



# UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program / Eighth Semester – 2020

Paper: Analytical Chemistry (Sp. Theory-II)

Course Code: CHEM-432 Part – I (Compulsory)

Time: 15 Min. Marks: 10

Roll No. in Fig. ....

Roll No. in Words. ....

Signature of Supdt.: .....

**ATTEMPT THIS PAPER ON THIS QUESTION SHEET ONLY.**

Division of marks is given in front of each question.

This Paper will be collected back after expiry of time limit mentioned above.

Q.1. Encircle the correct option.

(10x1=10)

(i) Chemical shift originates from

(a) Magnetic moment

(b) J-Coupling

(c) Electron shielding

(d) Free induction decay

~~(ii) Which of the following is not a type of mass analyser~~

(a) Frequency sweep analyser

(b) Magnetic sector analyser

(c) Double focusing spectrometer

(d) Time of flight analyser

(iii) In stimulated absorption, what is the life time of atoms in ground state

(a) one hour

(b) infinity

(c) 10sec

(d) one min

(iv) Ruby Laser is an example of

(a) Gas Laser

(b) Solid state Laser

(c) Liquid Laser

(d) Semiconductor Laser

(v) Which of the following is not a type of ion detector used in mass spectrometry

(a) Faraday cup collector

(b) photographic plates

(c) Electron multiplier

(d) Flame emission detector

(vi) Radiofrequency energy is used for

(a) Vibration of atom

(b) Vibration of molecules

(c) Excitation of atoms

(d) Affecting nuclear spin of atoms

(vii) Signal splitting in NMR arises from

(a) Spin-spin coupling

(b) Spin-spin decoupling

(c) Shielding effect

(d) Deshielding effect

(viii) In which region of electromagnetic spectrum a dye laser produces laser light

(a) Near UV to near IR

(b) UV

(c) IR

(d) Visible

(ix) Which nucleus is NMR inactive

(a)  $^{13}\text{C}$

(b)  $^{19}\text{F}$

(c)  $^{16}\text{O}$

(d)  $^{31}\text{P}$

(x) M+2 peak for  $\text{CH}_3\text{CH}_2\text{Br}$  in mass spectrometry appears at m/z

(a) 79

(b) 108

(c) 81

(d) 110



**ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED**

**Q.2. Give short answers to the following questions. (10x2=20)**

- i. What is difference between continuous analyzer and pulsed mass analyzer.
- ii. Describe optical resonator as laser system component
- iii. Describe nitrogen rule and even electron rule as applied in mass spectrometry.
- iv. Write down the basic principle of Magnetic Resonance Imaging ?
- v. What is spin lattice relaxation process?
- vi. Differentiate between spatial and temporal coherence.
- vii. What are the characteristics of laser?
- viii. Describe spin-spin coupling?
- ix. Give some advantages of laser.
- x. How array detector works in mass spectrometry?

**Answers to the following questions. (3x10=30)**

**Q no 3:**

- (a) Discuss electron impact ionization in mass spectrometry. (5)
- (b) Discuss inlet system of mass spectrometer. (5)

**Q no 4:**

- (a) Write down the analytical applications of NMR spectroscopy.. (5)
- (b) Discuss instrumentation of Fourier Transform NMR spectrometer..(5)

**Q no 5:**

- (a) Describe the construction and working of Ruby Laser.. (5)
- (b) Discuss the properties and applications of nitrogen Laser.. (5)