Mark Scored:

KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Level : B. Sc./B.Pharm./B. Tech. Course : INAN 301
Year : III Semester: I
Exam Roll No. : Time: 30 mins. F. M. : 20
Registration No.: Date FEB 2 4 2019

SECTION "A"
[10 Q. × 1 = 10 marks]

Select the most appropriate answer.

1. The Turbidimeter is based on which of the following characteristic properties?
   [ ] Emission of radiation [ ] Absorption of radiation
   [ ] Scattering of radiation [ ] Refraction of radiation

2. Which of the following statements is NOT true?
   [ ] Visible photons carry more energy than infrared photons
   [ ] X-ray photons carry more energy than microwave photons
   [ ] Ultraviolet photons carry more energy than visible photons
   [ ] Microwave photons carry more energy than infrared photons

3. Which of the following statement is true?
   [ ] When gas flow rate is equal to burning velocity the flame propagates back into the burner giving flashback
   [ ] The maximum temperature is located in the flame about 2.5 cm above the primary combustion zone
   [ ] Chromium exhibits a minimum in absorbance at the middle of the flame
   [ ] Temperature of 1700°C to 2400°C occur with various fuels when oxygen is the oxidant

4. Which of the following is the wavelength associated with an NMR signal at 368 MHz?
   [ ] 2.44 cm [ ] 81.52 cm [ ] 11.04 cm [ ] 60 cm

5. In Infra Red Spectroscopy, the number of vibrational modes for SO_2 molecule is.
   [ ] 4 [ ] 3 [ ] 2 [ ] 1

6. Which one of the following is a desorption source?
   [ ] Electron impact source [ ] Electrospray ionization
   [ ] Chemical ionization [ ] Field ionization

7. What will be the kinetic energy of a singly charged ion (Z=1) if it is accelerated through a potential of 10^3V in an electron impact source?
   [ ] 1.6×10^{-19} J [ ] 1.6×10^{-16} J [ ] 6.7×10^{-19} J [ ] 6.7×10^{-19} J

8. Which one of the following is used as IR transducer?
   [ ] Photomultiplier tube [ ] Vacuum Phototube
   [ ] Photoconducting transducer [ ] Carbon dioxide laser

9. To increase column efficiency which of the following condition is NOT desirable?
[ ] Number of plate should increase [ ] Plate height should decrease
[ ] Column resolution should be high [ ] Multipath term should be greater

10. Any aromatic molecule containing a benzyl group will show a very important fragment at m/e value
[ ] 14 [ ] 28 [ ] 77 [ ] 91

SECTION "B"
[10 Q. × 1 = 10 marks]

Fill in the blank by most appropriate VALUE or WORD.

11. _____percentage of light is transmitted through the sample when it has absorbance value 0.039.

12. The equation of least square analysis of calibration data for the determination of Cu by UV visible spectroscopy is S=1.21 Cu + 0.416. For the concentration of 15ppm Cu the value of standard deviation of measurement is 0.12. What will be the analytical sensitivity at this concentration of Cu? _____.

13. The absorption frequency in a 5T magnetic field of ^{1}H is _____ (Given $\gamma=2.68X10^{8}T^{-1}S^{-1}$).

14. The earliest, and still the most widely used, packings for GC are prepared from _____

15. After TLC development, ninhydrin is used for the visualization of colorless spots of _____

16. How many signals do the compound $(CH_3)_3CCH_2CHO$ have in ^{1}H NMR?
_____

17. In ion exchange chromatography the detector is based on _____ measurement.

18. A solution containing $3.9X10^{-5}$ mol/lit $KMnO_4$ has a molar absorptivity of 1.8×10^{4} $Lmol^{-1}cm^{-1}$ in a 1.00 cm cell, at 520 nm. The value of absorption at this wave length will be
_____

19. The resolution for the substances A and B having retention time 18.6 min and 17.1 min, respectively is _____ (Given, peak width for A is 1.1 and for B is 1.2 min)

20. The sample container used in the ultra violet (UV) region is made up of the material _____.

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Semester: I
F.M. : 55

SECTION "C"
[5Q. × 3 = 15 marks]

Attempt *ANY FIVE* questions.

1. a) What are the differences between dynamic range and detection limit? [2]
   b) What is figure of merit? [1]

2. What do you mean by chemical interference? What do you know about interference due to overlapping lines? How can it be avoided? Illustrate with an example. [3]

3. The selectivity coefficient for an ion selective electrode for K^+ with respect to Na^+ is reported to be 0.052. Calculate the relative error in the determination of K^+ in a solution that has a K^+ concentration of 0.004 M if the Na^+ concentration is 0.001 M. Assume that S_{bl} for a series of blanks was approximately zero. [3]

4. The data for a liquid chromatographic separation process are as follows: L=24.7cm; u=0.313ml/min; $(t_r)_A$=5.4min; $(t_r)_B$=13.3min; W_A =0.41min and W_B=1.07min. Calculate the plate height (H). [3]

5. In proton NMR spectra for $CH_3CH_2OCH_3$, calculate the number of multiplets for each band and their relative areas. [3]

6. State Beer's law. Why it is called a limiting law? [3]

7. Is carbon dioxide IR active? Justify. [3]

SECTION "D"
[5Q. × 5 = 25 marks]

Attempt *ANY FIVE* questions.

8. Write the principle of flame photometry. Write about the most common radiation source used for atomic absorption measurements. [1.5+3.5]

9. a) Define chromophore. What are the effects of substituent and conjugation on chromophores? [4]
   b) Why is iodine sometimes introduced into a tungsten lamp? [1]

10. a) Write Van Deemeter Equation. Write in short about the factors that influence column efficiency? [3]
    b) Write short note on role of solvent in UV visible spectroscopy? [2]

11. a) What is charge transfer absorption? Why it is important for quantitative purpose? [3]

b) What are the differences between normal phase chromatography and reversed phase chromatography? [2]

12. Draw block diagram showing components of mass spectrometer. What are different types of ion sources used in MS? [2+3]

13. a) What are the advantages of using a magnet having highest possible field strength? What are the screening constant and coupling constant? [3]

b) Predict the proton NMR spectra for acetone. [2]

14. Draw block diagram showing components of gas chromatograph. Write about columns used in GC. [2+3]

SECTION "E"

[2Q. × 7.5 = 15 marks]

Attempt *ANY TWO* questions.

15. a) What are the criteria for HPLC pump? Describe the various kinds of pumps used in HPLC. [4]

b) Explain the Electron Capture Detector (ECD). [3.5]

16. a) Write the role of NMR and MS in structure elucidation. [4]

b) Describe the general elution problem. How can the column resolution be improved? [3.5]

17. a) Write a short note on size exclusion chromatography. [3.5]

b) Differentiate between [2+2]
(i) Finger print region and group frequency region
(ii) Hydrogen lamp and deuterium lamp