

**M.Sc. DEGREE I SEMESTER EXAMINATION IN ENVIRONMENTAL  
TECHNOLOGY, NOVEMBER 2008**

**ENV 2108 CHEMO METRICS AND GOOD LABORATORY PRACTICES**

Time : 3 Hours

Maximum Marks : 50

**PART – A**(Answer **ANY TWO** questions)(Each question carries **SEVEN** marks)

(2 x 7 = 14)

- I. 1. Three samples, namely A, B & C are submitted to an analytical laboratory and the chemist carried out five determinations on each sample. The values of determination are given below :

Sample	Determination values				
A	6.1	6.3	6.2	6.5	5.9
B	36.5	37.3	36.9	38.4	35.4
C	241.5	244.7	237.5	252.9	242.9

Find the mean and standard deviations and calculate the coefficient of variance for each sample.

2. A chemist was asked to analyse a sample having known concentration of 50 mg/L of chlorine in water. Eight determinations were made by the chemist and the values are given below :

49.4, 49.8, 50.8, 49.3, 51.3, 50.0, 50.8, 51.8

Find the maximum possible bias for this chemist if 95% confidence interval is 2.36. (where  $n$  = sample size,  $\bar{x}$  = sample mean,  $s$  = sample standard – deviation,  $\mu$  = hypothesized population mean)

3. Gaussian Plume model is used to estimate ground level concentration of pollutant coming from a source of pollution. Explain how changes to meteorology (different stability class) affect plume spread using this dispersion model.

**PART – B**(Answer **ANY FOUR** questions)(Each question carries **SIX** marks)

(4 x 6 = 24)

- II. 1. Write brief note on any three of the following :

- (i) Regression control chart
- (ii) Moving average chart
- (iii) Exponentially – weighted moving average chart
- (iv) Pareto analysis.

**(Turn Over)**

2. How would you calibrate 50 ml burette? You have to cover at least five important steps. How the various data will be recorded for calculating the correction? Draw a blank table for recording the required experimental data.

3. In general, the errors in any set of measurement can be divided into following categories :

- (i) Systematic, determinate or constant errors
- (ii) Random or indeterminate errors
- (iii) Errors in measurements
- (iv) Gross errors
- (v) Other errors

Give a brief account of your understanding of above categories for minimizing the errors.

4. Laboratory note book is a complete record of what the analyst has done in the laboratory. Give a brief account of essential requirements as the same is used as legal document that records individual's original work.

5. Give a brief account of personal and general laboratory safety. What are the design aspects to be considered for installation and operation of high efficient fume chambers in chemical laboratory?

### PART – C

(Each question carries SIX marks)

(2 x 6 = 12)

III. 1. Write whether the given statements are TRUE or FALSE.

(Answer Any Six of the following) :

- (i) The density of water at 3.98°C is 1.0 g/ml.
- (ii) Pre-rinsing of pipette with the given chemical increases the precision and accuracy of measurement as the pressure and temperature of the pipette is stabilized and also wetting the walls of the tip will not take place.
- (iii) The precision of the pipette can be calculated using the following formula :  

$$\text{Coefficient of Variation} = \frac{\text{Standard deviation of the volumes at setting} \times 100}{\text{Mean of the volumes at the setting}}$$
- (iv) The mean error of the pipette can be calculated by subtracting 'the volume setting value of the pipette' from 'mean of the volumes at the setting ( $\bar{x}$ ).'
- (v) While setting the delivery volume (of pipetting) always approach the desired setting from the higher side to eliminate backlash.
- (vi) Unlike molarity, molality is independent of temperature because mass does not change with temperature.
- (vii) In acid-base chemistry, normality is used to express the concentration of proton or hydroxide ions in the solution.

(Contd.....3)

2. Complete the statements by filling the blanks .

(Answer Any Six of the following) :

- (i) 2 N sulphuric acid, means that the normality of  $H^+$  ions is .....  
or molarity of sulphuric acid is .....
- (ii) In redox reactions, normality measures the quantity of ..... or  
..... agent that can accept or furnish one mole of .....
- (iii) In precipitation reactions, normality measures the concentration of  
..... Which will ..... in a given reaction.
- (iv) In air pollution studies (ambient air) the concentration of particulate matters,  
aerosols or cloud droplets are commonly expressed as ..... to  
eliminate the need of taking into account the impact of .....  
and pressure on the density.
- (v) The components in waste water usually decomposes rapidly at room  
temperature, therefore, fixing or preservation of components in the sample  
is essential. For the estimation of cyanide ..... is added to the sample  
(for preserving) for adjusting the pH to .....
- (vi) In solid or liquid waste, Cr (VI) is considered as human .....  
and therefore related safety practices are necessary. Highly toxic and volatile  
compound, known as ..... is produced when chloride or halogens  
are added to chromic acid solution.
- (vii) Complete the equation given below :

