نموذج توصيف مقرر
Course Description Form

Name of College\Faculty : Science **اسم الكلية:**

Name of Department: Chemistry **اسم القسم العلمي:**

Course Name	Valence Bond Theory	**اسم المقرر**
Course No.	0420428	**رقم المقرر**
No. of Credits	3	**عدد الوحدات**
Theoretical Hours	3	**عدد الساعات النظرية**
Practical Hours	0	**عدد الساعات المحلية**

Course topics **مواضيع المقرر**

1. Basic elements of quantum chemistry.
2. The chemical bonding in diatomic molecules.
3. The chemical bonding in polyatomic molecules
4. Intermolecular interactions.

Text book: (Name, Author , Year , Publisher) **عنوان الكتاب : (الاسم ، المؤلف ، سنة الطبع ، دار النشر)**

Peter Atkins, Physical Chemistry, Oxford University Press, Oxford, Latest Edition.

References: (Name , Author , Year . Publisher) **عنوان المرجع : (الاسم ، المؤلف ، سنة الطبع ، دار النشر)**

1. Kotz, John C., Paul M. Treichel., John R. Townsend. Chemistry and Chemical Reactivity, Australia: Thomson Brooks/Cole., 2019. Print, Latest Edition.
2. Shaik, Sason S., Hiberty, Philippe C. A Chemist's Guide to Valence Bond Theory. Hoboken, New Jersey, Wiley, Latest Edition.
3. Wijesekera, Ramanee D. Coordination Compounds: Bonding, Structure and Nomenclature. Oxford, U.K.: Alpha Science International Ltd, Latest Edition.
4. Overlap of Atomic Orbitals to form Molecular Orbitals. http://www.chm.davidson.edu/vce/MolecularOrbitals/overlap/overlap1.html

Prerequisites					متطلبات المقرر	
Grading	Exams	50	%		الاختبارات	آلية رصد المقرر
	Quizzes	10	%		امتحانات قصيرة	
	H.W.	0	%		واجبات	
	Project (field study)	0	%		مشاريع (دراسة ميدانية)	
	Final	40	%		الاختبار النهائي	
	100%					

Chapters included:

Chapter	Topic	page
CH.1	Valence-Bond Theory	344-349
CH.2	Molecular Orbital Theory: The Hydrogen Molecule-Ion	351-356
CH.3	Molecular Orbital Theory: Homonuclear Diatomic Molecules	357-362
CH.4	Molecular Orbital Theory: Heteronuclear Diatomic Molecules	365-369
CH.5	Molecular Orbital Theory: Polyatomic Molecules	371-379

Course objectives					
No.	Course Objectives (Learning Outcomes)	Example(s) of relevant (Topics and activities)	Recommended Level to satisfy the objectives		
			High	Medium	Low
1	Describe the formation of covalent bonds in terms of atomic orbital overlap.	• Understand the wave-particle dualism and uncertainty principle. • Understand and interpret wave function. • Construct Schrödinger equation for particle in a box and apply them to molecules with Conjugated double bonds.	X		

		• Discuss wave mechanical treatment of hydrogen atoms. • Describe radial and angular parts of the wave function. • Describe the quantum numbers of the orbital and account for electron spin, Pauli exclusion principle and electronic configurations.			
2	Define and give examples of σ and π bonds.	• Understand the Born-Oppenheimer approximation and molecular potential energy curve. • Describe the concept of valence bond theory of hydrogen molecule, homonuclear diatomic molecules; σ-bond, bonding and antibonding orbitals. • Describe the σ-bond and π-bond from spin-pairing of electrons in polyatomic molecules, molecular geometry, and symmetries, localized and delocalized orbitals.	**X**		
3	Explain the concept of atomic orbital hybridization.	• Discuss the hydrogen molecule ion and the H_2 molecule. • Interpret the MO-LCAO approach and explain bonding and antibonding describe σ-orbital and σ-electron.	**X**		

4	Determine the hybrid orbitals associated with various molecular geometries	• Outline the Huckel approach for organic molecules, advanced approaches (PPP), HOMO`s and LUMO`s. • Account for the intermolecular interactions in terms of dispersion interaction, London forces and hydrogen bonding.	**X**		
Fields	Physical Chemistry				
Skills					
Coordinator (Name and Rank) :		Physical Chemistry Coordinator			
Signature and stamp :					
Date:		**10/11/2025**			