IPB UNIVERSITY
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
DEPARTEMEN KIMIA

DEPARTEMEN KIMIA
Gedung Kimia Wing 1 Lantai 3
Jl. Tanjung, Kampus Darmaga
Bogor 16680
Telp/Fax (0251)8624567
Email: kimia@apps.ipb.ac.id; Website: http://chem.ipb.ac.id

SYLLABUS

KIM 215
INORGANIC CHEMISTRY: Elements and Bonding
3(3-0)

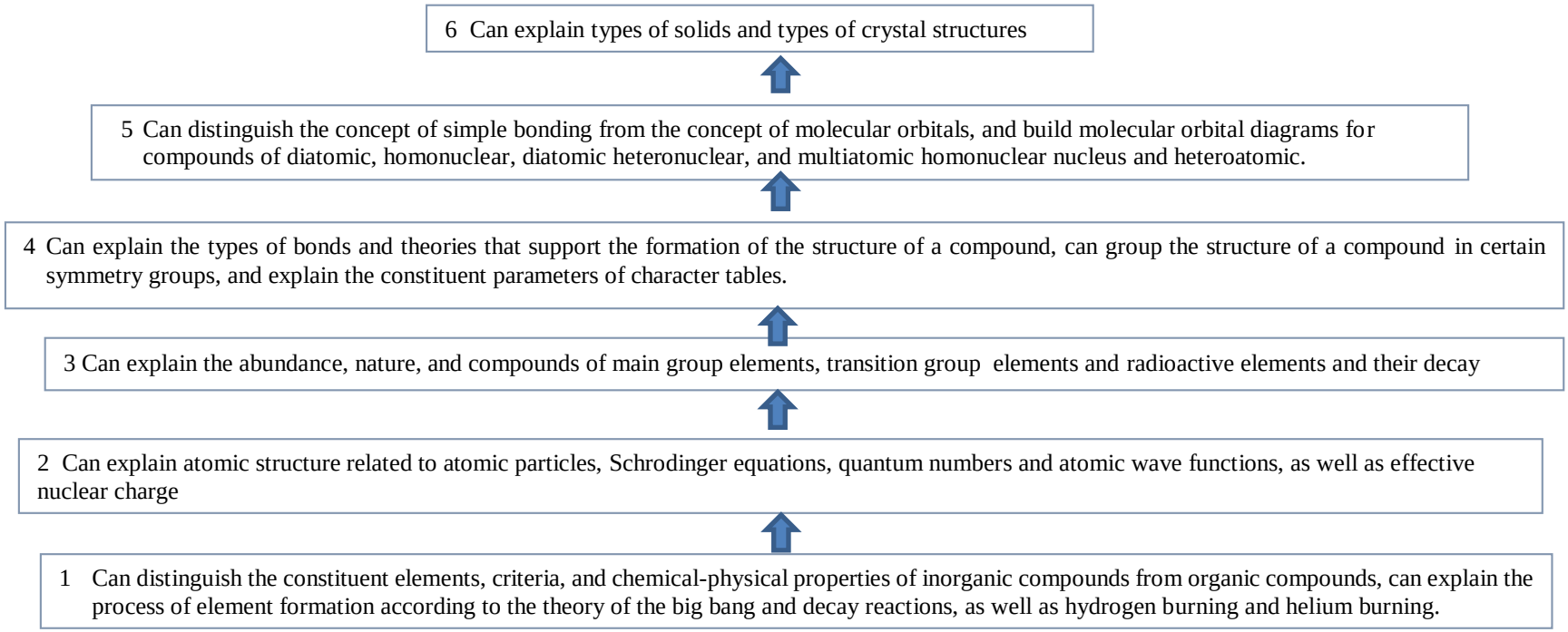
INSTRUCTIONAL ANALYSIS

Learning Outcomes:

Can distinguish the constituent elements, criteria, and chemical-physical properties of inorganic compounds from organic compounds, can explain the process of element formation according to the theory of the big bang and decay reactions, as well as hydrogen burning and helium burning. Can explain the abundance, nature, and compounding of the elements of the main group, the elements of the transition group. Can explain the structure of atoms according to traditional and modern concepts, types of bonds and theories that support the formation of the structure of a compound, can group the structure of a compound in certain symmetry groups and explain the constituent parameters of the character table. Can distinguish the concept of simple bonding from the concept of molecular orbitals, and build molecular orbital diagrams for compounds of diatomic, homonuclear, diatomic heteronuclear, and multiatomic compounds of the homonuclear and heteronuclear. Can explain the types of solids and types of crystal structures.

IPB UNIVERSITY
FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM
DEPARTEMEN KIMIA

DEPARTEMEN KIMIA
Gedung Kimia Wing 1 Lantai 3
Jl. Tanjung, Kampus Darmaga
Bogor 16680
Telp/Fax (0251)8624567
Email: kimia@apps.ipb.ac.id; Website: http://chem.ipb.ac.id



Course Name	:	Inorganic Chemistry: Elements and Bonding
Code/Credit	:	KIM 215/3(3-0)
Semester	:	Odd
Description	:	This course provides knowledge about introduction to inorganic chemistry, atomic structure, main group elements, transition group elements, radioactive elements, and their decay, simple chemical bonds, symmetry and molecular orbitals, types of solids and types of crystal structures.
Prerequisite course	:	-

DEPARTEMEN KIMIA
Gedung Kimia Wing 1 Lantai 3
Jl. Tanjung, Kampus Darmaga
Bogor 16680
Telp/Fax (0251)8624567
Email: kimia@apps.ipb.ac.id; Website: http://chem.ipb.ac.id

Learning outcomes	: 1 Can distinguish the constituent elements, criteria, and chemical-physical properties of inorganic compounds from organic compounds, can explain the process of element formation according to the theory of the big bang and decay reactions, as well as hydrogen burning and helium burning 2 Can explain atomic structure related to atomic particles, Schrodinger equations, quantum numbers and atomic wave functions, as well as effective nuclear charge 3 Can explain the abundance, nature, and compounds of main group elements, transition group elements, and elements of radioactive elements and their decay 2. Can explain the structure of atoms according to traditional and modern concepts, types of bonds and theories that support the formation of the structure of a compound, can group the structure of a compound in certain symmetry groups and explain the constituent parameters of character tables 3. Can distinguish the concept of simple bonding from the concept of molecular orbitals, and build molecular orbital diagrams for compounds of diatomic, homonuclear, diatomic heteronuclear, and multiatomic compounds of the homonuclear and heteronuclear. 4. Can explain types of solids and types of structures
Scope and Curriculum Map of Royal Society of Chemistry (RSC)	:
Division/Field	: Inorganic Chemistry
Lecturers	: 1 Dr. Charlena, M.Si 2 Sri Sugiarti Ph.D 3 Dr. Tetty Kemala M.Si 4 Dr. Noviyan Darmawan

Table 1. Plan for Study

Week Of	Learning Outcome	Topic	Method	Duration	Student Experience	Assessment			Reference
						Indicator	Criteria	(%)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)

DEPARTEMEN KIMIA
Gedung Kimia Wing 1 Lantai 3
Jl. Tanjung, Kampus Darmaga
Bogor 16680
Telp/Fax (0251)8624567
Email: kimia@apps.ipb.ac.id; Website: http://chem.ipb.ac.id

1	Can explain the difference between inorganic chemistry and organic chemistry, the event of the formation of elements, and the history of the development of inorganic chemistry	1 Lecture agreement 2 Contrast between organic chemistry and inorganic chemistry 3 The birth of the elements (the Big Bang) and the formation of the earth 4 Distribution of elements on earth 5 History of inorganic chemistry	Synchronous-Face-to-Face Online/Offline includes lectures and interactive discussions	150 min	Know and identify the difference between inorganic chemistry and organic chemistry, the events of the formation of elements, and the history of the development of inorganic chemistry	Correctness of the explanation of the contrast between organic chemistry and inorganic chemistry, the birth of the elements (the Big Bang) and the formation of the earth, the distribution of elements on earth, and the history of inorganic chemistry	Midterm	2.5	1
2	Can explain atomic structure related to atomic particles, Schrodinger equations, quantum numbers, and atomic wave functions, as well as the effective nuclear charge	1 Atomic particles and Schrödinger's equation 2 Quantum numbers and atomic functions 3 Effective nuclear charge	Synchronous-Face-to-Face Online/Offline includes lectures and interactive discussions	150 min	Know and identify atomic particles, Schrodinger's equation, quantum numbers, atomic wave functions, and effective nuclear charge	Completeness and correctness of explanations of atomic particles, Schrodinger equations, quantum numbers, atomic wave functions, and effective nuclear charge	Midterm	5	1,2,3
3-4	Can explain the abundance, physical properties, synthesis, and usefulness of the main group elements	1 Borane and carborane 2 Aluminum	Asynchronous includes: video viewing and interactive discussion	300 min	Know and identify the abundance, physical properties, synthesis, and uses of borane elements, carborane, and aluminum	The correct explanation of the element's borane, carborane, and aluminum	Midterm	5	1,2
5	Can explain the abundance, physical properties, synthetics, and usefulness of the main group elements	1 Nitrogen 2 Oxygen and Sulfur	Asynchronous includes video viewing and interactive discussion	150 min	Know and identify the abundance, physical properties, synthesis, and uses of nitrogen, oxygen, and sulfur	The correct explanation of nitrogen, oxygen, and sulfur elements	Midterm	5	1,2
6	Can explain the abundance, physical properties, synthesis, and uses of transition group elements	1 Properties of transition elements 2 Transition element compounds 3 Metal alloys	Asynchronous includes video viewing and interactive discussion	150 min	Know and identify the properties of transition elements, compounds of transition elements, and alloys	The correct explanation of the properties of transition elements, compounds of transition elements, and metal alloys	Midterm	5	2

DEPARTEMEN KIMIA
Gedung Kimia Wing 1 Lantai 3
Jl. Tanjung, Kampus Darmaga
Bogor 16680
Telp/Fax (0251)8624567
Email: kimia@apps.ipb.ac.id; Website: http://chem.ipb.ac.id

7	Can explain the abundance, physical properties, synthesis, and uses of radioactive elements as well as their decay	1 Nuclear chemistry 2 Decay of radioactive elements	Asynchronous includes video viewing and interactive discussion	150 min	Know and identify the abundance, physical properties, synthesis, and uses of the lanthanides and actinides, and their decay	The correct explanation of the lanthanide and actinide groups and their decay	Midterm	2.5	2
	MIDTERM							25	
8	Can explain Lewis electron-point diagrams, valence electron pair repulsion theory (VSEPR), electronegativity, polar bonds, and hydrogen bonding	1 Lewis's electron-dot diagram 2 Valence electron pair repulsion theory (VSEPR) 3 Electronegativity 4 Polar bond 5 Hydrogen bonding	Synchronous-Face-to-Face Online/Offline includes lectures and interactive discussions	150 min	Know and identify Lewis electron-point diagram, valence electron pair repulsion theory (VSEPR), electronegativity, polar bonds, and hydrogen bonding	Completeness and correctness of explanations of Lewis electron-point diagrams, valence electron pair repulsion theory (VSEPR), electronegativity, polar bonds, and hydrogen bonding	Exam III	5	1,2,3
9	Can explain the symmetry of a compound and group it into group theory, and determine the IR and Raman activity of the compound	Element and symmetry operations	Synchronous Face-to-Face Online/Offline includes lectures, interactive discussions, and video viewing	150 min	Know and identify elements and symmetry operations	Completeness and correctness of explanations of elements and symmetry operations	Exam III	5	1,2,3
10-11	Can explain the symmetry of a compound and group them into group theory, and determine the IR and Raman activity of the compound	1 Group theory 2 Group properties and representation	Lectures, interactive discussions	225 min	Know and identify group theory and the nature of group representation	Completeness and correctness of explanations of group theory and the nature of group representation	Exam III	5	1,2,3
	PRE-FINAL EXAMINATION							25	
11	Can explain the formation of molecular orbitals from atomic orbitals and can build molecular orbital diagrams for homonuclear and heteronuclear compounds	The formation of molecular orbitals from atomic orbitals	Interactive discussions	75 min	Know and identify the formation of molecular orbitals from atomic orbitals	Know and identify the formation of molecular orbitals from atomic orbitals	Exam IV	5	1,2,3

DEPARTEMEN KIMIA
Gedung Kimia Wing 1 Lantai 3
Jl. Tanjung, Kampus Darmaga
Bogor 16680
Telp/Fax (0251)8624567
Email: kimia@apps.ipb.ac.id; Website: http://chem.ipb.ac.id

12-13	Can explain the formation of molecular orbitals from atomic orbitals and can build molecular orbital diagrams for homonuclear and heteronuclear compounds	1 The formation of molecular orbitals from atomic orbitals 2 Homonuclear diatom molecules 3 Describing heteronuclear diatom molecules 4 Orbital molecules for large molecules 5 Expanded Shells and molecular orbitals	Synchronous-Face-to-Face Lectures Online /Offline include: Lectures, interactive discussions, and video viewing	300 min	Know and identify homonuclear diatom molecules, describe heteronuclear diatom molecules, molecular orbitals for large molecules, expanded shells, and molecular orbitals	The completeness and correctness of the explanation of the homonuclear diatom molecule, describing the heteronuclear molecule, the molecular orbital for large molecules, expanded shells and orbital molecules	Exam IV	15	1,2,3
14	Can explain the types of solids and types of crystal structure	1 Types of solids 2 Types of crystal structures	Synchronous-Face-to-Face Lectures Online /Offline include: lectures, interactive discussions, and video viewing	150 min	Know and identify the types of solids and types of crystal structure	Completeness and correctness of the explanation of the types of solids and types of crystal structures	Exam IV	5	
	FINAL EXAM							25	

DEPARTEMEN KIMIA
Gedung Kimia Wing 1 Lantai 3
Jl. Tanjung, Kampus Darmaga
Bogor 16680
Telp/Fax (0251)8624567
Email: kimia@apps.ipb.ac.id; Website: http://chem.ipb.ac.id

Table 2. Plan for Assignment

Week of	Topic	Objective	Description	Assessment Criteria
7	Main group elements	To increase students' insight about midterm subjects and prepare animation or presentation	Students in groups prepare animations and/or presentations (or in video form) on the selected topic in the midterm.	Activities in class and groups
Midterm				
11	Simple Chemical Bond-Symmetry	Can explain compounds in a certain symmetry		
Final exam	Molecular orbitals and types of solid structure	Can build molecular orbital diagrams of two atoms and three atoms homonuclear and heteronuclear and can explain the types of solids and types of solid structure		

Table 3. Plan for Assessment

Learning Outcomes	Assignment	Exam			
		I	II (Mid)	III	IV (Final)
Can distinguish the constituent elements, criteria, and chemical-physical properties of inorganic compounds from organic compounds, can explain the process of element formation according to the theory of the Big Bang and decay reactions, as well as hydrogen burning and helium burning		v			
Can explain atomic structure related to atomic particles, Schrodinger equations, quantum numbers, and atomic wave functions, as well as the effective nuclear charge	Practice questions				
Can explain the abundance, nature, and compounds of main group elements and clusters, transition group elements, radioactive and decay elements	Video creation	v			
Can explain the structure of atoms according to traditional and modern concepts, types of bonds, and theories that support the formation of the structure of a compound, can group the structure of a compound in certain symmetry groups, and explain the constituent parameters of character tables				v	
Can distinguish the concept of simple bonding from the concept of molecular orbitals, and build molecular orbital diagrams for compounds of diatomic, homonuclear, diatomic heteronuclear, and multiatomic compounds of the homonuclear and heteronuclear				v	

DEPARTEMEN KIMIA
Gedung Kimia Wing 1 Lantai 3
Jl. Tanjung, Kampus Darmaga
Bogor 16680
Telp/Fax (0251)8624567
Email: kimia@apps.ipb.ac.id; Website: http://chem.ipb.ac.id

Table 4. Distribution of Assessment

Assessment Criteria	Range	%	Remark
Assignments/Video Creation (Small Project)	70-100	25	Group and individual scores
Assessment: Midterm Prefinal Final	 0-100 0-100	 25 25 25	 Individual score Individual score
Inorganic Chemical Values: Elements and Bonding		**100**	

Table 5. Assessment Criteria

Range	Assessment Criteria
≥ 90	If students can: - Prepare small projects of teaching materials with good systematics, - Develop small projects effectively, efficiently, precisely, and in accordance with the teaching material - Submit the small projects on time, - Have a good, neat, and polite delivery attitude.
80--<90	If students can: - Prepare small projects of teaching materials with good systematics, - Develop small projects effectively, efficiently, precisely, and in accordance with the teaching material - Submit the small projects on time
70--<80	If students can: - Prepare a resume of teaching materials with good systematics, - Compile a resume appropriately and in accordance with the teaching material

DEPARTEMEN KIMIA
Gedung Kimia Wing 1 Lantai 3
Jl. Tanjung, Kampus Darmaga
Bogor 16680
Telp/Fax (0251)8624567
Email: kimia@apps.ipb.ac.id; Website: http://chem.ipb.ac.id

References

1 Gary L. Miessler, Donald A. Tarr. 2004. Inorganic Chemistry. 3rd Ed. Prentice-Hall, Inc. Upper Saddle River. NJ 07458.
2 Shriver DF, Atkins PW. 1999. Inorganic Chemistry. 3rd Ed. W.H. Freeman and Company. 41 Madison Avenue, NY 10010.
3 Bowser JR, 1993. Inorganic Chemistry. Brooks/Cole Publishing Company. Pacific Grove, CA 93950
4 Other related publications