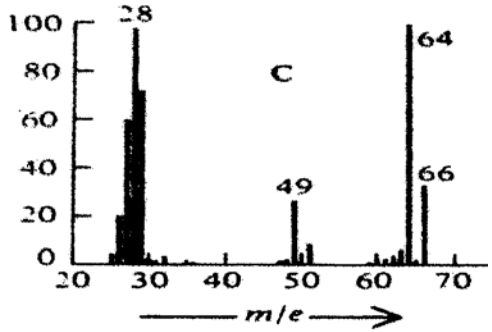


4. Answer ***any five*** questions :

a) Draw a schematic block diagram of a double beam UV-*v* is spectrometer. 2

b) How many grooves/cm must be cut on a grating monochromator block of 3 cm long, to resolve spectrum lines of 599.9 nm and 600.1 nm in a UV-*v* is spectrometer (1st order diffraction)? 2

c) Discuss the working principle of ATR-IR spectrometer is with schematic diagram. 2

d) Discuss how the sensitivity of a UV-Vis spectrometer related to data collection time and number of scans. 2

e) Discuss about the advantages of FT-IR spectrometer over dispersive IR spectrometer. 2

f) Write short note on ***any one*** : 2

i) Photomultiplier Tube (PMT),

ii) Grating monochromator

B. Sc. Chemistry Examination, 2023

(6th Semester)

CHEMISTRY (DSE)

Paper: DSE/Chem/Th/01

Time : Two Hours Full Marks : 40

UNIT : 6012-I

1. Answer ***any four*** questions.

a) Draw line diagram of AAS and explain the function of individual instrumental part. Give experimental detail for determination of As (Arsenic) in water sample. Is there any difference between Absorption Spectra of Atoms and Molecules? Explain. $2\frac{1}{2}$

b) An electroactive ion is moving towards electrode surface from bulk. Trace the journey in view of the chemical and electronic structure of the ion. Account on the redox process thereafter. $2\frac{1}{2}$

c) Using potentiometric titration determine concentration of Ca^{2+}, Cd^{2+} and Bi^{3+} in a mixture by using Na_2EDTA solution at controlled pH. Draw the potentiometric diagrams. $2\frac{1}{2}$

d) Write notes on use of membrane selective electrodes for identification and estimation of SO_2 in a gas mixture. Why does glass membrane become

inoperative in strongly acidic solution (pH < 4) and basic solution (pH > 11)? $2\frac{1}{2}$

e) Why are magnetic field and electric field applied in Mass Spectrometry? Explain the Fragmentation Rules in Mass Spectrometry. $2\frac{1}{2}$

f) Give schematic presentation of Flame photometry. Write experimental detail for detection of Li^+ in blood sample and K^+ in soil sample. $2\frac{1}{2}$

2. a) Describe the basic principle of ESCA. What are its utilities? 2+2

b) Derive the required equation involving magnetic flux density and angular momentum of nucleus assuming nucleus being a charged particle in spinning motion. 3

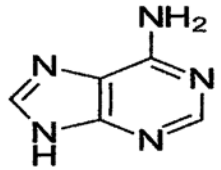
c) Calculate the specific activity of a 10.0 mg sample of an aluminium alloy containing 0.041% manganese (^{55}Mn) which undergone a 0.50 hr long irradiation in a neutron flux of 5×10^3 neutron/cm^2/ sec. In the reaction ^{56}Mn thus produced has a $t_{1/2}$= 2.58 hr. [Given: thermal neutron capture cross section = 13.3 barn; 1 barn = 10^{-24} cm^2/nuclei] 3

3. Answer ***any four*** questions :

a) Cite a reason why "chromatography" got started as an analytical technique. How did it get its name? $2+\frac{1}{2}$

b) Distinguish normal phase liquid chromatography and reverse phase liquid chromatography. Which of these was used initially? What led to the development of the other? $1+\frac{1}{2}+1$

c) In a study of "reverse phase liquid chromatography" using either C-18 or C-8 column, where column types have their usual meaning, where will the retention time for adenine be less and why? [Consider the same "polar solvent composition" as the mobile phase in either case]. $2\frac{1}{2}$



adenine

d) Explain the basis for separation of stereoisomers in chiral chromatography? What is a major drawback of chiral bonded stationary phases in this form of chromatography? $1\frac{1}{2}+1$

e) Discuss the role of the ionization chamber and ion collector in mass spectrometry. $1\frac{1}{2}+1$

f) Explain salient features of the mass spectrum of a compound labeled C that is provided below. Mention the molecular ion peak and predict the organic compound whose mass spectrum it could be. $1\frac{1}{2}+\frac{1}{2}+\frac{1}{2}$