UvaWellassa University, Sri Lanka
Faculty of Science and Technology
Mineral Resources and Technology Degree Programme
1st Semester Examination – March/April 2013

MRT 321-3 Basic Water Chemistry

Part II

1.

a.

Routine analysis of a water sample provides the following concentrations (in mg/l): Ca, 93.9; Mg 22.9; Na 19.1; bicarbonate 344; sulfate 85.0; chloride 9.0; pH 7.20.

I. Calculate the charge balance error. Is the water analysis acceptable? Comment on your answer.

II. Determine the hardness of the water in mg/L as $CaCO_3$

(20 marks)

b.

I. Discuss the principle of the hardness determination of a water sample by EDTA titration method. (20 marks)

II. 50 l of standard hardness water (SHW) containing 0.2 mg/ml $CaCO_3$ consumed 11.2 ml of EDTA solution for thecomplete titration in presence of Eriochrome black T. Determine the strength of the EDTA solution. 50 ml of tap water required 16.8 ml of the same EDTA solution for complete titration. Calculate the total hardness of the tap water. (20 marks)

c.

When both H^+ and OH^- are expressed on the *m* scale, and when H_2O is expressed on the mole fraction, the value of the acidity constant for water (K_w) at 25 ^{0}C/1 atm is $1.01 \times 10^{-14} m^2$. What would the constant equal at 25 ^{0}C/1 atm be, if we were to adopt the molal scale for expressing H_2O? (40 marks)

2.

a. The mathematical definition of the buffer capacity is $\beta = \frac{d(C_b - C_a)}{dpH}$. Based on this definition plus the intuitive understanding of the aqueous solutions, explain why the value of β can never be zero for any solution. (25 marks)