UNIVERSITY OF JOHANNESBURG

PROGRAM	:	B ENG TECH EXTRACTION METALLURGY
SUBJECT	:	**ANALYTICAL TECHNIQUES 2**
CODE	:	**PSTMTA2**
DATE	:	WINTER EXAMINATION 28 May 2019
DURATION	:	(SESSION 2) 12:30 - 13:30
WEIGHT	:	40: 60
TOTAL MARKS	:	80

EXAMINER	:	MS S.S. LEPHUTHING
MODERATOR	:	MR M DE VILIERS
NUMBER OF PAGES	:	3 PAGES

INSTRUCTIONS	:	ANSWER ALL QUESTIONS. CALCULATORS PERMITTED (ONE PER STUDENT).
REQUIREMENTS	:	2 SCRIPTS PER STUDENT

Question 1 [30]

1.1. What does the sample preparation depends on, for sample preparation before carrying out an analysis; [4]

1.2. Relative error is defined as the percentage of error compared to the true value, and there are two principal errors occurring during analysis. List the errors and further explain each [8]

1.3. Cyanide (CN^-) contamination in drinking water next to the gold mine was analysed by analysts A and analysists B. Based on the results below, use the F-test and T-test (at 5%) to determine the significant difference of the standard deviations between Analysts A and B [10]

Analysts A (n = 7): 0.069 ± 0.005 mg/L (± refers to one standard deviation)

Analysts B (n = 5): 0.078 ± 0.007 mg/L

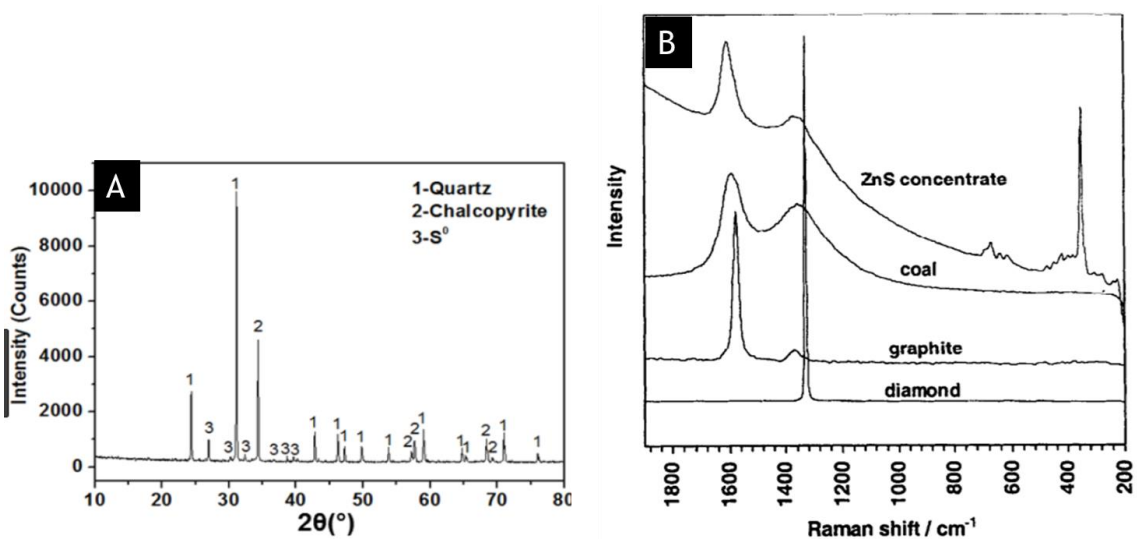
1.3.1. If the standard cyanide (CN^-) contamination that is acceptable to be disposed to the residue tailing dam is 0.008 mg/L and the difference between the analyzed values and the true values of analysts A and B are 0.003 and 0.001. Which analysts has a higher percentage relative error compared to standard acceptable contamination? [6]

Question 2 [35]

2.1. XRF instrument and EDS/ EDX that is normally equipped with SEM both can determine elemental analysis from which equipment are the results much more preferable than the other and why? [3]

2.2. Wavelength-dispersive (WD) is one of the categories spectrometers for XRF instrument on elemental analysis, explain why is preferable than energy-dispersive (ED) spectrometer. [6]

2.3. Name the equipment of the spectrums shown in figure 1 [2]



2.3.1. There are four measurements that can achieved using the equipment of spectrum A, explain further those measurements [8]

2.3.2. The spacing planes of atoms in crystal ABC was found to be 1.8 angstroms using an X-ray wavelength 122 pm. Assuming second order diffraction, what should be the angle at which the X-rays will be reflected across the surface of the crystal [6]

2.4. SEM and TEM are both scientific instruments that use a beam of highly energetic electrons to examine objects on a very fine scale to get information about the topography, morphology, composition and crystallographic information. Further explain the deference between these two instruments [10]

Question 3 [15]

3.1. In fire assaying experiments, crucible corrosion and addition of flux relates. Explain why the charge (e.g. Flux and ore) must be balanced? [4]

3.2. During crucible fusion, the base metals present should be kept oxidized to prevent them entering the metal phase. What are the components that should be added to keep these base metal oxidized? [3]

3.3. A 50 g assay aliquot of ore containing pyrite was assayed for gold and silver. Calculate how much of litharge and sodium carbonate that is required for 1.5 g pyrite [8]