkane group.

(6 marks)

(c) Describe the difference between symmetric and asymmetrical stretching.

(3 marks)

(d) Given the IR spectra of two chemical compounds shown in **Figure Q5(d)(i) and Q5(d)(ii)**. Differentiate the two spectra by identifying at least **three (3)** absorbance bands in each spectrum. Predict the two compounds.

(8 marks)

Q6 (a) (i) Write the definition of chromatography.

(1 mark)

(ii) Explain **three (3)** types of chromatography.

(6 marks)

(iii) Describe **three (3)** major high performance liquid chromatography (HPLC) components and their functions.

(6 marks)

(b) An internal standard is used in the lab experiments using gas chromatography (GC) but not high performance liquid chromatography (HPLC). Explain.

(2 marks)

(c) Calculate the number of theoretical plates N and the plate height H, when the retention time is 15.20 minutes, half of the base width (given in minutes) is 0.55 minutes and the column length is 25cm.

(5 marks)

(d) The following questions regard to the chromatograms shown in **Figure Q6(d)**. Choose the column that

(i) has greater efficiency.

(1 mark)

(ii) gives a greater selectivity factor (for X and Y).

(2 marks)

(iii) gives greater resolution between X and Y.

(2 marks)

Justify the answer for each **Q6(d)** (i), (ii) and (iii).

-END OF QUESTIONS-

TERBUKA

FINAL EXAMINATION

SEMESTER / SESSION : SEM 2 / 2017/2018 PROGRAMME : 1 DAU
COURSES : ANALYTICAL CHEMISTRY COURSES CODE : DAS 12403

Table Q4(b) : UV/Vis analysis

Absorbance at 425 nm	I	Io	%T	Concentration (mol/L)
0.0 (Blank)		0.40		
0.200		0.40		0.004
1.000		0.40		
1.500		0.40		
2.000		0.40		
2.500		0.40		

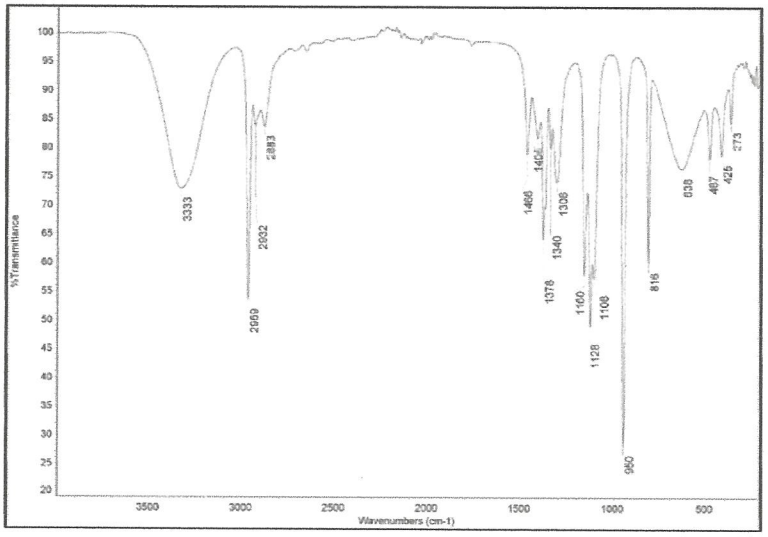

Figure Q5(d)(i)

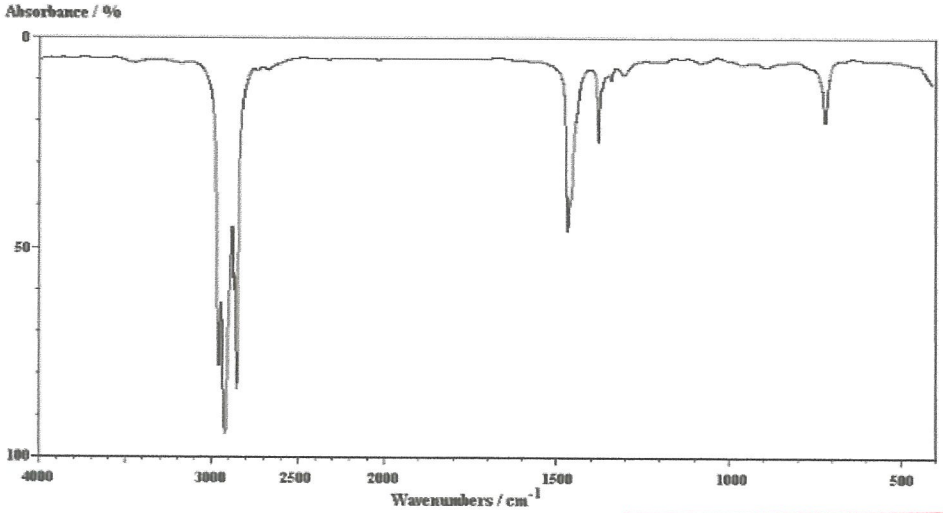

Figure Q5(d)(ii)

TERBUKA

FINAL EXAMINATION

SEMESTER / SESSION : SEM 2 / 2017/2018
COURSES : ANALYTICAL CHEMISTRY

PROGRAMME : 1 DAU
COURSES CODE : DAS 12403

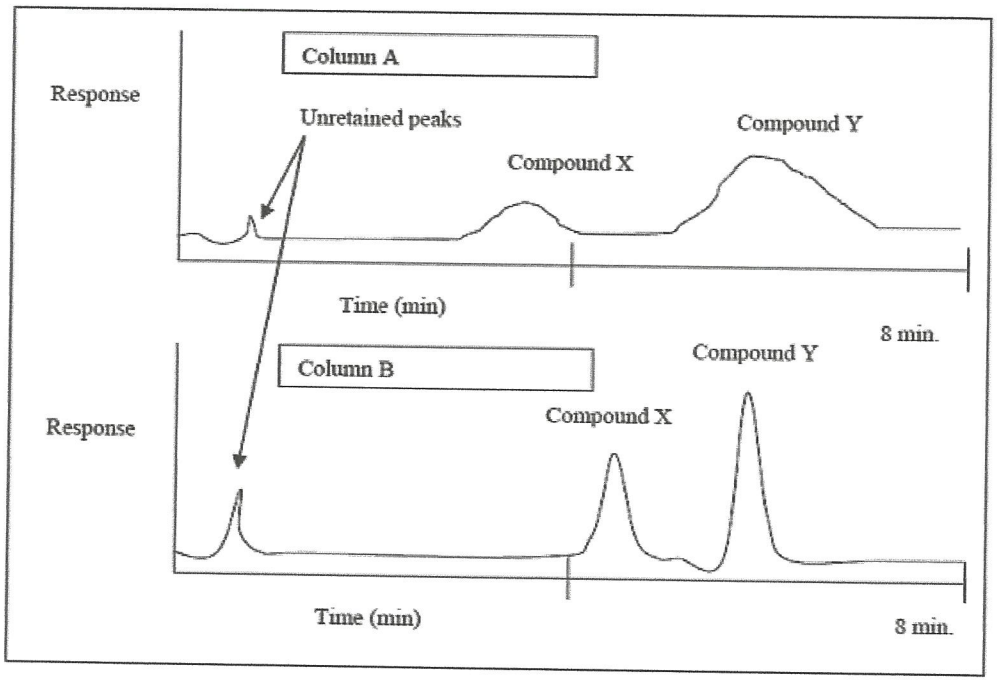

Figure Q6(d)

TERBUKA

AIDA BT MUHAMAD
Pensyarah
Jabatan Sains Dan Matematik
Pusat Pengajian Diploma
Universiti Tun Hussein Onn Malaysia