DOON UNIVERSITY, DEHRADUN

End Semester Examination, Second Semester, 2012

School of Environment & Natural Resources

Ph. D. Course work (Environmental Studies and Natural Resources)
Course: EES – 618: Analytical Techniques and Instrumentation

Time Allowed: 3Hour   *Maximum Marks: 50*

Note: Attempt Questions from Sections A,B,C. Graph sheet is required..

SECTION: A (Objective Type Questions. Attempt All Questions. (Marks: 1 X 1=10)

1. In ICP Plasma Discharge is generated by
   a) Magnetic Field Generator   b) Electric Field Generator
   c) Rotational Frequency Generator   d) Radio Frequency Generator

2. A Plasma in ICP consists of
   a) Electron, Proton and Neutral molecules   b) Electron and Proton
   c) Electron and Neutral molecules   d) Only Electron

3. Commonly used Detector/s in GC is/are
   a) FID and TCD   b) Only FID
   c) Only TCD   d) None of these

4. GPC (Gel Permentation Chromatography) used for the separation of
   a) Macro Molecules   b) Small Organic Compounds
   c) Complexed Inoraganic compounds   d) All

5. Scanning Electron Microscopy used to determine the
   a) Surface Morphology of Solid Materials
   b) Surface Morphology of Semisolid Materials
   c) Surface Morphology of all kind of Materials

6. Refractive Index Detector is used in
   a) GC   b) ICP
   c) HPLC   d) TLC

7. HPLC is a
   a) Qualitative Technique   b) Quantitative Technique
   c) Both   d) None of these

8. Titrant used to determine the % of Chlorine is
   a) Standard EDTA solution
   b) Standard NaOH solution
   c) Standard Na_2SO_3 solution
   d) Standard HCL solution

9. The pH range for Methyl Orange Indicator is
   a) pH 4.2 to pH 6.0   b) pH 3.2 to pH 6.0
   c) pH 3.2 to pH 4.2   d) pH 6.0 to pH 10.0

10. EBT (Euriochrom Black-T) is used as an Internal indicator to determine the
    a) Alkalinity of Water   b) Hardness of Water

P.T O

c) Turbidity of Water   d) Acidity of Water

1. Equal Volume of monochlorobenzene, dicholorobenzene and trichlorobenzene were chromatographed, the area found under each peak were 6.36, 7.55 and 7,45 cm² Assume that the detector response is equal, calculate the percentage composition of the mixture.

2. A 8.00 X 10^{-3} M solution of an organic compound was kept in a UV cell having a path length of 1.00 cm. When exposed to a wavelength of 500 nm, the absorbance of the solution is found to be 0.445. What is the molar absorptivity of organic compound at this wavelength?

3. (a) Why a separate lamp is required to determine each element in AAS?
   (b) What are the disadvantages of a total consumption burner as compared to premix laminar burner used in AAS?

4. A student prepared standard lead solutions for comparison and the absorbance of each solution was measured. A road-side soil sample was also prepared. The results are shown in the table below.

| Sample	Concentration (ppm)	Absorbance
Blank	0.00	0.00
Standard 1	1.00	0.17
Standard 2	2.00	0.34
Standard 3	3.00	0.48
Standard 4	4.00	0.65
Standard 5	5.00	0.83
Unknown Sample	?	0.58

   Calculate the concentration of unknown sample.

5. (a) Calculate the wave length of the resonance line of the sodium atom if the excitation energy of resonance level is 2.10 eV. (Given $hc = 12,350$)
   (b) Explain transmittance and absorbance. Calculate the absorbance of a given sample having transmittance 20%.

6. (a) Commercially available concentrated hydrochloric acid is 37.0% w/w HCl. Its density is 1.18 g/mL. Using this information calculate the Molarity of concentrated HCl.
   (b) List out the factors that affect the separation of compounds in GC.

1. Discuss the Principle and Instrumentation of Inductively Coupled Plasma?
2. Give the detail instrumentation of Gas Chromatogram.
3. How will you determine the total alkalinity of a given water sample? Discuss theoretically.

5. Calculate the amount of compound for the data given in **entries 6, 10 and 13** in HPLC spectra?
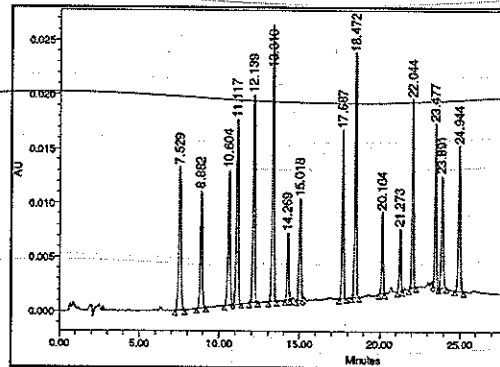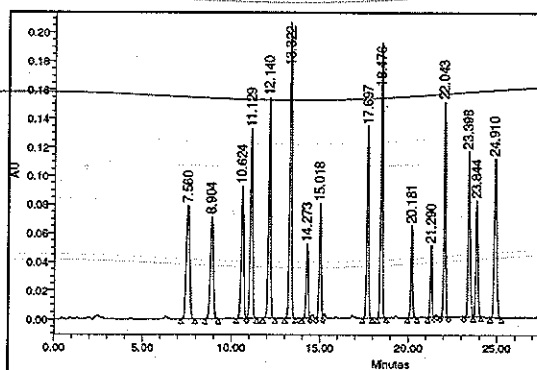
A (for standard)

B (for Sample)

And the data is (**RT = Retention Time**)

S. No	RT	% Area std	% area sample	S. No	RT	% Area std	% area sample
	RT	Area	Area	9	17.697	951963	111012
1	7.560	1089800	129490	10	18.476	1359427	158252
2	8.904	827955	98068	11	20.181	438434	50223
3	10.624	897975	109315	12	21.290	329167	38142
4	11.129	1186443	139341	13	22.043	1022908	117597
5	12.140	1305412	153258	14	23.398	927992	107410
6	13.322	1643846	193949	15	23.844	666323	87495
7	14.273	408431	46297	16	24.910	1012227	118740
8	15.018	622334	72574				