

## END OF SEMESTER EXAMINATIONS, APRIL/MAY - 2017

## APPLIED SPECTROSCOPY

SUBJECT CODE: 09P3PH12

MAJOR: M.Sc. (Physics)

TIME : 3 HOURS

SEMESTER : IV

MAX. MARKS: 70

SECTION – A (10 X 1 = 10)Answer ALL the Questions:Choose the best answer:

1. The relation  $\bar{\nu}_\beta - \bar{\nu}_\alpha = R_H \left( \frac{1}{3^2} - \frac{1}{4^2} \right)$  represents \_\_\_\_\_ series.  
a) Lyman      b) Balmer      c) Paschen      d) Pfund
2. The effect of \_\_\_\_\_ field on the spectrum was discovered by Zeeman.  
a) Electric      b) magnetic      c) Electromagnetic      d) fuse
3. Rotational spectra is exhibited by  
a) CO      b) Hcl      c) HI      d) all of these
4. For linear molecules  
a)  $I_a = 0; I_b = I_c = I$       b)  $I_a = I_b = I_c$   
c)  $I_a = I_b = 0$       d)  $I_a \neq I_b \neq I_c$
5. If  $\Delta\nu$  is positive Raman Spectrum consists of \_\_\_\_\_ lines.  
a) Stokes      b) anti-stokes      c) Lyman      d) Balmer
6. State selection rule for Raman transition.
7. What is meant by Raman Effect?
8. State Franck – Condon principle.
9. Define Chemical shift.
10. Compare Emission and absorption.

SECTION – B (5 X 4 = 20)Answer ALL the Questions:

11. a) State and explain Ritz - combination principle.

(OR)

- b) Compare Stark effect and Zeeman effect.

12. a) With suitable examples explain about symmetric and antisymmetric molecules.

(OR)

- b) Discuss about the vibration - rotation spectra of CO.

13. a) Give the quantum theory of Raman effect.

(OR)

b) Compare Raman and IR spectrum.

14. a) What is meant by (i) Fortrat diagram.

(ii) Pre-dissociation – Explain.

(OR)

b) Explain the basic principle of ESR.

15. a) Write short notes on (i) Relaxation processes.

(ii) Chemical shift.

(OR)

b) Explain about (i) Isomer shift.

(ii) Quadrupole interaction.

### **SECTION – C (5 X 8 = 40)**

#### **Answer ALL the Questions:**

16. a) Discuss about the experimental setup for Zeeman effect and explain about normal and anomalous Zeeman effect.

(OR)

b) Explain (i) Zeeman effect in Hyperfine structure.

(ii) Back - Goudsmit effect in Hyperfine structure.

17. a) Describe the techniques and instrumentation for microwave spectroscopy.

(OR)

b) Give an account of vibrating diatomic molecule as a harmonic oscillator.

18. a) Describe about the technique and instrumentation of recording Raman spectra.

(OR)

b) Compare and Contrast vibrational Raman and rotational Raman spectra.

19. a) Discuss about (i) Born – Oppenheimer approximation.

(ii) Vibration coarse structure.

(OR)

b) Explain the (i) ESR spectra of free Radicals.

(ii) Hyperfine structure.

20. a) Explain about NMR instrumentation.

(OR)

b) Explain in detail about NQR spectroscopy and its instrumentation.

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