END OF SEMESTER EXAMINATIONS, NOVEMBER - 2018
APPLIED SPECTROSCOPY
SUBJECT CODE: 09P3PH12

MAJOR: M.SC (PHYSICS)   **SEMESTER : IV**
TIME : 3 HOURS   **MAX. MARKS: 70**

SECTION – A (10 X 1 = 10)

Answer All the questions:

1. What is Ritz combination principle?
2. Wave numbers of the alkali spectra can be written as

    a) $\bar{\gamma} = \dfrac{1}{\lambda} = R\left[\dfrac{1}{(\alpha - p)^2} - \dfrac{1}{(\beta - q)^2}\right]$ b) $\bar{\gamma} = \dfrac{1}{\lambda} = R\left[\dfrac{1}{(\alpha + p)^2} - \dfrac{1}{(\beta + q)^2}\right]$

    c) $\bar{\gamma} = \dfrac{1}{\lambda} = R\left[\dfrac{1}{(p - \alpha)^2} - \dfrac{1}{(q - \beta)^2}\right]$ d) $\bar{\gamma} = \dfrac{1}{\lambda} = R\left[\dfrac{1}{(p - \alpha)^2} + \dfrac{1}{(q + \beta)^2}\right]$

3. Give any one application of microwave spectroscopy
4. When $I_B = I_C > I_A$, then the molecule is called_____

    a) Oblate symmetric top   b) Prolate symmetric top

    c) Spherical top   d) Assymmetric top.

5. Induced electric dipole moment is

    a) $\mu = \alpha E$ b) $\mu = E$ c) $\mu = \alpha$ d) $\psi = \alpha x E$

6. What are asymmetric top molecules?
7. What is predissociation?
8. The fine structure in ESR spectrum is due to

    a) One paired electronic spin   b) Two unpaired electronic spin

    c) More than three unpaired electronic spin   d) More than one unpaired electronic spin

9. In NMR_____frequency waves induce transition between magnetic energy levels of a molecule.

    a) IR   b) Radio   c) Microwave   d) Far IR.

10. What is meant by quadrupole relaxation.

SECTION – B (5 X 4 = 20)

Answer All the questions:

11. a) Discuss the stark effect in Hydrogen.

    (OR)

    b) Discuss briefly the Paschen Back effect.

12. a) Explain the simple harmonic oscillator of the vibrating diatomic molecule.

    (OR)

    b) Obtain an expression for the rotational levels of a diatomic molecule taking it as a rigid rotator.

13. a) Explain the Quantum theory of Raman effect.

    (OR)

    b) Explain the pure rotational Raman spectra of linear molecules.

14. a) Discuss briefly the electronic spectra of diatomic molecules using Born-oppenheimer approximation.

    (OR)

    b) Write a note on hyperfine structure of E.S.R Spectroscopy.

15. a) With a neat diagram, explain the continuous wave N.M.R. Spectrometer.

(OR)

b) Discuss the Quadrupole effects of Mossbauer spectroscopy.

SECTION – C (5 X 8 = 40)

Answer All the questions:

16. a) Explain in detail the Lande's g factor.

(OR)

b) Discuss in detail about the experimental setup for normal Zeeman effect.

17. a) Explain linear symmetric and asymmetric top molecule.

(OR)

b) With neat diagram, explain Fourier transform spectroscopy.

18. a) Explain the Vibrational Raman spectra of H_2O and CO_2 molecule.

(OR)

b) Describe structure determination from Raman and Infra-red spectroscopy

19. a) Explain the basic principle of ESR spectrometer.

(OR)

b) Explain Franck Condon principle.

20. a) Discuss in detail about the chemical shift of Nuclear magnetic resonance spectroscopy.

(OR)

b) Explain the quadrupole effects of NMR

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