

## THE SYLLABI OF NON METAL INORGANIC CHEMISTRY

Faculty	: FMIPA UNY
Study Program	: Chemistry
Course /Code	: KIM6409
Credit	: 4 sks (3T, 1P)
Semester /Term	: 2
Prerequisite	: General Chemistry
Lecturer	: Prof. Dr. Hari Sutrisno Dr. Dyah Purwaningsih

### I. Course Description:

Modern Atomic Theory is essential and, this should be composed: Spectrum of Hydrogen Atom, the wave equation of Schrödinger and its significance to the *s*, *p*, *d*, and *f* orbitals; the stability of electronic configuration of species. Screening effect of orbitals and effective nuclear charge are to discussed. Periodic table of the elements in various types are proposed, consisting of classification of elements into particular Group and the chemical aspect of particular non metal elements. Covalent bond, hybridization, and VSEPR Theory are discussed in detail. Acid-base concept of Bronsted-Lowry, Lewis, Usanovich - Lux, and Hard-Soft of Pearson are also introduced. Redox, balancing typical reaction, Reduction potential concept, and Latimer-Frost Diagrams are described. Selected non metal elements, Hydrogen, Boron, Groups of Carbon, Nitrogen, Oxygen, Halogen, and Noble Gas are elaborated via typical electronic structure, catenation, geometry aspects approached by hybridization and VSEPR Theory, and anomaly aspects for particular species. Typical chemical aspect in water involving particular hydrogen bond, hydride compound, allotrop of carbon, diamond, graphite, and fullerene are well discussed.

### II. Standard Competency:

Students understand basic concepts of electronic structure of atom, various aspects of periodicity of the elements, chemical bonds, acid-base, redox composing Latimer and Frost Diagrams, and chemical aspects of non metal elements.

### III. Activity Outline :

Meeting	Competence	Topic	Strategy	Reference
1-2	Understand (1) the Bohr model of atom and the spectrum of hydrogen atom (2) wave mechanics of atomic model, and orbitals	THE STRUCTURE OF ATOM : 1.1. Spectrum of Hydrogen Atom and Bohr Theory 1.2. The Application of Bohr Theory, Its weakness, and Fine Structure of the Spectrum 1.3. Wave mechanics of Atomic Theory: Atomic Orbitals, <i>s</i> , <i>p</i> , <i>d</i> , and <i>f</i> )	Lecturing Discussing Problem - Solving	1. Hand out (PPT) 2. Dictate: Kimia Anorganik I

3-4	Understand the classification of elements in the periodic table and the various models of the tables	THE PERIODIC TABLE OF ELEMENT Organization of the Periodic Table, Classification of elements in the Table and The Periodic Properties Misconception Cases	Lecturing Discussing Problem - Solving	3. Geoff Rayner-Canham: Descriptive Inorganic Chemistry
5-7	Describe (1) the covalent bond (2) VSEPR geometry of molecule	MOLECULAR STRUCTURE : 3.1. Simple Bonding Theory: Structure Lewis dan Linnet; Resonansi 3.2. Bonding Models: Ionic Compounds 3.3 Bonding Models: Covalent Compounds (Valence Bond Theory and MOT) 3.4. VSEPR Theory 3.5. MO Theory 3.6. Polar Molecular (electronegativity; size effect atom)	Lecturing Discussing Problem - Solving	
8	MIDTERM EXAM			
9-11	Understand the various types of acid-base compounds	ACID AND BASE 4.1. Arrhenius, Bronsted – Lowry, Lewis 4.2. Ingol-Robinson; Usanovich; Acid-Base Lux-Flood, Acid-Base in Solvent System, and Frontier Orbital 4.3. Soft-Hard Acid-Base 4.4. The Strength of Acid-Base, the Binary Acid and the Oxy Acid and Superacid	Lecturing Discussing Problem - Solving	
12-14	(1) Understand the redox and non redox reaction (2) Describe the Latimer-Frost Diagram	CHEMICAL REACTION 5.1. Non Redox 5.2. Redox, the Reduction potential, and Latimer-Frost Diagram.	Lecturing Discussing Problem - Solving	
15	Understand the typical chemical aspect of hydrogen, boron, carbon, nitrogen and oxygen	HYDROGEN 6.1. Isotop, Chemical aspects, Bonding on Hydrogen, Hydrate, and Hydrogen ion 6.2. The preparation of Hydrogen, Hydride, Water, and Hydrogen Bond. GROUP BORON The Trend of the Group, and Boron GROUP CARBON The Trend of the group, Carbon and Silicon GROUP NITROGEN The trend of the group: Nitrogen, Phosphorous, and Arsen GROUP OXYGEN The trend of the group: Anomaly of Oxygen, Oxygen and Sulphur	Lecturing Discussing Problem - Solving	
16	Understand the chemical trend of group of halogen and Noble Gas	HALOGEN Anomaly of Fluorine, Fluorine, Chlorine, Halide and its Oxydes, Oxyhalide Acids and its Anions,		

		and Interhalogen compound. NOBLE GAS: The Trend of the Group, Xenon fluoride and Xenon oxyde,		
17	FINAL EXAM			

#### IV. Tasks:

Students should solve the exercise problems spesified in the Dictate.

#### V. References:

##### Compulsory :

1. Handout of (printed) power points
2. Diktat Kimia Anorganik I

##### Suggested Reading :

1. J. Huheey, E.A. Keiter, R.L. Keiter: "Principles of Structure and Reactivity", 1993, New York, HarperCollins College Publishers
2. G.L. Miessler, P.J. Fischer and D.A. Tarr: "Inorganic Chemistry", 2014,
3. G. Rayner-Canham : "Descriptive Inorganic Chemistry", 1996, New York, W.H. Freeman and Company
4. D.F. Shriver, P.W. Atkins, , and C.H. Langford : "Inorganic Chemistry", 1990, Oxford, Oxford University Press.
5. F.A. Cotton, and G. Wilkinson : "Basic Inorganic Chemistry", 1976, New York, John Wiley & Sons, Inc.
6. N.N. Greenwood, and A. Earnshaw : "Chemistry of the Elements", 1989, Oxford, Pergamon Press.

#### VI. Evaluation:

Mid-term test	: 40%
Final exam	: 40%
Practice	: 20%