Course Specifications

M. S. Physical Chemistry (major)Level: GraduateA. Basic InformationTitle:Advanced Inorganic ChemistryCode:C16211Credit hours:2 h Lecture:2 h. Oracleanic States:0Academic year:2012 B. Professional Information: 1. Overal Amis of the course:* By the end of the course:* By the structure of the hydrogenic atom• Clarify the structure of the hydrogenic atom• Clarify the structure of the hydrogenic atom• Clarify the structure of the lydrogenic atom• Identify Crystal field theory• Relate ligand – Field and Electronic – Spectroscopy1. Intended Learning outcomes of the course (ILOS), after completing this course the student will be able to:• Iknow and understand:• Identify Systerically symmetric potential, general solution• Discuss transformation to spherical polar coordinates• Present the angular equation• Tabulate the quantum numbers: n, 1, m, and s• Interpret the Pauli cxelusion principle and Slater determinant.• Illustrate penetration, shielding, and building up principle• Show therm – structure for polyelectron of free ion• Recognize bonding and antibonding molecular orbitals• Draw molecular – orbital Energy Levels: triatomic, π – system, centric molecule: thezare, etera methylenecyclobutane, BF3.• Compare butadiene versus cyclobutalene• Distruct split the field and practical skills sucti• Analyze the final solution for the full wave function in acceptable real forms.•	Program:	-	Chemistry (majo							
 A. Basic Information Title: Advanced longanic Chemistry Code: CH6211 Credit hours: 2.h Lecture: 2h/week Tutorial: 0. Practices: 0. Academic year : 2012 B. Professional Information: 1. Overall Amis of the course: * By the end of the course the student will be able to Outline the structure of the hydrogenic atom Clarify the structure of many – electron atoms Discuss aspects of Molecular Orbital Theory Identify Crystal field theory Relate ligand – Field and Electronic – Spectroscopy 1. Intended Learning outcomes of the course (ILOs), after completing this course the student will be able to: Low and understand: Identify spherically symmetric potential, general solution Discuss transformation to spherical polar coordinates Present the angular equation Show the radial equation Tabulate the quantum numbers: n, l, m, and s Interpret the Pauli exclusion principle and Slater determinant. Illustrate penetration, shielding, and building up principle Show therm – structure for polyelectron of free ion Recognize bonding and antibonding molecular orbitals Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecular – orbital Eorepi Levels: triatomic, π – system, centric molecule: benzene, tetramethylencyclobutane, BF₂. Compare butdiene versus cyclobutadiene I. gain intellectual skills such: I. basize the final solution for the full wave functions in acceptable real forms. I. Bulastrate spin – orbital End potential, vacto Dato, Ta Explain the effect of V_{sc} on the d wave functions I. besign interederal crystal field potential, sordial, d orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital Present delocal	Loval, Cradu		Chemistry (major)						
Title:Advanced Inorganic Chemistry Code:Code:CH6211Credit hours:2 hLecture:2h/weekTutorial:0Practices:0Academic year:2012B. Professional Information:1Overall Amis of the course:** By the end of the course the student will be able to• Outline the structure of many – electron atoms• Discuss aspects of Molecular Orbital Theory• Identify Crystal field theory• Relate ligand – Field and Electronic – Spectroscopy1. Intended Learning outcomes of the course (ILOS), after completing this course the student will be able to:• Ikow and understand:• Identify spherically symmetric potential, general solution• Discuss transformation to spherical polar coordinates• Present the angular equation• Tabulate the quantum numbers: n, l, m, and s • Interpret the Pauli exclusion principle and Slater determinant.• Illustrate penetration, shielding, and building up principle• Show them – structure for polyelectron of free ion• Recognize bonding and antibonding molecular orbitals• Draw molecular – orbital Energy Levels: triatomic, π – system, centric molecule: berzene, tetramethylenccyclobutane, BF ₂ , • Compare butadiene versus cyclobutadiene• Big in intellectual skills such:• Outgate the final solution for the full wave functions in acceptable real forms.• Illustrate spin – orbital Energy Levels: triatomic, π – system, centric molecule: berzene, tetramethylencyclobutane, BF ₂ , • Compare butadiene versus cyclobutadiene• Dalayee the f										
Code: CH6211 Credit hours: 2 h Lecture: 2h/week Tutorial: 0 Practices: 0 Academic year: 2012 B Professional Information: 1. Overall Amis of the course: * By the end of the course the student will be able to • Outline the structure of many – electron atoms • Discuss aspects of Molecular Orbital Theory • Identify Crystal field theory • Relate ligand – Field and Electronic – Spectroscopy 1. Interded Learning outcomes of the course (ULOS), after completing this course the student will be able to: • Identify spherically symmetric potential, general solution Discuss transformation to spherical polar coordinates • Present the angular equation • Show the radial equation • Interpret the Pauli exclusion principle and Slater determinant. • Illustrate penetration, shielding, and building up principle • Show ther – structure for polyelectron of free ion • Recognize bonding and antibonding molecular orbitals • Draw molecular - orbital Energy Levels: triatomic, π – system, centric molecule: berzene, tetramethylencyclobutane, Bf ₃ . • Show tern – structure f			Advanced Inorg	anic C	hemistry					
Credit hours: 2 h Lecture: 2h/week Tutorial: 0 Practices: 0 Academic year: 2012 3 3 B. Professional Information: 1 Overall Amis of the course: * By the end of the course the student will be able to • Outline the structure of many – electron atoms 0 Discuss aspects of Molecular Orbital Theory • Identify Crystal field theory • Relate ligand – Field and Electronic – Spectroscopy 1. Intended Learning outcomes of the course (ILOS), after completing this course the student will be able to: • • Identify Spherically symmetric potential, general solution • • Jiscuss transformation to spherical polar coordinates • • Present the angular equation • Show the radial equation • Show the radial equation • Interpret the Pauli exclusion principle and Slater determinant. • Illustrate penetration, shielding, and building up principle • • Show molecular - orbitals correlation diagram for: diatomic molecules • Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules •										
 Academic year : 2012 B. Professional Information: 1. Overall Amis of the course: By the end of the course the student will be able to Outline the structure of the hydrogenic atom Clarify the structure of many – electron atoms Discuss aspects of Molecular Orbital Theory I dentify Crystal field theory Relate ligand – Field and Electronic – Spectroscopy 1. Intended Learning outcomes of the course (ILOS), after completing this course the student will be able to: i. know and understand: Identify spherically symmetric potential, general solution Discuss transformation to spherical polar coordinates Present the angular equation Show the radial equation Show the radial equation principle and Slater determinant. Illustrate ponetration, shielding, and building up principle Show term – structure for polyelectron of free ion Recognize bonding and antibonding molecular orbitals Draw molecular – orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₂. Compare butadiene versus cyclobutadiene fi gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{ext}, D_{am}, T₄ Explain the effect of V_{ext} on the d wave functions Illustrate spin – orbital coupling Deduce octahedral crystal field potential, proving at anothis, and bond order Classing and practical skills such: Design three dimensions plot of s orbital, p orbital, d orbital, and the z – component of orbital and put enductions. Illustrate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order Charge of l	-			:	2h/week					
 B. Professional Information: Overall Amis of the course: By the end of the course the student will be able to Outline the structure of the hydrogenic atom Clarify the structure of many – electron atoms Discuss aspects of Molecular Orbital Theory Identify Crystal field theory Relate ligand – Field and Electronic – Spectroscopy Intended Learning outcomes of the course (ILOS), after completing this course the student will be able to: know and understand: Identify spherically symmetric potential, general solution Discuss transformation to spherical polar coordinates Present the angular equation Tabulate the quantum numbers: n, 1, m, and s Interpret the Pauli exclusion principle and Slater determinant. Illustrate penetration, shielding, and building up principle Show term – structure for polyelectron of free ion Recognize bonding and antibonding molecular orbitals Draw molecular - orbital correlation diagram for: diatomic molecules Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules Show the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{ot}, D_{ato} T_d Explain the effect of V_{oc} on the d wave functions Ill obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, and the z – component of orbital and partical skills such: Design three dimensions plot of s orbital, p orbital, and the z – component of orbital and practical skills such: Design three dimensions plot of s orbital, p orbital, and the z – component of orbital and partical skills such: Design three dimensions plot of s orbital, p orbital, and the z – component of orbital angular momentum. 	Т	utorial: 0	Practices:	0						
 1. Overall Amis of the course: * By the end of the course the student will be able to Outline the structure of the hydrogenic atom Clarify the structure of many – electron atoms Discuss aspects of Molecular Orbital Theory Identify Crystal field theory Relate ligand – Field and Electronic – Spectroscopy 1. Intended Learning outcomes of the course (ILOS), after completing this course the student will be able to: I. know and understand: Identify spherically symmetric potential, general solution Discuss transformation to spherical polar coordinates Present the angular equation Show the radial equation Tabulate the quantum numbers: n, 1, m, and s Interpret the Pauli exclusion principle and Slater determinant. Illustrate penetration, shielding, and building up principle Show term – structure for polyelectron of free ion Recognize bonding and antibohding molecular orbitals Draw molecular - orbitals correlation diagram for: diatomic molecules Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules Show molecular – orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₂. Compare butadine versus cyclobutadiene 11, gain intellectual skills such: Analyze the final solution for the full wave functions in acceptable real forms. Illustrate spin – orbital and practical skills such: Design three dimensions plot of s orbital, p orbital, and the z – component of orbital angular momentum. ealculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order bise spin tree dimensions plot of s orbital, p orbital, and the z – component of orbital angular momentum. ealculate the most proba	Α	cademic year : 202	12							
 * By the end of the course the student will be able to Outline the structure of the hydrogenic atom Clarify the structure of many – electron atoms Discuss aspects of Molecular Orbital Theory Identify Crystal field theory Relate ligand – Field and Electronic – Spectroscopy Intended Learning outcomes of the course (ILOS), after completing this course the student will be able to: i. Know and understand: I. Identify spherically symmetric potential, general solution Discuss transformation to spherical polar coordinates Present the angular equation Show the radial equation Tabulate the quantum numbers: n, l, m, and s Interpret the Pauli exclusion principle and Slater determinant. Illustrate penetration, shielding, and building up principle Show term – structure for polyelectron of free ion Recognize bonding and antibonding molecular orbitals Draw molecular - orbital correlation diagram for: diatomic molecules Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules Show torl – orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecylobutane, BF₃. Compare butadiene versus cyclobutadiene i. gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{oct}, D_{4h}, T_d Explain the effect of V_{acc} on the dwave functions ii. obtain professional and practical skills such: Design three dimensions plot of s orbital, o robital, and the z – component of orbital angular momentum. elaculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order i. Neve genera	В.	Professional Inforn	nation:							
 Outline the structure of the hydrogenic atom Clarify the structure of many – electron atoms Discuss aspects of Molecular Orbital Theory Identify Crystal field theory Relate ligand – Field and Electronic – Spectroscopy Intended Learning outcomes of the course (ILOs), after completing this course the student will be able to: know and understand: Identify spherically symmetric potential, general solution Discuss transformation to spherical polar coordinates Present the angular equation Show the radial equation Show the radial equation Interpret the Pauli exclusion principle and Slater determinant. Illustrate penetration, shielding, and building up principle Show torm – structure for polyelectron of free ion Recognize bonding and antibonding molecular orbitals Draw molecular - orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene igin intellectual skills such: Analyze the final solution for the full wave functions in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, Voer, D_ah, T_d Explain the effect of V_{scc} on the d wave functions identify such]	1. Overall Amis of	the course:							
 Clarify the structure of many – electron atoms Discuss aspects of Molecular Orbital Theory Identify Crystal field theory Relate ligand – Field and Electronic – Spectroscopy Intended Learning outcomes of the course (ILOS), after completing this course the student will be able to: Ixow and understand: Identify spherically symmetric potential, general solution Discuss transformation to spherical polar coordinates Present the angular equation Show the radial equation Tabulate the quantum numbers: n, 1, m, and s Interpret the Pauli exclusion principle and Slater determinant. Illustrate penetration, shielding, and building up principle Show ther adial equation of free ion Recognize bonding and antibonding molecular orbitals Draw molecular - orbital correlation diagram for: diatomic molecules Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecular – orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene ii gain intellectual skills such: Analyze the final solution for the full wave functions in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{oat}, D_{ab}, T_d Explain the effect of V_{sect} on the d wave functions iii obtiin professional and practical skills such: Design three dimensio		* By the end of	of the course the	e stude	ent will be able to					
 Discuss aspects of Molecular Orbital Theory Identify Crystal field theory Relate ligand – Field and Electronic – Spectroscopy Intended Learning outcomes of the course (ILOS), after completing this course the student will be able to: Identify spherically symmetric potential, general solution Discuss transformation to spherical polar coordinates Present the angular equation Show the radial equation Tabulate the quantum numbers: n, l, m, and s Interpret the Pauli exclusion principle and Slater determinant. Illustrate penetration, shielding, and building up principle Show term – structure for polyelectron of free ion Recognize bonding and antibonding molecular orbitals Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules Show molecular – orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{ort}, D_{ahn} T_d Explain the effect of V_{wet} on the d wave functions obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, d orbital, and the z – component of orbital and maximum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order 		• Outline the struct	ture of the hydroge	nic ato	om					
 Identify Crystal field theory Relate ligand – Field and Electronic – Spectroscopy Intended Learning outcomes of the course (ILOs), after completing this course the student will be able to: Know and understand: Identify spherically symmetric potential, general solution Discuss transformation to spherical polar coordinates Present the angular equation Show the radial equation Tabulate the quantum numbers: n, l, m, and s Interpret the Pauli exclusion principle and Slater determinant. Illustrate penetration, shielding, and building up principle Show term – structure for polyelectron of free ion Recognize bonding and antibonding molecular orbitals Draw molecular - orbital S correlation diagram for: diatomic molecules Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules		Clarify the struct	ure of many – elec	tron at	toms					
 Relate ligand – Field and Electronic – Spectroscopy Intended Learning outcomes of the course (ILOs), after completing this course the student will be able to: know and understand: Identify spherically symmetric potential, general solution Discuss transformation to spherical polar coordinates Present the angular equation Show the radial equation Tabulate the quantum numbers: n, l, m, and s Interpret the Pauli exclusion principle and Slater determinant. Illustrate penetration, shielding, and building up principle Show term – structure for polyelectron of free ion Recognize bonding and antibonding molecular orbitals Draw molecular - orbital scorrelation diagram for: diatomic molecules Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules Show molecular – orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{octo} D_{4bo} T_d Explain the effect of V_{oct} on the d wave functions obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, d orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond orde		• Discuss aspects of	of Molecular Orbita	al Theo	ory					
 Intended Learning outcomes of the course (ILOs), after completing this course the student will be able to: Know and understand: Identify spherically symmetric potential, general solution Discuss transformation to spherical polar coordinates Present the angular equation Show the radial equation Tabulate the quantum numbers: n, 1, m, and s Interpret the Pauli exclusion principle and Slater determinant. Illustrate penetration, shielding, and building up principle Show term – structure for polyelectron of free ion Recognize bonding and antibonding molecular orbitals Draw molecular - orbital s correlation diagram for: diatomic molecules Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules		Identify Crystal fi	eld theory							
 course the student will be able to: know and understand: Identify spherically symmetric potential, general solution Discuss transformation to spherical polar coordinates Present the angular equation Show the radial equation Tabulate the quantum numbers: n, 1, m, and s Interpret the Pauli exclusion principle and Slater determinant. Illustrate penetration, shielding, and building up principle Show term – structure for polyelectron of free ion Recognize bonding and antibonding molecular orbitals Draw molecular - orbitals correlation diagram for: diatomic molecules Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules Show molecular – orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{oct}, D_{4h}, T_d Explain the effect of V_{oct} on the d wave functions Othin professional and practical skills such: Obesign three dimensions plot of s orbital, p orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order in the general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 		• Relate ligand – F	ield and Electronic	e – Spe	ectroscopy					
 i. Know and understand: i. Know and understand: i. Identify spherically symmetric potential, general solution Discuss transformation to spherical polar coordinates Present the angular equation Show the radial equation Tabulate the quantum numbers: n, l, m, and s Interpret the Pauli exclusion principle and Slater determinant. Illustrate penetration, shielding, and building up principle Show tern – structure for polyelectron of free ion Recognize bonding and antibonding molecular orbitals Draw molecular - orbitals correlation diagram for: diatomic molecules Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules Show molecular – orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene ii. gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{oct}, D_{4h}, T_d Explain the effect of V_{oct} on the d wave functions iii. obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 	1	I. Intended Learnin	ng outcomes of th	e cours	se (ILOs), after completing this					
 Identify spherically symmetric potential, general solution Discuss transformation to spherical polar coordinates Present the angular equation Show the radial equation Tabulate the quantum numbers: n, 1, m, and s Interpret the Pauli exclusion principle and Slater determinant. Illustrate penetration, shielding, and building up principle Show term – structure for polyelectron of free ion Recognize bonding and antibonding molecular orbitals Draw molecular - orbitals correlation diagram for: diatomic molecules Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules Show molecular - orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene ii gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{act}, D_{abv} T_d Explain the effect of V_{oct} on the d wave functions iii obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpt transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 		course the stude	ent will be able to:							
 Discuss transformation to spherical polar coordinates Present the angular equation Show the radial equation Tabulate the quantum numbers: n, 1, m, and s Interpret the Pauli exclusion principle and Slater determinant. Illustrate penetration, shielding, and building up principle Show term – structure for polyelectron of free ion Recognize bonding and antibonding molecular orbitals Draw molecular - orbitals correlation diagram for: diatomic molecules Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules Show molecular - orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene ii gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{oct}, D_{ah}, T_d Explain the effect of V_{oct} on the d wave functions iii obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpt transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 										
 Present the angular equation Show the radial equation Tabulate the quantum numbers: n, l, m, and s Interpret the Pauli exclusion principle and Slater determinant. Illustrate penetration, shielding, and building up principle Show term – structure for polyelectron of free ion Recognize bonding and antibonding molecular orbitals Draw molecular - orbitals correlation diagram for: diatomic molecules Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules Show molecular – orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene ii. gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital for yoet on the d wave functions iii. obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 		• •			•					
 Show the radial equation Tabulate the quantum numbers: n, l, m, and s Interpret the Pauli exclusion principle and Slater determinant. Illustrate penetration, shielding, and building up principle Show term – structure for polyelectron of free ion Recognize bonding and antibonding molecular orbitals Draw molecular - orbitals correlation diagram for: diatomic molecules Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules Show molecular - orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene ii gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{oct}, D_{4h}, T_d Explain the effect of V_{oct} on the d wave functions iii. obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 			-	ical pol	lar coordinates					
 Tabulate the quantum numbers: n, l, m, and s Interpret the Pauli exclusion principle and Slater determinant. Illustrate penetration, shielding, and building up principle Show term – structure for polyelectron of free ion Recognize bonding and antibonding molecular orbitals Draw molecular - orbitals correlation diagram for: diatomic molecules Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules Show molecular – orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene ii gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{oct}, D_{4h}, T_d Explain the effect of V_{oct} on the d wave functions iii. obtain professional and practical skills such: Design three dimensions plot of s orbital, d orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 										
 Interpret the Pauli exclusion principle and Slater determinant. Illustrate penetration, shielding, and building up principle Show term – structure for polyelectron of free ion Recognize bonding and antibonding molecular orbitals Draw molecular - orbitals correlation diagram for: diatomic molecules Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules Show molecular – orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene ii gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital and practical skills such: Explain the effect of V_{oct} on the d wave functions iii obtain professional and practical skills such: calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 			-							
 Illustrate penetration, shielding, and building up principle Show term – structure for polyelectron of free ion Recognize bonding and antibonding molecular orbitals Draw molecular - orbitals correlation diagram for: diatomic molecules Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules Show molecular – orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene ii. gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{oct}, D_{4h}, T_d Explain the effect of V_{oct} on the d wave functions iii. obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, d orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 			-							
 Show term – structure for polyelectron of free ion Recognize bonding and antibonding molecular orbitals Draw molecular - orbitals correlation diagram for: diatomic molecules Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules Show molecular – orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene ii. gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{oct}, D_{4h}, T_d Explain the effect of V_{oct} on the d wave functions iii. obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order ix have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 		-	-	-						
 Recognize bonding and antibonding molecular orbitals Draw molecular - orbitals correlation diagram for: diatomic molecules Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules Show molecular – orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene ii. gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{oct}, D_{4h}, T_d Explain the effect of V_{oct} on the d wave functions iii. obtain professional and practical skills such: calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 		-	-							
 Draw molecular - orbitals correlation diagram for: diatomic molecules Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules Show molecular – orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene ii. gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{oct}, D_{4h}, T_d Explain the effect of V_{oct} on the d wave functions iii. obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, d orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 										
 Differentiate between the second row homo – and hetero – diatomic, term symbol for linear molecules Show molecular – orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene ii. gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{oct}, D_{4h}, T_d Explain the effect of V_{oct} on the d wave functions iii. obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, d orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 		-	-	-						
 linear molecules Show molecular – orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene ii. gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{oct}, D_{4h}, T_d Explain the effect of V_{oct} on the d wave functions iii. obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, d orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 					-					
 Show molecular – orbital Energy Levels: triatomic, π – system, centric molecule: benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene ii. gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{oct}, D_{4h}, T_d Explain the effect of V_{oct} on the d wave functions iii. obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 				d row h	homo – and hetero – diatomic, term symbol for					
 benzene, tetramethylenecyclobutane, BF₃. Compare butadiene versus cyclobutadiene ii. gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{oct}, D_{4h}, T_d Explain the effect of V_{oct} on the d wave functions iii. obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 										
 Compare butadiene versus cyclobutadiene ii. gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{oct}, D_{4h}, T_d Explain the effect of V_{oct} on the d wave functions iii. obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 										
 ii. gain intellectual skills such: Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{oct}, D_{4h}, T_d Explain the effect of V_{oct} on the d wave functions iii. obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, d orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 										
 Analyze the final solution for the full wave function in acceptable real forms. Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{oct}, D_{4h}, T_d Explain the effect of V_{oct} on the d wave functions iii. obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, d orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 			•	סטענממ	liene					
 Illustrate spin – orbital coupling Deduce octahedral crystal field potential, V_{oct}, D_{4h}, T_d Explain the effect of V_{oct} on the d wave functions iii. obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, d orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 		-		a full u	veve function in accortable real forms					
 Deduce octahedral crystal field potential, V_{oct}, D_{4h}, T_d Explain the effect of V_{oct} on the d wave functions iii. obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, d orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 					wave function in acceptable fear forms.					
 Explain the effect of V_{oct} on the d wave functions iii. obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, d orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 		-								
 iii. obtain professional and practical skills such: Design three dimensions plot of s orbital, p orbital, d orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 			-	-						
 Design three dimensions plot of s orbital, p orbital, d orbital, and the z – component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 		_								
 component of orbital angular momentum. calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 		-	-							
 calculate the most probable radius, mean radius of an orbital present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 		U U	1							
 present delocalization energy, electron density, formal charge at atoms, and bond order iv. have general and transferable skills as: Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 		-	-							
order iv. have general and transferable skills as: • Show splitting of levels and terms in chemical environment • interpet transition from weak to strong field, construction of the energy level diagrams • clarify Orgel diagrams			-							
 Show splitting of levels and terms in chemical environment interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 		-								
 interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 		iv. have general ar	d transferable ski	lls as:						
 interpet transition from weak to strong field, construction of the energy level diagrams clarify Orgel diagrams 		 Show splitting 	g of levels and terr	ns in cł	hemical environment					
clarify Orgel diagrams										
		-		0						
Present Tanobe – Sagano diagrams		 clarify Orgel 	diagrams							
		• Present Tano	be – Sagano diagra	ms						

2- Content	NL P	T 4	D. d. T
Торіс	No. of hours	Lecture	Practical
The structure of the hydrogenic atom Spherically	10	5	0
symmetric potential			
Angular, Radial equations, final solution in real			
forms. Quantum numbers: n, l, m, and s Pauli			
Exclusion Principle and Slater determinant.			
Three dimensions plot of s orbital, p orbital, d			
orbital			
Orbital angular momentum			
Calculating the most probable r			
The structure of many – electron atoms	2	1	0
Penetration, shielding, and building up principle			
Spin – orbit coupling			
Molecular Orbital Theory	8	4	0
Molecular - Orbitals Correlation Diagram for: H ₂ ,			
$\operatorname{He}_{2},\operatorname{He}_{2}^{+}$			
The second row homo – and hetero – diatomic			
Term Symbol for linear Molecules			
Triatomic, π – system of Allyl radical: electron			
density at atoms, formal charge, and bond order			
Molecular – Orbitals for centric molecule			
Butadiene versus cyclobutadiene			
Benzene: delocalization energy			
Tetramethylenecyclobutane: bond order			
BF ₃ .			
Crystal field theory	4	2	0
Octahedral Crystal Field Potential, Voct, D4h,			
Td			
The effect of Voct on the d wave functions			
Ligand – Field	4	2	0
Splitting of levels and terms in chemical			
environment			
Transition from weak to strong field,			
construction of the energy level diagrams			
Orgel diagrams			
Tanobe – Sagano diagrams			

Teaching and Learning Methods:

Lectures, discussion and active lecture

2.	Student Assessment Methods:							
	written exam, quizzes and open book exam							
	Assessment Schedule							
	Assessment 1:	on the fifth week						
Assessment 2:		on the sixth week						
	Assessment 3:	on the tenth week	on the tenth week					
	Assessment 4:	on the twelfth week	on the twelfth week					
	Assessment 5:	on the fourteenth week						
	Weighting of Assessment	ts						
	Mid – Term Examination and oral exam: 20							
	Semester work:	20%						
Final – Term:		60%						
Total:		100%)					
3.	List of References							
a-	text books							

A. B. P. Lever: Inorganic Electronic spectroscopy

B.N. Figgis: Introduction to Ligand Field

F. A. Cotton: Chemical Applications of Group Theory

4. Facilities Required for Teaching and Learning: overhead projector, audio video projector and data show

Course Coordinator: Joseph J. Stephanos, Assoc. Prof. Head of Department: Prof. Ahmad Abd El Migid:

Date: 2012