Uva Wellassa University, Sri Lanka
End Semester Examination - March 2011
MRT 322-1 Water Quality Analysis Methods

Time: One (01) hour

Total 04 questions
Answer all questions
You may use standard symbols/ abbreviations without a definition

Na 23; K 39; O 16; H 1.00; C 12.0; Cl 35; Ca 40.0; Mg 24

1) (i) State five water quality parameters that are routinely measured in drinking water. Your answer should contain at least a single parameter from each of the following categories: biological, chemical and physical.

(25 marks)

(ii) How are major and trace constituents in drinking water classified? State two examples from each category.

(25 marks)

(iii) Routine analysis of a water sample provides the following concentrations (in mg/L): Ca 93.9; Mg 22.9; Na 19.1; bicarbonate 344.0; sulfate 85.0; chloride 9.0; pH 7.20.

(a) Express the concentration in terms of molarity
(b) Determine the hardness of the water in mg/L $CaCO_3$

(25 marks)

(iv) What is a Water Quality Index? Give the names (in abbreviated form) of three organizations that formulate water quality standards. Name the water quality index routinely used in Sri Lanka?

(25 marks)

2) (i) The following "total analysis" of a water sample has been reported. Note that the pH is not given.

$NH_3 - N$	0.08 mg/L
$NO_2^- - N$	0.008 mg/L
$NO_3^- - N$	2.00 mg/L
Na^+	227 mg/L
K^+	18.3 mg/L
Cl^-	24.1 mg/L
F^-	21.2 mg/L
HCO_3^- as C	15 mg/L
Ca^{2+} as $CaCO_3$	1.7 mg/L
SO_4^{2-}	20 mg/L

Do a charge balance calculation on the data. Comment on your results. Calculate the ionic strength of the water sample. Can activity coefficients of the solute species be treated as one?

(25 marks)

(ii) The following water analysis is reported in mg/L. Calculate the TDS content of this sample.
Ca 48.0; Mg 3.6; Na 2.1; K 0.1; bicarbonate 152.0; sulfate 3.2; chloride 8.0; nitrate 0.2; total iron 0.08; pH 7.5. Clearly indicate assumptions you made in the calculations.
(25 marks)

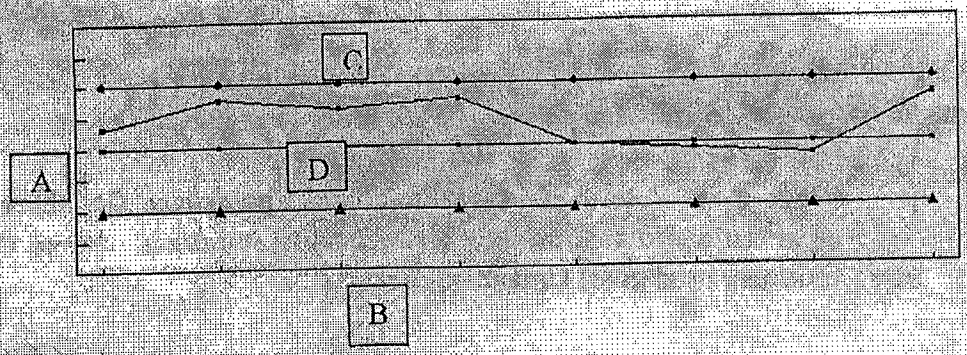
(iii) State three types of water sampling methods.
(25 marks)

(iv) The concentration of the fluoride in drinking water and the incidence of tooth mottling showed a distinct correlation. Why?
(25 marks)

3) (i) The following analytical methods are routinely used in water analysis: potentiometry, titrametry, spectrometry and gravimetry. Which methods are used in the detection of following parameters in water? total hardness; alkalinity; nitrate, sulfate and pH.
(25 marks)

(ii) Define the COD content in a water sample. How is it routinely measured? Calculate the theoretical COD of 0.02 M of glucose.
(25 marks)

(iii) A specimen of a control chart used with pH meter is shown below. Label A, B, C, and D in the diagram.
(25 marks)



4) (i) Write short notes:
(a) Water Disinfection
(b) Chlorine Demand
(c) THM
(25 marks)

(ii) Write down balanced chemical reactions between chlorine and ammonia.
(25 marks)

(iii) What is breakpoint chlorination? Illustrate your answer with a graph showing the regions of residual chlorine, chloroamine formation and destruction zones, breakpoint, and free chlorine.
(25 marks)

(iv) How is residual chlorine content in drinking water determined (only state the chemical principles behind this method?
(25 marks)