12-12-17

DOON UNIVERSITY, DEHRADUN
End Semester Examination, December, 2017, V Semester
School of Physical Sciences
Integrated M.Sc. Chemistry
Course: CYD–301: Analytical Methods in Chemistry

Time Allowed: 3 Hours. ***Maximum Marks: 30***

Note: Attempt All Questions

SECTION: A

Attempt All Questions.

(Marks: 6Q × 1/2= 3)

1. Why peaks resulting from n → π* transitions are shifted to shorter wavelengths (blue shift) with increasing solvent polarity.
2. Write equation relating L.J.P. with transference number.
3. What solvent would be appropriate to record as much of the UV/VIS spectrum of naphthalene and why.
4. Which of the following statements accurately describes the molecular vibrations characteristic of IR spectroscopy and Why?
   (a) Stretching frequencies are lower than corresponding bending frequencies.
   (b) Triple bonds have lower stretching frequencies than corresponding double bonds, which in turn have lower frequencies than single bonds.
   (c) Bonds to hydrogen have higher stretching frequencies than those to heavier atoms.
   (d) Stretching frequencies appear mostly in the fingerprint region.
5. Solvent extraction is more effective when the extraction is repeated with:
   a) Extra solvent
   b) Large solvent
   c) Small solvent
   d) No solvent
6. A mobile phase cannot be a :
   a) Gas
   b) Solid
   c) Liquid
   d) Solid or gas

(Marks: 2Q × 1= 2)

7. What is the difference in the position of monochromators in UV-Vis Spectrophotometer and IR spectrometer?

8. X is 12 times more soluble in trichlorpmethane than in water. What mass of X will be extracted from 1.00 dm^3 of aqueous solution containing 25 g by shaking with 100 cm^3 of trichloromethane?
   a) 15 .6 g
   b) 13.6 g
   c) 20.0 g
   d) 11.6 g

SECTION: B

Attempt All Questions.

(Marks:5Q × 2=10)

9. Define the following terms: (a) releasing agent, (b) protective agent. (c) chemical interference and (d) atomization (e) hollow cathode lamp
10. An analyst attempts to determine strontium with an atomic absorption instrument equipped with a nitrous oxide-acetylene burner, but the sensitivity associated with the 460.7-nm atomic resonance line is not satisfactory. Suggest at least three things that might be tried to increase sensitivity.
11. Why is atomic emission more sensitive to flame instability than atomic absorption or fluorescence?
12. What is graphite furnace AAS, give the advantages and disadvantages of this technique.
13. A pure compound may be either MgO, $MgCO_3$, or MgC_2O_4. A thermogram of the substance shows a loss of 91.0 mg from a total of 175.0 mg used for analysis. What is the formula of the compound? The relevant possible reactions are
    $MgO \rightarrow$ No reaction
    $MgCO_3 \rightarrow MgO+CO_2$
    $MgC_2O4 \rightarrow MgO+CO_2+CO$

SECTION: C

Attempt All Questions.

(Marks:5 Q × 3=15)

14. Draw a labelled working diagram of UV-Vis Spectrophotometer and explain the function of the main components.
15. A municipal water company was having problems with its water analysis. The problem lay in the AAS determination of Fe at 248.3 nm. The absorbance of the water, after 5 fold dilution was 0.646 at 248.3 nm. A standard solution prepared by dissolving 0.1483g of iron wire in acid, diluting to 250 mL. After a further x100 dilution the solution had an absorbance of 0.813. Calculate the ppm in the water sample. What is wrong with this analysis?
16. a) Explain briefly the principle of ion exchange chromatography.(b) How can we obtain soft water using ion exchange chromatography?
17. In normal phase HPLC, how will the retention time of a component of a mixture vary with the polarity of its molecules? Explain your answer (b) Discuss the three types of chromatogram development procedure.
18. What are the advantages of HPLC over GC?