

S-494

Total Pages : 3

Roll No.

MSCPH-507

Spectroscopy

M.Sc. Physics (MSCPH)

2nd Semester Examination, 2022 (Dec.)

Time : 2 Hours]

Max. Marks : 70

Note : This paper is of Seventy (70) marks divided into two (02) Sections A and B. Attempt the questions contained in these sections according to the detailed instructions given therein.

SECTION–A

(Long Answer Type Questions)

Note : Section 'A' contains Five (05) long answer type questions of Nineteen (19) marks each. Learners are required to answer any Two (02) questions only.

(2×19=38)

1. What is the difference between optical spectra and X-ray spectra? Explain why emission spectra and absorption spectra are not identical. How would you account for the finite width of absorption edges in X-ray spectra.

2. Discuss the main features of the spectrum of He atom. How is the spectrum explained quantum mechanically. Also show that He in the ground state can exist only in singlet state.
3. Outline the theory of Paschen-Back effect and discuss the Paschen-Back pattern of $^2P - ^2S$ transition.
4. Write short notes on :
 - (a) Franck Condon principle.
 - (b) Fortrat diagram.
 - (c) Sequence and progression.
5. Give the salient features of the rotation-vibration spectrum of a diatomic molecule. What will be the effect of presence of isotopes on the spectrum.

SECTION-B

(Short Answer Type Questions)

Note : Section 'B' contains Eight (08) short answer type questions of Eight (08) marks each. Learners are required to answer any Four (04) questions only. (4×8=32)

1. Explain the Stark effect broadening of spectral lines.

2. What are identical particles? Show that the wave function describing the system of identical particles must have the property of exchange symmetry.
3. What do you understand by LS and JJ coupling schemes. Give the selection rules for them.
4. The moment of inertia of CO molecule is $1.46 \times 10^{-46} \text{ kgm}^2$. Calculate the energy in eV in the lowest rotational energy level of the CO molecule.
5. Explain with suitable expression how will you determine the inter-nuclear distance of a particle which exhibit rotational spectra.
6. What is fine structure of spectral lines? Describe the main features of the fine structure of emission spectra of the hydrogen atom.
7. What is the principle of Photo acoustic effect? Give the experimental set up for studying this effect. Give its important applications.
8. With the exciting line 4358 \AA , a sample gives stoke's line at 4458 \AA . Deduce the wavelength of the anti-stoke's line.



