



Science Academies' Refresher Course on Applications of Quantum Mechanics: Atoms, Molecules and Radiation

21 December 2015–4 January 2016

at

Department of Physics, University of Mumbai

Sponsored by

Indian Academy of Sciences, Bengaluru

Indian National Science Academy, New Delhi

The National Academy of Sciences, India, Allahabad

A two week Refresher Course on the theme 'Applications of Quantum Mechanics: Atoms, Molecules and Radiation' will be held at University of Mumbai during 21 December 2015–4 January 2016. The Course is primarily aimed at college teachers of Physics at the UG/PG level. It will cover basics of the subject through lectures and tutorials. Students pursuing Ph.D. degree in Physics may also apply. College/university teachers of Physics will be given preference.

Topics: The course will consist of four modules. In addition, there will be interactive sessions and tutorials aimed at clarifying basic concepts and improving the pedagogical skills of participants.

Module 1: Basics of quantum mechanics: Historical remarks, Mathematical background, Schrödinger equation, Abstract formulation, Dirac notation, Representations and pictures, Linear oscillator, Perturbation theory.

Module 2: Atoms: Hydrogen atom, Fine structure, Helium atom, Multi-electron atoms, Orbital and spin angular momentum, Addition of angular momenta, L-S and j-j coupling, Ortho and para hydrogen.

Module 3: Interaction of electromagnetic radiation with matter: Quantum theory of radiation, spontaneous, stimulated emission and absorption probabilities, electric dipole selection rules, Einstein A and B coefficients, Rabi coefficients, Thomson Scattering, Jaynes–Cummings Model.

Module 4: Molecules: Different types of chemical bonds, Hydrogen molecular ion, Hydrogen molecule, Diatomic molecules, Basics of molecular orbital and valence bond theories, Rotational and vibrational spectra, Basic theory of NMR.

Resource persons: N. Mukunda (Bengaluru), V. Balakrishnan (IITM, Chennai), A. Rangwala (Univ. of Mumbai), Vaibhav Prabhudesai (TIFR), Deepak Dhar (TIFR), Anuradha Misra (Univ. of Mumbai), Praveen Pathak (TIFR), Siddharth Kasturirangan (Univ. of Mumbai).

Course Director: Deepak Dhar (TIFR, Mumbai)

Course Coordinator: Anuradha Misra (Univ. of Mumbai, Mumbai)

Teachers who wish to participate should send their applications online using the following link:

<http://web-japps.ias.ac.in:8080/Refreshcourse/RCQA.jsp>

Alternatively, applications may be sent by e-mail to rcqm2015@mu.ac.in

Please note that participants have to attend the full duration of the Course. Selected participants will be provided with local hospitality and round trip bus/train (III A/C) fare by the shortest route.

Last date for receiving applications: **10 November 2015**