UNIVERSITY OF MINES AND TECHNOLOGY, TARKWA

SECOND SEMESTER EXAMINATIONS, MAY

COURSE NO: **MR 354**

COURSE NAME: **MINERAL CHEMISTRY**

CLASS: **MR III** TIME: **3HRS**

Name**:** _____Index Number: _____

ANSWER ALL QUESTIONS

1. a) Differentiate between Reflected and Transmitted Light Microscope (**6 marks**)

   b) Write short notes on the following terms

   (i) Polishing hardness

   (ii) Microindentation hardness

   (iii) Opaque minerals

   (iv) Anisotropic minerals

   (v) Scratch hardness

   (vi) Plane polarized light (**2marks each**)

2. a) Concisely describe the three main stages in polished section preparation. (**15 marks**)

   b) Describe how to set up a microscope for pyrite identification in a polished section. (**5 marks**)

   c) (i) What is a reflectance? (**2 marks**)

   (ii) List three (3) factors that influence reflectance of a mineral during ore microscopic examination. (**3 marks**)

   (ii) State and describe the possible errors to be encountered when measuring a reflectance of a mineral. Provide a corrective measure for each of the errors. (**3 marks**)

   (iv) State the significance of optical reflectance in ore and process mineralogy. (**3 marks**)

3. a) Copy and complete Table 1. (**20 marks**)

Mineral	Formula	Colour	Reflectance	Anisotropy
Chalcocite				
Hematite				
Galena				
Bornite				
Ilmenite				

Jamesonite				
Arsenopyrite				
Pyrite				
Pentlandite				
Sphalerite				

b) What are clay minerals? (**2 marks**)

c) With the aid of a diagram, list and explain the three (3) classes of clay minerals found in gold and base metal ore deposits. (**6 marks**)

d) Explain the negative effects of clay minerals on sulphide mineral flotation. (**6 marks**)

e) Cyanidation of gold ore gave gold recovery of 70%. A mineralogical characterization of the tailings revealed 35% pyrite, 50% silicates (predominantly quartz), 11% dolomite and 4% other trace minerals. QEMSCAN analysis using PMA and SMS modes detected 15 native/electrum minerals and 45 gold-silver telluride (petzite) grains. The Au particles were all below 15 μm. The petzite grains were associated with hessite and galena minerals. Spot analysis of the identified gold-mineral particles showed 18% Au, 42% Ag and 40% Te. A four stage diagnostic leaching also revealed 70% free (cyanidable) gold, 3.98% carbonaceous locked gold, 25.3% locked in sulphide minerals and 1.02% silicate encapsulated. As the project metallurgist responsible for this project, discuss the possible causes of the gold lost based on the leaching and mineralogical results. Again, propose strategies to mitigate the effects and to improve recovery. (**7 marks**)

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