Uva Wellassa University of Sri Lanka
Faculty of Applied Sciences
Department of Science and Technology
400 Level 1st Semester Examination – July / Auguest 2019
MRT 414-1 Mineral Value Addition Laboratory - II

Uva Wellassa University

Instructions to candidates
Duration: One (01) Hour
Number of questions: Structured Essay 12
Answer All Questions
Mark allocation: 100 Marks
Illustrate your answers with sketch/diagrams where necessary

1. a. What is the standard method for Carbon Content Analysis? [02 marks]

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b. How do you perform the Carbon Content Analysis? [08 marks]

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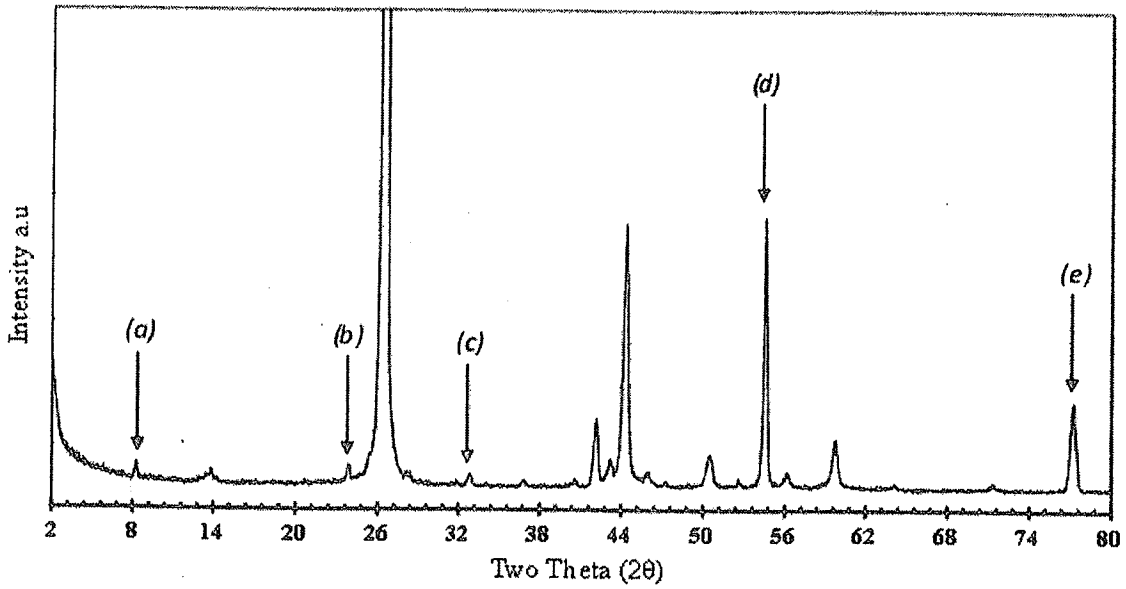
Refer below X-ray diffractogramme of natural vein graphite (Graph 01), to answer for question no 02 and 03.



Graph 01 - X-ray diffractogramme of natural vein graphite

(7/2)

2. Find the d-spaces of the peaks, marked as a, b, c, d and e in X-ray diffractogramme by filling the table below. (Hint - Bragg's Law $n\lambda=2d.\sin\theta$, n=1 and λ=1.5418 Å) [10 marks]

Peak ID	2θ	sinθ	d-space (Å)
(a)	.....	.....	.....
(b)	.....	.....	.....
(c)	.....	.....	.....
(d)	.....	.....	.....
(e)	.....	.....	.....

3. Identify the peaks relevant to graphite with their miler indexes and gangue mineral as "GM". Hint - Use the JCPDS card for graphite (Figure 01) given below [08 marks]

(a). .....

(b). .....

(c). .....

(d). .....

(e). .....

12-0212 Wavelength= 1.5418

C

Carbon

Graphite

Rad.: CuKa λ: 1.5418 Filter: d-sp:

Cut off: Int.: I/Icor.:

Ref: Read, M., Bell Telephone Laboratories, Murray Hill, NJ, USA, Private Communication, (1960)

Sys.: Hexagonal S.G.: $P6_3/mmc$ (194)

a: 2.464 b: c: 6.736 A: C: 2.7338

α: β: γ: Z: 4 mp:

Ref: Ibid.

Dx: 2.253 Dm: SS/FOM: F_{12} = 5(0.118 , 20)

PSC: hP4. Deleted by revision. Mwt: 12.01. Volume[CD]: 35.42.

d(A)	Int	h	k	l
3.37	100	0	0	2
2.132	2	1	0	0
2.036	3	1	0	1
1.80	1	1	0	2
1.68	8	0	0	4
1.54	2	1	0	3
1.23	6	1	1	0
1.15	6	1	1	2
1.12	2	0	0	6
1.05	2	2	0	1
.99	4	1	1	4
.84	1	0	0	8
.82	2			

Figure 01 - JCPDS card for graphite

4. What do you mean by "*Surface Modification*" of graphite? [04 marks]

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5. Briefly explain the chemical oxidation method for graphite surface modification. [08 marks]

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6. Name three (03) characterization techniques that can be used to confirm the surface modification of graphite. [06 marks]

i). .....

ii). .....

iii). .....

7. Refer the given Fourier-transform infrared spectroscopy (Graph 02) to answer the following questions.

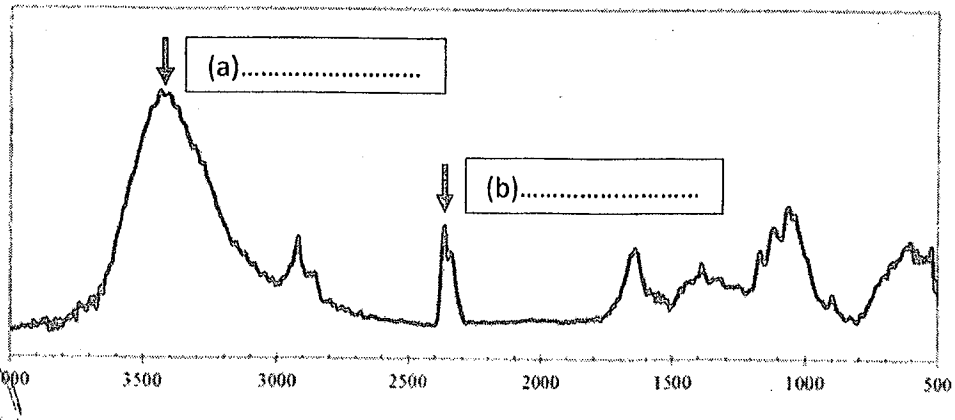
(a). Name X and Y axis on the FTIR spectroscopy with the units. [04 marks]

(b). Identify and mark the peaks mentioned in the below FTIR spectroscopy. [06 marks]

(c). What is the reason for appearing that above mentioned two peaks in most of FTIR graphs? [06 marks]

(a). .....

(b). .....



X = ...

Graph 02 - Fourier-transform infrared spectroscopy

8. Explain the preparation of Graphene oxide by modified Hummer's method. [14 m

9. What is the safety precaution, when adding H_2O_2 to the reaction mixture, in the preparatio Graphene oxide by modified Hummer's method? [04 mar

10. Briefly discuss the surface properties of Graphene oxide compared to the raw graphite with aid of following Scanning Electron Microscopic images (Figure 02). [06 mar

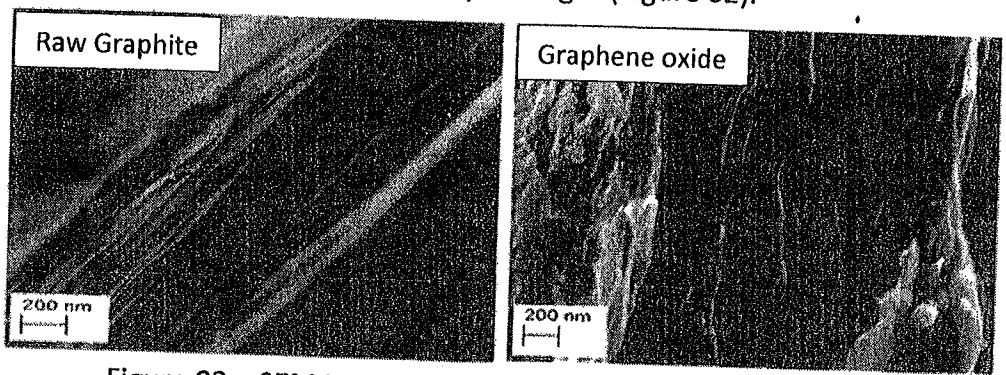


Figure 02 – SEM Image of Raw graphite and Graphene oxide

arks]

1. How do you perform the calcination of dolomite before the preparation of Precipitated Calcium Carbonate (PCC) nanoparticles? [04 marks]

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2. Briefly explain the synthesis method of Precipitated Calcium Carbonate (PCC) nanoparticle by Ca^{2+} - ligand complexes. [10 marks]

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