

**Navrachana University**  
**School of Liberal Sciences and Education**  
**End-Semester Examination November 2017**  
**M. Sc. in Analytical Chemistry Semester III**

**Course: Spectrochemical Analysis-I****Course Code: CH211****Date: 21/11/2017****Marks: 40****Time: 3:30 to 5:30 pm****Instructions:**

- Write each answer on a new page
- Use of a calculator is permitted

Q.1. Match the following

(10)

Sr. No.	Column A	Column B
a)	Conducting metal tip	i) Shielding and deshielding of protons
b)	Polystyrene	ii) Nernst Glower
c)	Nuclear Overhauser Effect	iii) Calibration of IR instrument
d)	Argon	iv) Scanning Tunneling Microscopy
e)	Klystron tube	v) Atomic Force Microscopy
f)	Curie point	vi) Black body radiation
g)	Diamagnetic anisotropy	vii) ESR spectroscopy
h)	Thermocouple	viii) Spin decoupling
i)	Rare earth oxides	ix) Inductively Coupled Plasma
j)	Cantilever	x) Pyroelectric Transducers

Q.2. Choose the correct option

(5)

1. Sample is coated with a thin layer of gold or silver metal during.....  
 (a) Auger Spectroscopy    (b) SEM    (c) AFM    (d) TEM
2. Identification of cis and trans isomers can be done using.....  
 (a) Raman Spectroscopy    (b) IR    (c) ESR    (d) UV spectroscopy
3. Hyperfine splitting in ESR takes place due to ..... interaction.  
 (a)  $^1\text{H}-^1\text{H}$     (b)  $^1\text{H}-^{13}\text{C}$     (c)  $^{13}\text{C}-^{13}\text{C}$     (d) all of the above
4. Broadening of IR peak due to hydrogen bonding takes place in ..... group.  
 (a) -CHO    (b) -COOH    (c) -NH<sub>2</sub>    (d) -CH<sub>3</sub>

5. The maximum value that a depolarization ratio can have is .....
- (a) 0.83      (b) 0.85      (c) 0.75      (d) 0.88

Q.3. Answer the following

(6)

- (a) Give full forms of DEPT and SEM.
- (b) Explain why protons of acetylene appear upfield.
- (c) Explain applications of IR radiation in day to day life.

Q.4. Answer **any three** of the following

(9)

- (a) Explain principle of Auger spectroscopy with suitable diagram.
- (b) Deduce structure of  $C_5H_{11}Cl$  if it shows  $\delta$  1.1 singlet 9H, and  $\delta$  3.4 singlet 2H.
- (c) Calculate enantiomeric excess and percentages of both optical isomers with specific rotations  $\pm 15.2$  degrees, if a mixture shows observed rotation as  $-5.1$  degrees.
- (d) Explain splitting of energy levels of spinning nuclei in presence of external magnetic field.

Q.5. Answer **any two** of the following

(10)

- (a) Draw a schematic diagram of an NMR instrument and explain each component.
- (b) Explain in detail any two sources and three detectors used in IR spectroscopy.
- (c) Differentiate between Raman spectroscopy and IR spectroscopy.

-----End of Question Paper-----