Symmetry and Group Theory
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Lecture - 01
Course Contents

Hello everyone, my name is Jeetender Chugh and I will be teaching symmetry and group theory course in this video. So, before we actually go on and start with lecture 1, let us first look at the course contents prerequisites, etc.

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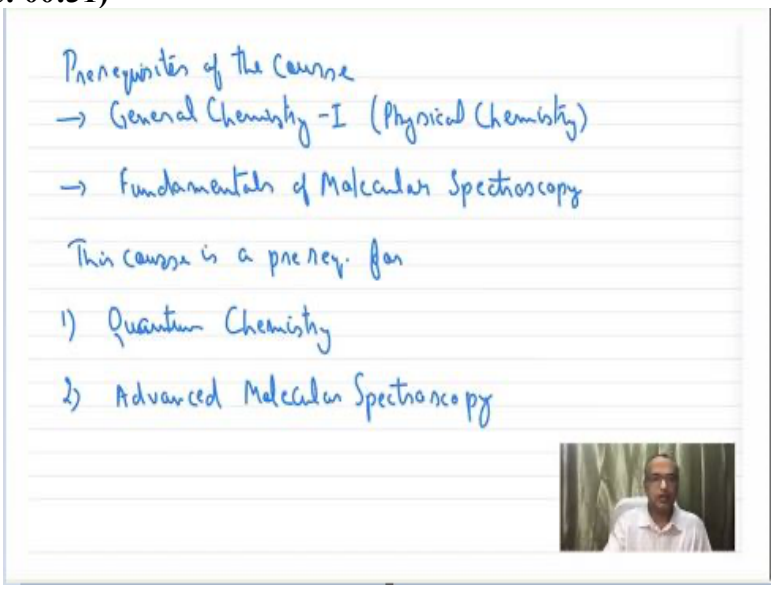

So, let me first list down the prerequisites for this course sets of the course. So, it will be highly beneficial if you have already gone through general chemistry 1 and in particular physical chemistry component of it. Also, it will be beneficial if you have gone through fundamentals of molecular spectroscopy. Once you have taken this course, this course becomes an excellent prerequisite for if you are going to take let us say this course is a prerequisite for quantum chemistry if you are going to take quantum chemistry course, and if you are going to study advanced molecular spectroscopy.

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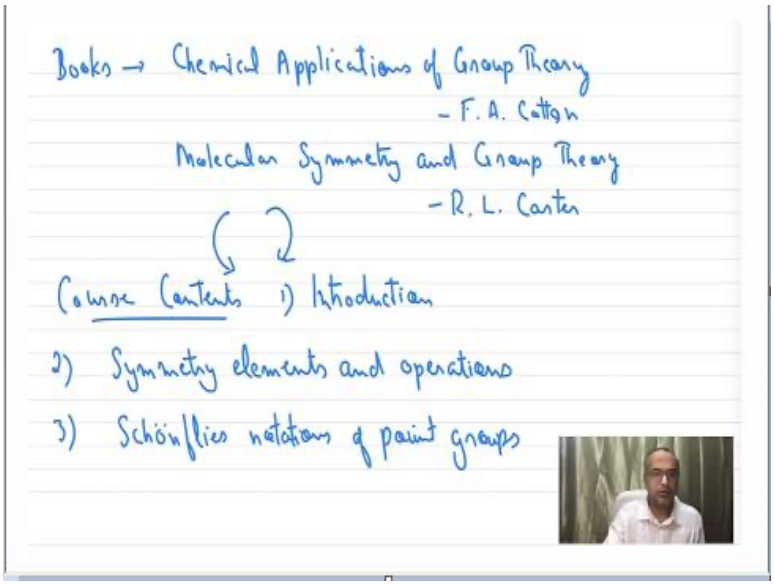

So, now, let us also look at the books which are the following. So, one of the books is chemical applications of group theory. This is by F.A. Cotton and the second book which I will be following is molecular symmetry and group theory. And this is authored by R.L. Carter. So, any other book also if you follow, one of the major points which you will have to take care, let us say if you are following multiple books, some of the books carry or some of the books actually carry out rotations in clockwise direction, and some of the books carry.

So, this courses is all about symmetry and we will be doing a lot of rotation of molecules. So, some of the books carry clockwise rotations, other books carry anti-clockwise rotation. So results may differ out if you are following multiple books for a given set of problems, but if you keep following the same notation or same orientation, all through then it should not matter. So we will see this in more details when will actually come to rotations and all.

Let us also list down the course contents. The course content of this course, I will start with introduction in lecture 1. This will be followed by defining symmetry elements and symmetry operations this will be followed by Schonflies notations of point groups.

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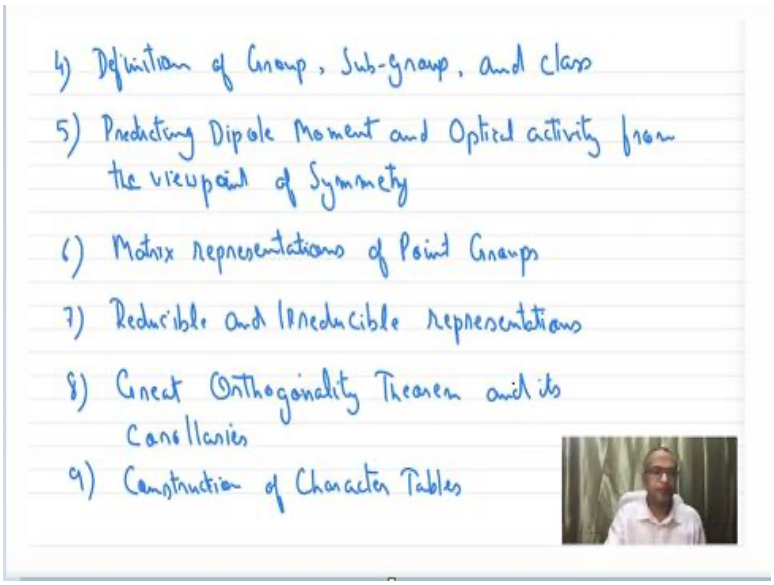

Then we will have a definition of group, subgroup, and class. Once we have done this we will actually do our very first application of group theory which will be predicting physical properties like dipole moment and optical activity from the viewpoint of symmetry. Then we will be writing matrix representations of point groups. So, if you have not gone through matrices goes in a long time so, I would request you to brush up your basics of matrices.

Reducible and irreducible representations. One of the very important theorems in group theory which is called as great orthogonality theorem and its corollaries then we will be construction of character tables.

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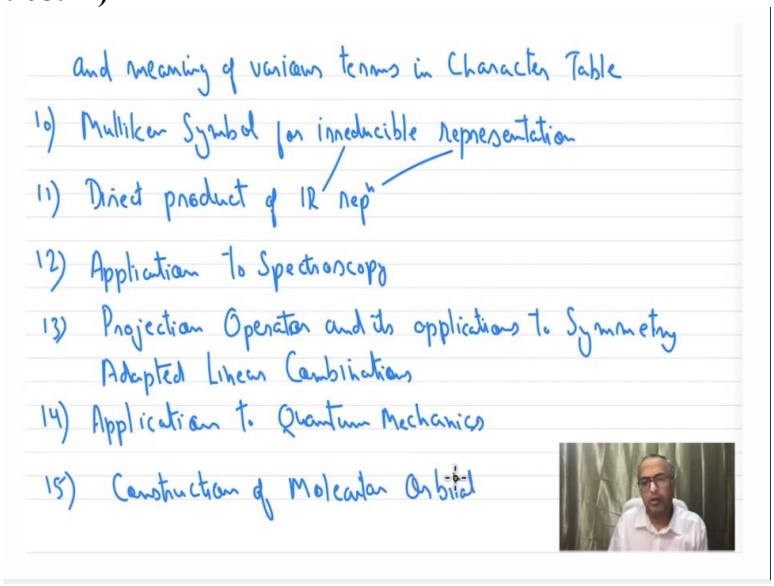

And meaning of various terms in character table. This will be followed by Mulliken symbol for irreducible representation. Direct product. This is direct product of irreducible representation. So I am writing this in short form so this is irreducible representation. Application to spectroscopy so, it will be beneficial if you have already gone through a spectroscopy course, but I will be covering a little briefing about spectroscopy.

So, do not worry a lot but still it will be better if you have already gone through. Another important concept in the theory is projection operator and its applications to symmetry adapted linear combinations. Application to quantum mechanics and last will be construction of molecular orbital.

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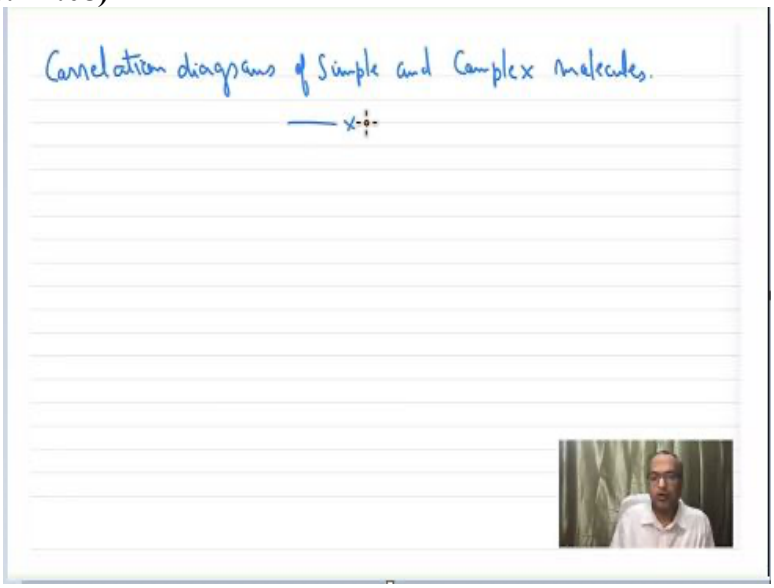

Correlation diagrams of simple and complex molecules.

So, we have discussed today the prerequisites of the course, the books which I will be following and the course contents. So, that is all for in this video and let us see you in next video where we will start with lecture 1.