



Uva Wellassa University, Sri Lanka  
End Semester Examination – September/ October 2012  
MRT 421-1 Mineral Nanoscience



Duration: One (01) hour

Total 05 (five) questions  
Answer 04 (four) questions only

- 01) i. Explain the following terms used in nanotechnology and nanoscience.  
(a) Top down method for nanoparticle production  
(b) Bottom up method for nanoparticle production  
(30 marks)
- ii. List three (03) methods used for the production of Carbon Nanotubes (CNTs).  
(30 marks)
- iii. Describe the properties and applications of Carbon Nanotubes (CNTs).  
(40 marks)
- 02) Explain the working mechanisms and principles behind the following characterization methods used in nanotechnology. Explain using diagrams.  
(a) Atomic Force Microscopy (AFM)  
(b) Scanning Electron Microscopy (SEM)  
(100 Marks)
- 03) i. What is Acid Mine Drainage? Explain briefly.  
(40 Marks)
- ii. Explain the process of nanoparticle formation in acid mine drainage. Give 3 examples.  
(60 Marks)
- 04) i. Describe the "Chloride process" for manufacturing ultrafine titanium dioxide (TiO<sub>2</sub>) pigment from ilmenite (FeTiO<sub>3</sub>) sand. Write all balanced chemical equations related to this process.  
(30 Marks)

- ii. Describe the "Sulphate process" for manufacturing ultrafine titanium dioxide titanium dioxide ( $\text{TiO}_2$ ) pigment from ilmenite ( $\text{FeTiO}_3$ ) sand. Write all balanced chemical equations related to this process. (40 Marks)
- iii. Explain the principles behind the "sol-gel method" used for the synthesis of titanium dioxide nanoparticles (nano- $\text{TiO}_2$ ). Explain using an example. (30 Marks)
- 05) i. Explain the principles behind the hydrocyclone separation method used for the separation process of very fine particle of nanoclay (Montmorillonite) from a clay deposit. (60 Marks)
- ii. Describe the properties and applications of nanoclay (Montmorillonite). (40 Marks)