

# Unit 11 - Week - 8 - Electronic Transitions

**Course outline**

How does an NPTEL online course work?

**Week-1: Introduction to Symmetry elements, Symmetry operations and Group Theory**

**Week 2- Generation of Symmetry Operations from Symmetry Elements; Point Group analysis; Relation between molecular symmetry and physical properties(polarity and chirality).**

**Week 3 - Introduction to Group Multiplication Tables; Stereographic Projections and Matrix Representations of Symmetry Operations**

**Week 4- Matrix Representation of Point Group, Introduction to Reducible and Irreducible Representation, Description of Character Table , Great Orthogonality Theorem and its consequences**

**Week 5 - Constructing Character table using the consequences of GOT, Relation between group theory and quantum mechanics, Introduction to Symmetry Adapted Linear Combinations: Projection operator.**

**Week 6 - Projection operator, concept of Symmetry Adapted Linear Combination(SALC), concept of Linear Combination of Atomic Orbitals(LCAO),LCAO-MO, Hückle Approximations and Introduction to Normal Mode of Vibration.**

**Week 7 - Molecular Vibrations: Normal modes and their symmetry aspects, Selection rules of fundamental vibrational transitions.**

**Text Transcripts**

**Week - 8 - Electronic Transitions**

- Lecture 36
- Lecture 37
- Lecture 38
- Lecture 39
- Lecture 40
- Quiz : Assignment 8
- Feedback form 8
- New Lesson
- Solutions of Assignment 8

**DOWNLOAD VIDEOS**

## Assignment 8

The due date for submitting this assignment has passed. **Due on 2020-03-25, 23:59 IST.**  
As per our records you have not submitted this assignment.

1) For centrosymmetric molecules, transition from d orbital to d orbital is **1 point**

Spin forbidden  
 Laporte forbidden  
 Laporte allowed  
 Spin allowed

**No, the answer is incorrect. Score: 0**  
**Accepted Answers:**  
*Laporte forbidden*

2) Find the spin allowed transition form the following **1 point**

$^1\Sigma \rightarrow ^1\Pi$   
  $^1\Sigma \rightarrow ^3\Pi$   
  $^4\Sigma \rightarrow ^3\Pi$   
  $^3\Sigma \rightarrow ^1\Pi$

**No, the answer is incorrect. Score: 0**  
**Accepted Answers:**  
 $^1\Sigma \rightarrow ^1\Pi$

3) Which of the following transition is Laporte allowed **1 point**

$^3\Sigma_u \rightarrow ^1\Delta_u$   
  $^3\Sigma_g \rightarrow ^1\Delta_g$   
  $^3\Sigma_g \rightarrow ^1\Pi_u$   
 None of the above

**No, the answer is incorrect. Score: 0**  
**Accepted Answers:**  
 $^3\Sigma_g \rightarrow ^1\Pi_u$

4) The given transition,  $^1\Sigma_g \rightarrow ^1\Pi_u$  is **1 point**

Spin allowed but Laporte forbidden  
 Laporte allowed but Spin forbidden  
 Both spin and Laporte allowed  
 Both spin and Laporte forbidden

**No, the answer is incorrect. Score: 0**  
**Accepted Answers:**  
*Both spin and Laporte allowed*

5) For naphthalene, what will be the state corresponding to given configuration?  
 $b_{1u}^2 b_{1g}^2 b_{3g}^2 b_{1u}^2 a_u b_{3g}$  **1 point**

$B_{3u}$   
  $B_{2u}$   
  $A_{1g}$   
  $A_{2u}$

**No, the answer is incorrect. Score: 0**  
**Accepted Answers:**  
 $B_{3u}$

6) If the given transition is spin allowed,  $^{2s+1}\Sigma_g \rightarrow ^1\Pi_u$  then what is the value of 's'? **1 point**

0  
 1  
 1/2  
 2

**No, the answer is incorrect. Score: 0**  
**Accepted Answers:**  
0

7) For a transition from  $\Psi$  to  $\Psi'$ , the transition moment integral (M) is given as **1 point**

$$M = \int \Psi_v'^* \Psi_v \, d\tau \int \Psi_{s'}^* \Psi_s \, d\tau \int \Psi_{e'}^* \mu_e \Psi_e \, d\tau + \int \Psi_{e's'}^* \Psi_{e's} \, d\tau \int \Psi_{v'}^* \mu_N \Psi_v \, d\tau$$

[ Where,  $\Psi = \Psi_{es} \Psi_v$ ; and further  $\Psi_{es} = \Psi_e \Psi_s$  and  $\mu = \mu_e + \mu_N$ ; v stands for vibration and depends on nuclear coordinations]

Now, the second integral  $\int \Psi_{e's'}^* \Psi_{e's} \, d\tau \int \Psi_{v'}^* \mu_N \Psi_v \, d\tau$  becomes zero, because of the fact

$\int \Psi_{v'}^* \mu_N \Psi_v \, d\tau = 0$ , because  $\Psi_{v'}$  and  $\Psi_v$  are orthogonal

$\int \Psi_{e's'}^* \Psi_{e's} \, d\tau = 0$ , because  $\mu_N$  is zero

$\int \Psi_{e's'}^* \Psi_{e's} \, d\tau = 0$ , because  $\Psi_{e's'}$  and  $\Psi_{e's}$  are orthogonal

None of the above

**No, the answer is incorrect. Score: 0**  
**Accepted Answers:**

$\int \Psi_{e's'}^* \Psi_{e's} \, d\tau = 0$ , because  $\Psi_{e's'}$  and  $\Psi_{e's}$  are orthogonal

8) Consider the integral of Question no.7. After equating the second part on the right hand side to zero, it gets simplified to **1 point**

$$M = \int \Psi_{v'}^* \Psi_v \, d\tau \int \Psi_{s'}^* \Psi_s \, d\tau \int \Psi_{e'}^* \mu_e \Psi_e \, d\tau$$

The first integral  $[\int \Psi_{v'}^* \Psi_v \, d\tau]$  is known as

- Franck-Condon factor  
 Laporte factor  
 Spin selection factor  
 (a) and (b) both

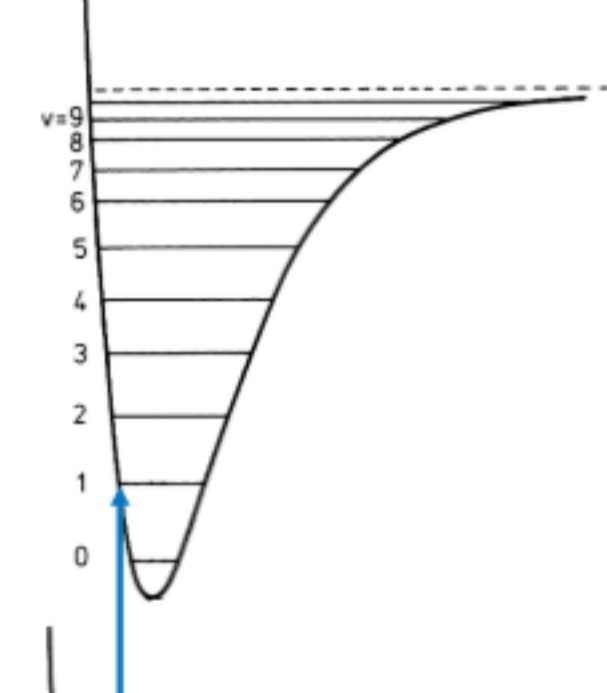
**No, the answer is incorrect. Score: 0**  
**Accepted Answers:**  
*Franck-Condon factor*

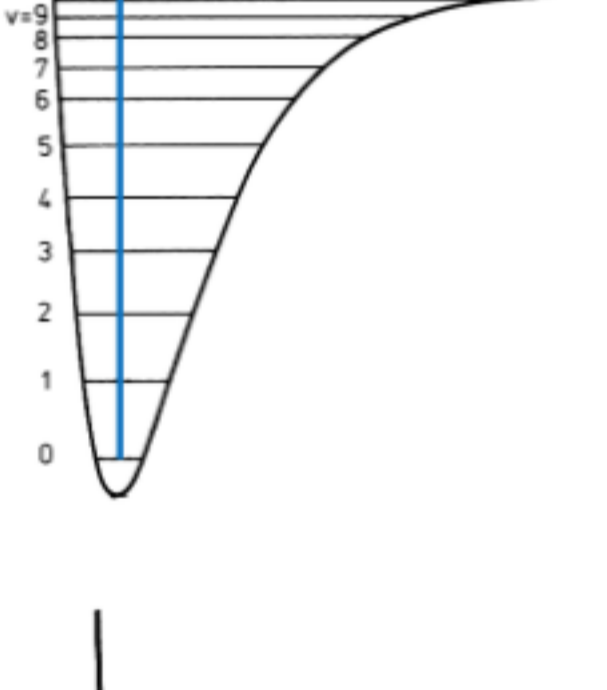
9) Given that the energy integral  $\int \Psi_i H \Psi_j \, d\tau$  is non-zero. Then  $\Psi_i$  and  $\Psi_j$  \_\_\_\_\_ **1 point**

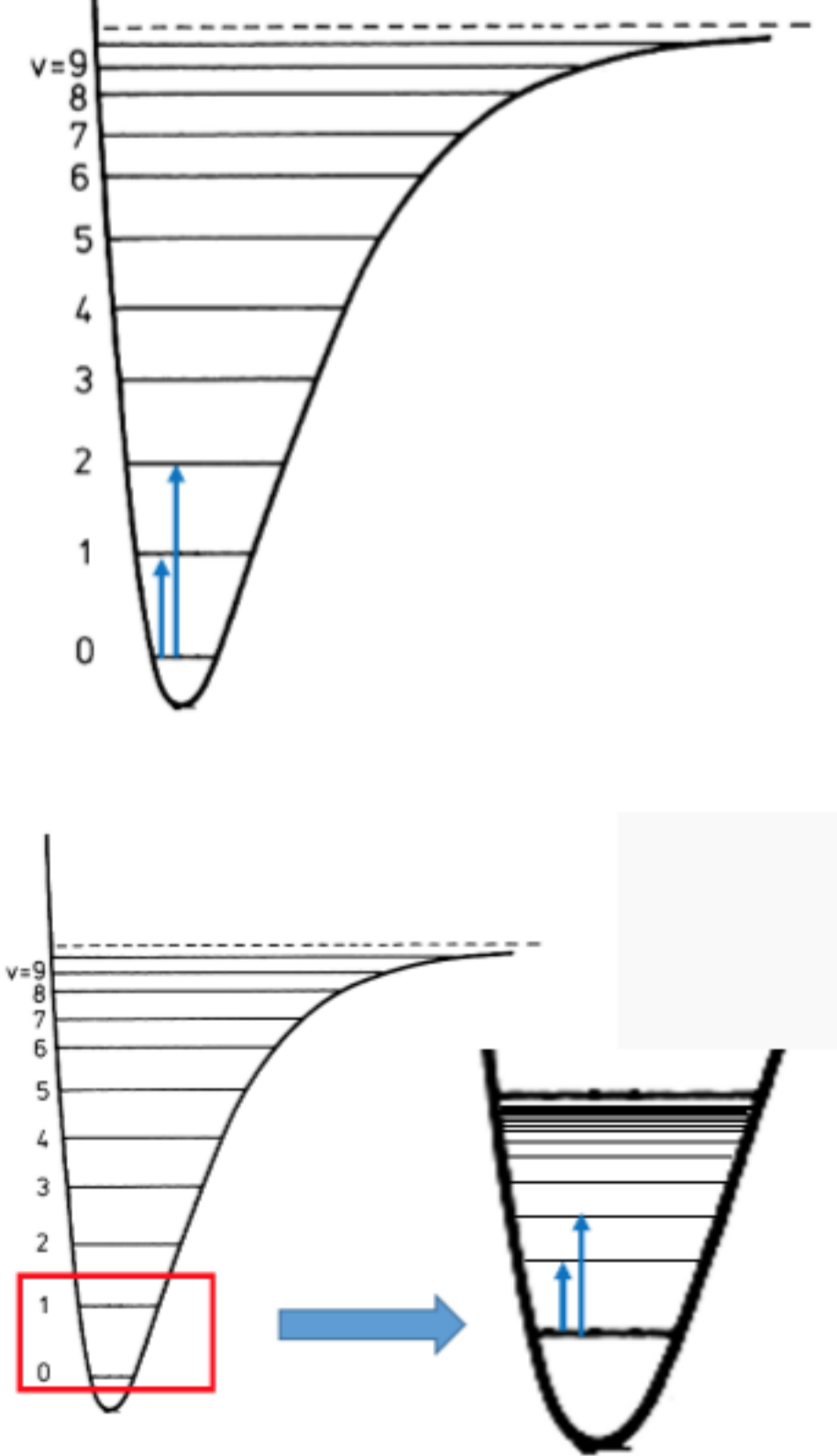
- belong to two different IRs  
 belong to the same IR  
 ust belong to two different IRs having different dimensionalities  
 none of the above

**No, the answer is incorrect. Score: 0**  
**Accepted Answers:**  
*belong to the same IR*

10) Which of the following picture represents an electronic transition **1 point**







none of the above

**No, the answer is incorrect. Score: 0**  
**Accepted Answers:**

