

LECTURING PROGRAM OUTLINES

CHEMISTRY STUDY PROGRAM

DIPONEGORO UNIVERSITY
SEMARANG



LECTURING PROGRAM OUTLINES

- Course : **CHEMISTRY OF ELEMENTS**
 Code/SKS/Semester : PAK 111/SKS/Semester I
 Description : The course will learn elements present in periodic table system, their groups and abundances in nature. Beside that it will learn the element properties, preparation, isolation and the use of the elements as well as its compounds.
 Standard of Competency : By learning the course the students can explain the groups of elements in nature, element properties, and to prepare and isolate from their minerals. And also they can explain the use of the elements or their compounds in daily life.
 Prerequisite :-

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1.	Able to explain the element distributions and the tipe of metal in nature	Introduction	1. Element abundances 2. Pengolongan unsur logam	2 x 50 minutes	Speech and discussion	1, 2, 5
2.	Able to explain: 1. the elements of groups 1 and 2 2. Norm variation the elements of Li, Be and Mg 3. preparation and isolation procedures and their uses	Element groups 1 and 2	1. Hydrogen compounds 2. Free metals 3. Biner and terner salts 4. Norm variation of groups: Be, Li dan Mg	4 x 50 minutes	Speech, discussion, structural task	1, 3, 4
3.	Able to mention and explain: 1. Properties of groups 13 and 14 2. The correlation of the elements of B, Si and Ge 3. preparation and isolation procedures and their uses	Element groups 13 and 14	1. Element groups 13 and 14 2. Metal elements of Al, Ga, In, Tl, Sn and Pb 3. Metalloid: B, Si and Ge 4. The chemistry of carbon inorganics	8 x 50 minutes	Speech, discussion, structural task	2, 3, 4
4.	Able to mention and explain: 1. the element properties of groups 15 until 18	Element groups 15-18	1. Properties of elements of 15-18 2. Preparation and the uses of	6 x 50 minutes	Speech, discussion, structural task	1, 4, 6

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
	2. preparation and isolation procedures and their uses.		their free elements 3. Hydride elements of groups 15-18 4. Oxides of elements of groups 15-18 5. Halides of elements of groups 15-18 6. Compounds and ions of inert gas			
5.	Able to mention and explain: 1. the properties of transition element groups 2. availability, preparation, isolation and the uses of transition metal groups	Transition elements	1. General properties of transition metals, oxidation states, and magnetic properties 2. Availability, isolation and the uses of the elements	8 x 50 minutes	Speech, discussion, structural task	1, 5
6.	Able to explain: 1. the availability, isolation, and properties and the uses of lanthanide and actinide elements 2. The differences between lanthanides and actinides	Lanthanide and actinide elements	1. availability, synthesis, isolation and properties of lanthanide elements	4 x 50 minutes	Speech, discussion, structural task	1, 3, 5

REFERENCES

1. Bowser, J., 1990, "Inorganic Chemistry", John Wiley and Sons, New York.
2. Cotton, F.A. and Wilkinson, G., 1987, "Basic Inorganic Chemistry", John Wiley and Sons, New York.
3. Huheey, J.E., 1983, "Inorganic Chemistry Principles of Structure and Reactivity", 3ed, Harper Inc., New York.
4. Lee, J.D., 1991, "Concise inorganic Chemistry", 4th edition, Chapman and Hall Inc.
5. Manku, G.S., 1980, "Theoretical Principles of Inorganic Chemistry", Mc. Graw Hill, New York.
6. Sharpe, A.G., 1992, "Inorganic Chemistry", John Wiley and Sons, New York.



LECTURING PROGRAM OUTLINES

Course : **INORGANIC CHEMISTRY I**

Code /SKS/Semester : PAK 130/2 SKS/Semester II

Description : The courses contain the importance of simple basic of inorganic compound structures either bonds, geometry or the lattices of inorganic compounds or reactions involving inorganic compounds.

Standard of Competency : Able to explain the structure, geometry, lattice and properties of simple inorganic compounds

Prerequisite : Basic Chemistry I and Elemental Chemistry

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1.	Able to write elektron configuration and to explain the properties of related atoms	Review of atomic and ionic structures	<ol style="list-style-type: none">1. electron configuration2. Quantum numbers3. Properties of elemental periodics4. Ionic size5. Effective nuclear charge	4x50 minutes	Speech,discussion, structural task	5
2.	Able to predict both the type of bonding polarity or simple inorganic molecule geometry	Simple molecular structures	<ol style="list-style-type: none">1. Types of chemical bonds (Ionic and covalent bonds)2. Octet theory3. Valence bond theory4. Bonding polarity and dipol moment5. Molecular Geometry (VSEPR theory and Hibridisation theory)6. Molecular Orbital Theory (diatom molecules of first periode)	10x50 minutes	Speech,discussion, structural task	4,5
3.	Able to explain the formation of ionic solid, the structure of ionic solid and its properties	Ionic Solid	<ol style="list-style-type: none">1. Ionic compounds2. Ratio of radii3. Equation of Born Lande and Lattice Energy4. Born-Haber Cycle5. Fajan Rules	8x50 minutes	Speech,discussion, structural task	3,4

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
4.	Able to mention the examples of anions and to explain its role in the chemical bonding formation	Anionic Chemistry	1. Oxide ions, hydroxides and alcoxide 2. Oxoanion 3. Polyinuclear oxoanion	6x50 minutes	Speech,discussion, structural task	1
5.	Able to differ the compex and double salts and able to explain the formation of simple compex compounds	Coordination Compound	1. The differences of double and complex salts 2. Undestanding of coordination compounds and its examples in daily life. 3. Formation of simple coordination compounds (Blomstrand- Jorgensen dan Werner Theories)	4x50 minutes	Speech,discussion, structural task	2

REFERENCES

1. Cotton, F.A & Wilkinson, G., 1987, "Basic Inorganic Chemistry", John Wiley & Sons, New York.
2. Gilreath, S.E, 1988, "Fundamental Concepts of Inorganic Chemistry, Mc Graw-Hill Book Company, Singapore
3. Jolly, W.L., 1987, "Modern Inorganic Chemistry", John Willey & Sons, New York.
4. Miessler, G.L and D.A. Tarr, 1991, Inorganic Chemistry, Prentice Hall, Singapore
5. Owen, S.M. & A.T. Brooker, 1991, "A Guide to Modern Inorganic Chemistry, Longman Group, London



LECTURING PROGRAM OUTLINES

Course : **INORGANIC CHEMISTRY II**
Code/SKS/Semester : PAK 231/2 SKS/Semester III
Description : The course learns basic of chemical reaction, bonding concept, acid-base concept and solvent properties that resuming characteristic behaviour of inorganic compounds in the aqueous and non aqueous solvents.
Standard of Competency : to explain the behaviour of inorganic compound reactions in aqueous and non aqueous media.
Prerequisite : Inorganic chemistry I

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1.	To predict the stability and reactivity of compounds	Inorganic reaction aspect	1. Termodinamics aspect and inorganic reaction kinetics 2. Stability and reactivity of compounds	6 x 50 minutes	Speech,discussion, structural task	3,5
2.	To explain the factors involving bonding strength	Chemical bonding concept	1. Type of bonding reviews 2. Bond strength (dissociation energy, bond energy and force constant) 3. Bond length 4. Ionic and covalent radii	6 x 50 minutes	Speech,discussion, structural task	2,3
3.	To classify the inorganic compound into acid base system	Acid base concept	3. Acid base definition: Arrhenius, Bronsted-Lowry, Lux Flood, Solvent system, Usanovich, Lewis and Generalisation concept of acid and base 4. Protonic and non protonic acid base system: proton affinity, Deferention levelling solvent, cosolvation Agen, the strength of hydration, oxy, amine acids and solvation effects 5. Solvolysis reaction 6. Hard and soft acid-base (HSAB)	6 x 50 minutes	Speech,discussion, structural task	3,2

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
4.	To explain solvent properties and to predict the solubility of compounds	Solvent	1. Solubility of the compounds 2. The change of energy in the solution formation 3. General behaviour of solvent 4. Specific non aqueous solvent	6 x 50 minutes	Speech, discussion, structural task	4,2,1
5.	To differ the type of inorganic reactions	The rype of inorganic reaction	1. Acid base reaction 2. Redox reaction 3. Reaction in non aqueous solvent	8 x 50 minutes	Speech, discussion, structural task	4,1

REFERENCES

1. Gilreath, S.E, 1988, "Fundamental Concepts of Inorganic Chemistry, Mc Graw-Hill Book Company, Singapore
2. Huhey, J.E., 1983, "Inorganic Chemistry Principles of Structure and Reactivity, 3 ed , Harper Inc. New York.
3. Jolly, W.L., 1987, "Modern Inorganic Chemistry", John Willey & Sons, New York.
4. Manku, G.S., 1980, "Theoretical Principles of Inorganic Chemistry, Mc Graw Hill, Singapore.
5. Owen, S.M. & Brooker, A.T, 1991, "A Guide to Modern Inorganic Chemistry, Longman Group, London



LECTURING PROGRAM OUTLINES

Course : **INORGANIC CHEMISTRY III**
Code MK/SKS/Semester : PAK 232/2 SKS/Semester IV
Description : It will discuss the meaning, properties and reaction of coordination compounds.
Standard of Competency : to explain the structure and reaction of complex compounds
Prerequisite : Inorganic chemistry II

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1	To explain the definition, history, and nomenclature of coordination compounds	Introduction	1. Definition of coordination compounds, ligands, metal ions 2. History 3. Nomenclature of coordination compounds	2x 50 minutes	Speech, discussion, structural task	1,3
2	To explain the formation of bonding in complex compounds	Coordination bond	1. Introduction of coordination bond theory • Pair electron bonding • Concept of effective atomic number • Atomic and ionic electronic structures 2. Valence bond theory 3. Crystal and Ligand Field Theory 4. Molecular orbital theory	8x50 minutes	Speech, discussion, structural task	1,3
3	To predict geometry formation and to explain the type of complex compound isomer	Stereochemistry	1. Geometry of coordination compounds 2. Isomers in metal complex	4x50 minutes	Speech, discussion, structural task	1,3

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
4	To prepare the complex compounds and to differ the type of reaction involved in the complex	Preparation and reaction of complex compounds	<ol style="list-style-type: none"> 1. Substitution reaction in aqueous and non aqueous solvents 2. Non Solvent Substitution reaction 3. Solid complex thermal dissociation 4. Oxidation reduction reaction 5. Catalyst 6. Substitution reactions without dissociation of ligand metal bond 7. Trans Effects 8. Synthesis of cis-trans isomers 9. Preparation of active optic compounds 10. Preparation of carbonyl metal and organometallic compounds 	10x50 minutes	Speech, discussion, structural task	1,2,3
5	To explain the factors involved in stability and able to determine complex stability constant	Complex ion stability	<ol style="list-style-type: none"> 1. stability Constants 2. Factors influencing complex stability 3. determination of stability constant 	4x50 minutes	Speech, discussion, structural task	1,2,3

REFERENCES

1. Basolo, F. and Johnson, R., 1964, 1st ed., "Coordination Chemistry: the Chemistry of Metal Complexes" W.A. Benjamin, Inc.
2. Basolo, F. and Ralph G. Pearson, 1973, 2nd ed., "Mechanism of Inorganic Reactions", John Wiley and Sons, Inc.
3. Huheey, J.E., 1983, "Inorganic Chemistry Principles of Structure and Reactivity", 3rd ed. Harper Inc.



LECTURING PROGRAM OUTLINES

Course : **INORGANIC SYNTHESIS**
Code/SKS/Semester : PAK 311/2 SKS/Semester V
Description : It discusses the steps, types, and rate of reaction and mechanism of reaction in inorganic reactions
Standard Competency : able to synthesize inorganic compounds.
Prerequisite : Inorganic Chemistry III

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1	Students are able to explain the steps of reactions	Introduction	1. Rate's law 2. Effective collision 3. Steady state 4. Factors controlling the reactions 5. Catalysist and activated complex 6. labil and inert complex	4x50 minutes	Speech,discussion, structural task	1,2,4
2	Students are able to differ migration and insertion reactions	Exchange reaction of atoms and groups	1. Migration and insertion reaction	4 x 50 minutes	Speech,discussion, structural task	3
3	Students are able to explain complex compound reaction mechanism	Mechanisme of acid and base reactions	1. Stiochiometric and intimate mechanisms 2. Subtitution mechanism in square planar complex 3. Subtitution menchanism in octahedral complex kompleks oktahedral 4. Hidrolysis of bases	8 x 50 minutes	Speech,discussion, structural task	3,4,5

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
4	Students are able to explain oxidation and reduction in complex compounds	Mechanism of oxidation and reduction reactions	1. Mechanism of inner sphere and outer sphere reactions 2. Oxidative addition reaction	4 x 50 minutes	Speech, discussion, structural task	3,4,5, 1,2
5	Students are able to explain radical reaction	Mechanism of radical reaction	1. Metal catalyst in organic reaction 2. Photochemistry reaction complex of Co(III) and Cr(III)	4 x 50 minutes	Speech, discussion, structural task	5,6
6	Students are able to explain solid state	Solid state reaction	1. Adsorption 2. Charge transfer reaction	6 x 50 minutes	Speech, discussion, structural task	5,6

REFERENCE:

1. Shriver, D.F., Atkin, P.W., Langford H Cooper, 1990, "Inorganic Chemistry", Oxford University Press, New York.
2. Cotton, F.A.G. Wilkinson & PL Gausc, 1995, "Advanced Inorganic Chemistry", John Wiley & Sons, Inc, New York.
3. Basolo, F., & Pearson, 1973, second edition, "Mechanism of Inorganic Reaction", John Wiley and Sons, New York.
4. Jolly, W.L., 1987, "Inorganic Chemistry", John Wiley and Sons, New York.
5. Bowser, J., 1990, "Inorganic Chemistry", John Wiley and Sons, New York.
6. Huheey, J.E., 1983, "Inorganic Chemistry Principles of Structure and Reactivity", Third edition, Harper Inc



LECTURING PROGRAM OUTLINES

Course : **PRACTICE OF CHEMISTRY I**
Code/SKS/Semester : PAK 101P/1 SKS/Semester I
Description : The practice consists of general chemistry concepts for freshman students
Standard of Competency : Students are able to practice general chemistry
Prerequisite : General chemistry I

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1	Students are able to practice of identification of fungsional groups	Identificatio of fungsional groups	1. identification of glucoses 2. identification of fat 3. identification of aldehide and alchohol	3x50 minutes	Practice	1,3
2	Students are able to determine the content of acetic acid	Determnation of acetic acid content	1. preparation of standard solution 2. titration of the acid with standard base	3x50 minutes	Practice	1,3
3	Students are able to determine the rate of reaction	Determination of rate of reaction	1. preparation the reagent of HCl 2. preparation of magnesium tape 3. determination of reaction rate of magnesium with acid	3x50 minutes	Practice	1,3
4	Students are able to measure of conductivity of rhe solution	conductivity	1. preparation of solution 2. measurement of conductivity	3x50 minutes	Practice	1,2,3
5	Students are able to determine solubility of substances	Solubility	1. Reaction of precipitation 2. acid influence of the precipitate 3. compex formation inflence	3x50 menit	Practice	1,2,3

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
			to the precipitate			
6	Students are able to study of anion and cation reaction	Anion and cation reaction	1. reaction of anion 2. reaction of cation	3x50 minutes	Practice	1,3

REFERENCES

Brady, 2004, General chemistry, John Wiley and Sons, New York



LECTURING PROGRAM OUTLINES

Course : **PRACTICE OF CHEMISTRY II**
Code/SKS/Semester : PAK 102P/1 SKS/Semester II
Description : The practice consists of general chemistry concepts for freshman students
Standard of Competency : Students are able to practice general chemistry
Prerequisite : General chemistry I

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1	Students are able to practice of chemical thermodynamics	Termodinamics	1. preparation of solution 2. measurement of energy changes	3x50 minutes	Practice	1,3
2	Students are able to identify macomolecules	Identification of macromolecules	1. identification of carbohydrates 2. identification of fat 3. identification of protein 4. identification of vitamins	3x50 minutes	Practice	1,3
3	Students are able to determine the content of NaOH and NaHCO ₃ mixture	Determination of the content of NaOH and NaHCO ₃ mixture	1. preparation the reagent of HCl 2. titration the mixture 3. calculation of the content	3x50 minutes	Practice	1,3
4	Students are able to measure of conductivity of rhe solution	conductivity	3. preparation of solution 4. measurement of conductivity	3x50 minutes	Practice	1,2,3
5	Students are able to determine solubility of substances	Solubility	1. Reaction of precipitation 2. acid influence of the precipitate 3. complex formation inflence to the precipitate	3x50 menit	Practice	1,2,3
6	Students are able to study of anion and cation reaction	Anion and cation reaction	1. reaction of anion 2. reaction of cation	3x50 minutes	Practice	1,3

REFERENCES

Brady, 2004, General chemistry, John Wiley and Sons, New York



LECTURING PROGRAM OUTLINES

Course : **GEOCHEMISTRY**
 Code/SKS/Semester : PAK 233/2 SKS/Semester III
 Description : It discusses the structure of internal earth, the faith of chemical elements and geochemical process.
 Standard of Competency : able to explain the structure of internal earth, geochemical process and the involvement of chemical elements as well as their use in human life.
 Prerequisite : chemistry of element and general chemistry II

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1.	Able to explain internal earth structure, abundance and faith of the elements as well as geochemical isotop	introduction	1. internal earth structure 2. abundance and faith of the elements 3. geochemical isotop	4 x 50 minutes	Speech,discussion, structural task	1,3
2.	Able to explain magma formation from the view of thermodynamics and chemical kinetics	Formation and crystallisation of magna	1. Thermodynamics and chemistry of crystal 2. Magma and frozen stones	8 x 50 minutes	Speech,discussion, structural task	1,3
3.	Able to explain faith of charcoal, oil, and carbonate, phosphate and iron sedimentaions	Sedimentation and diagenesis	1. inorganic geochemistry (sedimentation, carbonate, phosphate, iron, etc) 2. organic geochemistry (charcoal, oil)	8 x 50 minutes	Speech,discussion, structural task	1,3
4.	Able to explain decay and formation of soil in the view of chemistry	Decay and soil	1. decay process 2. soil and its formation	8 x 50 minutes	Speech,discussion, structural task	1,2
5.	Able to explain geochemical cycle	Metamorfose and geochemical cycle	1. Metamorfose 2. geochemistry cycle	4 x50 minutes	Speech,discussion, structural task	1,2,3

REFERENCES:

- Mason, B. dan Moore, C.B., 1982, "Principle of Geochemistry", John Wiley & Sons, New York.
- Rose W. Arthur, Hawkes, H.E., Webb, J.S., 1979, "Geochemistry in Mineral Exploration", Academic Press.
- Krauskopf, K.B., Bird, D.K., 1995, Introduction to Geochemistry,"edisi ke-3, McGraw Hill, Inc. Singapore.



LECTURING PROGRAM OUTLINES

courses : **INORGANIC MATERIAL**
Code/SKS/Semester : PAK234/2 SKS/Semester III
Description : It explains type, properties, uses of natural and synthetic material
Standard of Competency : able to explain the correlation between structure and material properties to the material uses.
Prerequisite : Inorganic chemistry I and II

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1.	Able to explain the trend of element to catenate and alterate	Pendahuluan	1. catenation 2. Alteration	2 x 50 minutes	Speech,discussion, structural task	
2.	Able to explain allotropy shape of elements	Homopolimer	4. Carbon Allotropy 5. Sulphur Allotropy 6. Phosphorous Allotropy	4 x 50 minutes	Speech,discussion, structural task	
3.	Able to explain the preparation, properties and the uses of synthetic heteropolymer	Heteropolimer	1. Berilium hidride 2. Boron hidride 3. Boron nitride 4. Polifosfazene 5. Polyxilan 6. Polyxiloxane	8 x 50 minutes	Speech,discussion, structural task	
4.	Able to explain the preparation, propertie and the uses of natural heteropolymer	Silica – alumina Polymer	1. clay 2. Zeolite 3. Silica gel	8 x 50 minutes	Speech,discussion, structural task	
5.	Able to explain the preparation, properties and the uses of ceramics	Ceramics	1. traditional ceramics, Glass, cement 2. new ceramics	6 x 50 minutes	Speech,discussion, structural task	
6.	Able to explain the preparation, properties and the uses of metals	metals	1. alloy 2. conductor and semiconductor	4 x 50 minutes	Speech,discussion, structural task	

REFERENCES

1. Grim, R.E., 1968 Clay Mineralogy, McGraw-Hill Book Company.
2. Kingery, W. D., 1960, Introduction to Ceramics Inorganic Polymer
3. Kowska, J.H., 1991, Carbon Active, Simon & Schuster International Group, England.
4. Marck, J.E., Allock, H.R., and West, R., 1992, Inorganic Polymer, Prentice Hall, New York.
5. Mumpton, F.A., Sen, L.B., 1976, Natural Zeolite, Pergamon Press.
6. Scott, R.P.W., 1993 Silica Gel and Banded Phases Their Production, Properties and Use in LC, John Wiley & Sons.
7. Vansant, E.F., 1990 Pore Size Engineering in Zeolites, John Wiley & Sons.



LECTURING PROGRAM OUTLINES

Course : **BIOINORGANIC CHEMISTRY**
Code /SKS/Semester : PAK 338/2 SKS/Semester VI
Description : it discusses the role of inorganic elements to the biological system
Standard of Competency : able to explain the presence and fuction of inorganic elements or compounds in the biological system.
Prequisite : Inorganic chemistry III

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1.	Able to explain role of other science to the advace of bioinorganic chemistry	Introduction	<ol style="list-style-type: none">1. background, relevancy and perspective of bioinorganic chemistry2. existence and uses of inorganic elements in organisms3. Biological function of inorganic compounds	4 x 50 minutes	speech, web+animation	2, 4, 6
2.	Able to explain composition and the role of metals in porfirin, protein and enzyme molecules	Metals in biological system	<ol style="list-style-type: none">1. Metallobiomolecules and their composition2. Metalloporphirin and related system3. Metalloprotein4. Metalloenzymes	4 x 50 minutes	speech, web+animation	2, 3, 4, 6
3.	Able to explain clorophyls and the role of Mg, photosynthesis process and oxygen production process from water	Center metal in photosynthesis	<ol style="list-style-type: none">1. Total volume and effisiency in photosynthesis2. Clorophyl and the role of magnesium in photosynthesis3. main process in photosynthesis4. water oxidation to oxyigen	4 x 50 minutes	speech, web+animation	1, 4, 5, 6

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
4.	Able to explain the uptake of iron by microorganism and plant, transport process and iron storage in living thing	Uptake, transportation and storage of iron essential metal	1. Mobilisation of iron, oxidation state, solubility and medium relevancy 2. uptake of iron by microorganism/siderophore 3. uptake of iron by plant/phytosiderophore 4. transportation and storage of iron	8 x 50 minutes	speech, web+animation	5,6
5.	Able to explain the existence and uses of enzyme containing nickel	Enzyme containing nickel	1. Urease 2. Hydrogenase 3. Methyl coenzyme M reductase 4. CO dehydrogenase	6 x 50 minutes	speech, web+animation	5
6.	Able to explain the existence and uses of protein containing copper	Protein containing copper	1. Cu as center of protein-oxygen activation 2. Protein Cu as oxidase and reductase 3. Dismutase Cu, Zn and other super-oxide	6 x 50 minutes	speech, web+animation	5

REFERENCES

- Bowser, J. R., 1993, "Inorganic Chemistry", Wadworth Inc. Belmont, California.
- Caret, Robert L., Denniston, Katherine J., and Topping, Joseph J., 1993, "Principles and Applications of Inorganic, Organic and Biological Chemistry", Wm. C. Brown Publisher.
- Harrowfield Jack, 2001, "Lecture Notes of Biological Inorganic Chemistry".
- Jolly, William L., 1991, "Modern Inorganic Chemistry", Second Edition, Mc. Graw Hill Inc.
- Kaim, Wolfgang and Schwederski, Brigitte, 1994, "Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life", John Wiley and Sons.
- Wilkins, Patricia C. and Wilkins, Ralph G., 1997, "Inorganic Chemistry in Biology", Oxford University Press. Inc., New York.



LECTURING PROGRAM OUTLINES

Course : **ORGANOMETALLIC CHEMISTRY**
Code/SKS/Semester : PAK 333/2 SKS/Semester V
Description : it discusses the application of extended coordination compounds covering reaction principles, catalytic reaction involving organometal or the availability of organologam in environment
Standard of Competency : able to explain the formation of organometallic compounds, catalytical reaction involving organometallic compounds and their compounds in environment
Prerequisite : Coordination chemistry

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1.	Able to explain the meaning of organometal compounds	Introduction	1. definition of organometallic compounds 2. The history of organometal invention and its development	2x50 minutes	Speech, discussion and structured task	3
2.	Able to explain the bond formation of organometallic compounds	Principle of organometallic reaction	1. Rule of 18 e (Efektif Atomic Number / EAN) and electron count 2. Ligand in organometallic compounds 3. organometallic compounds of main groups	8x50 minutes	Speech, discussion and structured task	3,4
3.	Able to predict the bond formation between metal and ligands	Characterization of organometallic compounds	1. Identification using <i>Infra Red Spectrophotometry</i> 2. Identification using <i>Nuclear Magnetic Resonance</i>	4x50 minutes	Speech, discussion and structured task	3
4.	Able to explain catalysis reaction of organometals and type of reactions	Organometal and catalyst reaction	1. Reaction involving ligand (ligand dicosiation and substitution, oxidative additon,	10x50 minutes	Speech, discussion and structured task	1,3

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
			reductive elimination and nucleophilic transfer) 2. Reaction involving ligand modification (Insertion, migration, elimination and abstraction)			
5.	Able to mention organometallic compounds that potentially lead to pollution problem in environment	Organometallic compound in environment	1. Organomercury 2. Organotin 3. Organolead 4. Organoarsen 5. Organosilicon	8x50 minutes	Speech, discussion and structured task	2

REFERENCES

1. Bowser, J., 1990, "Inorganic Chemistry", John Wiley and Sons, Inc.
2. Craig, Peter, 1986, "Organometallic Compound in the Environment", John Wiley and Sons, New York.
3. Miessler, G.L and D.A. Tarr, 1991, Inorganic Chemistry, Prentice Hall, Singapore
4. Owen, S.M. and A.T. Brooker, 1991, A Guide to Modern Inorganic Chemistry, Longman Group, London



LECTURING PROGRAM OUTLINES

Course : **INORGANIC SYNTHESIS**
Code/SKS/Semester : PAK 331/2 SKS/Semester V
Description : It discusses principles and techniques of inorganic compound synthesis and its characterization
Standard of Competency : able to explain the way of inorganic compound synthesis and modify the compound as well as its characterization
Prerequisite : inorganic chemistry III

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1.	Able to explain thermodynamics and kinetics aspect in synthesis of inorganic compounds	Principle of synthesis	1. thermodynamics and kinetics aspects on inorganic synthesis 2. examples of synthesis of : H_2SO_4 ; NH_3 ; $(NH_4)_2SO_4$	5 x 50 minutes	Speech, discussion and structured task	1,2
2.	Able to explain the technique and reaction of inorganic compound synthesis	Synthesis technique	1. synthesis technique ⊕ vakum ⊕ electrolytic ⊕ high temperature ⊕ electrical discharge ⊕ high pressure ⊕ photochemical 2. crystal growth	9 x 50 minutes	Speech, discussion and structured task	1,2
3.	Able to explain the properties of inorganic compound and able to determine appropriate methods of identification	Compound characterization	1. Physical properties of compounds 2. Spectrophometry: IR, UV, AAS, XRD, EPR, NMR, MS	6 x 50 minutes	Speech, discussion and structured task	1,2
4	Able to design the process of inorganic compound synthesis	Synthesis design	1. recent synthesis design of inorganic compounds	12 x 50 minutes	Speech, discussion and structured task	1,2,3

REFERENCES

1. Jolly, w., 1972, "The Synthetic and Characterization Inorganic Compound", Prentice Hall, New York.
2. Angelici, R.J., 1977,"Synthesis and Techniques in Inorganic Chemistry", WB Saunders, Publishers.
3. S Kopkar, 1987,"Extraction of Metal in Organic Solvents", Prentice Hall, New York.



LECTURING PROGRAM OUTLINES

Course : **INORGANIC STRUCTURE ELUCIDATION**

Code/SKS/Semester : PAK 366/2 SKS/Semester VI

Description : It discusses the methods of inorganic compound structure determination including diffraction, microscopy, spectroscopy methods.

Standard of Competency : able to explain: inorganic substance structure, overview of identification methods and determination of inorganic structure, as well as application of diffraction, microscopy and spectroscopy methods to determine inorganic structure.

Prerequisite : Inorganic chemistry III

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1.	Able to explain general structure of inorganic compounds, and method for identification	introduction	1. overview of inorganic structure 2. overview of identification methods and determination inorganic structure	6x50 minutes	Speech, discussion and structured task	1
2.	Able to explain basic principle of diffraction methods	diffraction methods	1. X-rays diffraction: powder, high temperature, single crystal 2. electron diffraction 3. neutron diffraction	10x50 minutes	Speech, discussion and structured task	1
3.	Able to explain basic principle of microscopy methods	microscopy methods	3. Mikroskopi optikal 4. Mikroskopi elektron	6x50 minutes	Speech, discussion and structured task	1
4.	Able to explain basic principle of spectroscopy methods and their application	spectroscopy methods	spectroscopy methods of 1. IR-Raman 2. UV-Vis 3. NMR and ESR 4. electron 5. X-rays 6. Mossbauer	10x50 minutes	Speech, discussion and structured task	1

REFERENCES:

1. West, A.R., 1984, "Solid State Chemistry and Its Applications", John Wiley and Sons, USA



LECTURING PROGRAM OUTLINES

Course : **PHYSICAL BIOCHEMISTRY**

Code/SKS/Semester : PAK 354/2 SKS/VI

Description : it discusses structural aspect and thermodynamics of macromolecules such as protein and nucleic acid, the principle and application of characterization method of that and biological process molecular principles.

Standard of Competency: : able to apply physical biochemistry theory on macromolecule characterization process as well as biological process

Prerequisite : Biochemistry I

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1.	Able explain the structural and thermodynamic aspect of macromolecules	Macromolecules structure and dynamics	1. three dimensional structure of protein and nucleic acid 2. Thermodynamics of macromolecules	4x50 minutes	Speech, discussion and structured task, quiz	1,3,4,5,6,7
2.	Able to apply structural and thermodynamics aspects in t process of separation and characterization of macromolecules	Macromolecule separation and characterization methods principle and application	1. Sentrifugation, Electrophoresis, mass spectometry. 2. X-rays diffraction 3. Spectroscopy: IR, UV, L/CD, NMR 4. Radioisotope	8x50 Minutes	Speech, discussion and structured task, quiz	1,3
3.	Able to explain structure and dunction of cell menbrane	Biochemistry of cell membrane	1. membrane cell structure & function 2. membrane cell transport system 3. other fuction of biomembrane	4x50 minutes	Speech, discussion and structured task, quiz	2,6
4.	Able to explain nerveus, eyes and muscle cells from molecular view	Molecular aspect of Biological cell	1. nerveus cell system 2. eye cell system	5x50 minutes	Speech, discussion and structured task,	2,6

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
		system	3. muscle cell contraction		quiz	
5.	Able to explain hormonal mechanism	Hormonal Mechanism	1. inter cell communication 2. type of cell receptor 3. mechanism of hormones 4. Hydrophilic and hydrophobic 5. Amplification and Modulation of hormonal signal	5x50 minutes	Speech, discussion and structured task, quiz	2

REFERENCES:

1. Van Holde, K.E., *et al.*, (1998), *Principles Physical Biochemistry*, Prentice-Hall, Inc., New Jersey.
2. Devlin, T.M., (1997), *Textbook of Biochemistry With Clinical Correlations*, Fourth Edition, Wiley-Liss, Inc, USA.
3. Rhodes, G., (2000), *Crystallography Made Crystal Clear: A Guide Users Of Macromolecular Models*, Second Edition, Academic Press, California.
4. Boyer, R.F., (1993), *Modern Experimental Biochemistry*, Second Edition, The Benjamin/Cummings Publishing Company, Inc, California.
5. Fersht, A., (2000), *Structure And Mechanism In Protein Science*, Third Printing, W.H. Freeman and Company, New York.
6. Lehninger, A.L., (1973), *Bioenergetics*, 2nd Edition, The Benjamin/Cummings Publishing Company, Inc, California.
7. Creighton, T.E., (1984), *Proteins: Structure And Molecular Principles*, W.H. Freeman and Company, New York.



LECTURING PROGRAM OUTLINES

Course : **BIOCHEMISTRY I**
 Code/SKS/Semester : **PAK 260/3 SKS/IV**
 Description : It will discuss the general aspect of biochemistry such as the composition of living things, related interactions as well as catalysts and reaction control.
 Standard of Competency : able to apply biochemistry to nowadays living.
 Prerequisite : Physical chemistry II, Organic chemistry I

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1	Able to explain: type of living things, biochemistry at living thing and identification of biomolecule, energy transformation, chemical reaction in cell	Introduction	1. characterization of living thing 2. Biochemistry in living thing 3. Biomolecule 4. Transformation 5. cell Energy 6. cell reaction chemistry	25 minutes 25 minutes 50 minutes 50 minutes 50 minutes 50 minutes	Speech, discussion and structured task, quiz	1 s.d. 9
2	Able to order cell molecular organization hierarchy and to identify specialization and biomolecular differential, cell structure organization	Molecular component of cell	1. cell molecule organization hierarchy 2. Specialisation and differentiation of biomolecule 3. cell structural organization	50 minutes 50 minutes 2x50 minutes	Speech, discussion and structured task, quiz	2,3,4,9
3	Able to use theories of water molecule property, the important water property to living thing, acid-base and buffer	Water in living thing	1. water molecule properties 2. important property of water in living thing 3. Acid-base and buffer	50 minutes 50 minutes 2x50 minutes	Speech, discussion and structured task, quiz	1,5,6,9

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
4	Able to identify type and function of carbohydrate: glycogen, starch, dextrane as storage sugar and complex sugar in membrane, type and function of lipid (biology membrane and transport), type and property of amino acid, protein: peptide structure and three dimension of protein, type and function of protein (fibrous protein and globular) type and function of vitamin, mineral and coenzyme	Characterization of biomolecule	<ol style="list-style-type: none"> 1. Jenis dan Fungsi Karbohidrat: Glikogen, Pati, Dekstran sbg gula cadangan dan Gula Kompleks pada Membran 2. Jenis dan Fungsi Lipid (Membran Biologi dan Transport) 3. type and property of protein amino acid: peptide structure and three dimension of protein 4. type and function of protein (Fibrous and Globular protein) 5. type and function of vitamin, Mineral, and coenzyme 	<p>3x50 minutes</p> <p>4x50 minutes</p> <p>2x50 minutes</p> <p>3x50 minutes</p>	Speech, discussion and structured task, quiz	1, 3 s.d.9
	Able to show: structure, property, and classification, reaction mechanism, reaction kinetics, inhibition, isolation, purification, characterization, and immobilization as well as enzyme application	Biocatalyst and biochemistry control	<ol style="list-style-type: none"> 1. Structure, property and classification of enzymes 2. reaction reaction of enzymes 3. reaction kinetics of enzyme 4. enzyme inhibition 5. Isolation, purification, and characterization of enzyme 6. Enzyme immobilisation, enzyme application 	<p>50 minutes</p> <p>50 minutes</p> <p>50 minutes</p> <p>50 minutes</p> <p>50 minutes</p> <p>50 minutes</p>	Speech, discussion and structured task, quiz	3 s.d. 9

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
	Able to describe: structure and biological function of DNA, type and function of DNA, protein biosynthesis, nucleoprotein	Structure, property and role of nucleic acid	1. DNA structure 2. DNA biological function 3. Structure and type of RNA 4. RNA biological function 5. Protein biosynthesis 6. Nucleoprotein	50 minutes 50 minutes 50 minutes 50 minutes 50 minutes 50 minutes	Speech, discussion and structured task, quiz	1, 3 s.d.9

REFERRECES:

1. Devlin, T.M., (1997), *Textbook of Biochemistry With Clinical Correlations*, Fourth Edition, Wiley-Liss, Inc, USA.
2. Brown, W.H., and Rogers, E. P., 1980, *General, Organic and Biochemistry*, Student Edition Wadsworth International, USA
3. Lehninger, (1977), *Biochemistry*, second edition, Worth Publisher, Inc, USA.
4. Mathews, C.K., and Van Holde, K.E., (1996), *Biochemistry*, second edition, The Benjamin/Cummings Publishing Company, Inc, California, USA.
5. Stryer L., (1988), *Biochemistry*, third edition, WH Freeman and Company, New York, USA.
6. Trehan, K., 1987, *Biochemistry*, Willy Eastern Limited, New Delhi.
7. Voet, D., and Voet, J.G., (1990), *Biochemistry*, John Wiley and Sons, New York, USA.
8. Wirahadikusumah M, (1985), *Biokimia: Protein, Enzim, dan Asam Nukleat*, Penerbit ITB, Bandung
9. Wuryanti, 1999, Buku Pegangan Kuliah Mahasiswa Bagian A, Lab. Biokimia, Jurusan Kimia FMIPA UNDIP, Semarang, Indonesia.



LECTURING PROGRAM OUTLINES

Course : **BIOCHEMISTRY II**
 Code/SKS/Semester : PAK 361/3 SKS/V
 Description : it discusses energy transfer process, molecular metabolism and storage, genetic information and role of antibody in human body
 Standard of competency : able to identify energy dynamics and macromolecule in living system
 Prerequisite : Biochemistry I

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1		INTRODUCTION		30		
2	Able to describe energy transfer process in living thing	BIOENERGETICS	2.1 energy cycle in cell 2.2 use of high energy phosphate 2.3 Oksidative fosforilase and electron transport 2.4 Ion transport through membrane 2.5 muscle contraction 2.6 photofosforilase	6 x 50 minutes	Speech, discussion and structured task, quiz	1,2,3,4
3	Able to order the steps of biomolecular metabolism process in living body and their storage	METABOLISM	3.1 basic concept of metabolism 3.2 carbohydrate 3.2.1 Glycolysis 3.2.2 citrate acid cycle 3.2.3 Glyconeogenesis 3.2.4 Glycogenolisis 3.3 Metabolism of fatty acid 3.3.1 Beta oxidation of fatty acid 3.3.2 Biosynthesis of fatty acid 3.4. Protein metabolism 3.4.1 amino acid		Speech, discussion and structured task, quiz	1,2,3,4

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
			degradation 3.4.2 Urea cycle 3.5. Nucleic acid metabolism 3.5.1. Purin metabolism 3.5.2. Pirimidin metabolism 3.6. Metabolism integration 3.7 desease due to metabolism disorder			
4	Able to show the step of genetic information in human things	GENETIC INFORMATION CYCLE	4.1 Chromosome and Gen 4.2 Replication 4.3 Transcription 4.4 genetic code 4.4 Translation 4.5 Gen expression regulation	6 x 50 minutes	Speech, discussion and structured task, quiz	1,2,4
5	Able to describe the structure and function of antibody in body of human being	IMMUNO-CHEMISTRY	5.1 Antibody and immunity respons 5.2 Antibody Structure and cellular mechanism of antibody formation	5 x 50 minutes	Speech, discussion and structured task, quiz	1,2,4

REFERENCES:

1. Devlin, T.M., (1997), *Textbook of Biochemistry With Clinical Correlations*, Fourth Edition, Wiley-Liss, Inc, USA.
2. Lehninger, (1977), *Biochemistry*, second edition, Worth Publisher, Inc, USA.
3. Mathews, C.K., and Van Holde, K.E., (1996), *Biochemistry*, second edition, The Benjamin/Cummings Publishing Company, Inc, California, USA.
4. Stryer L., (1988), *Biochemistry*, third edition, USA.
5. Voet, D., and Voet, J.G., (1990), *Biochemistry*, John Wiley and Sons, New York, USA.
6. Wirahadikusumah M, (1985), *Biokimia: Protein, Enzim, dan Asam Nukleat*, Penerbit ITB, Bandung
7. Wirahadikusumah M, (1985), *Biokimia: Metabolisme Energi, Karbohidrat, dan Lipid*, Penerbit ITB, Bandung



LECTURING PROGRAM OUTLINES

Course : **MEDICAL BIOCHEMISTRY**

Code /SKS/Semester : PAK 263/2 SKS/V

Description : it discusses the meaning of healthy and sick from the view of biochemistry, type of disease and its modern and conventional diagnoses, mechanism and interaction of medicinal compound in human body. Definition, type and production of vaccine and gene therapy and its application

Standard of Competency : able to explain the mechanism and interaction drug in cell of human body.

Prerequisite : Biochemistry I

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1	Able to explain the relation of drug and health	drug and health relation	1. definition of drug and health drug function	2 x 50 minutes	Speech, discussion and structured task, quiz	1,2,5
2	Able to explain normal and abnormal metabolism	Metabolism in human body	1. metabolism process integration in human body 2. Metabolism disorder	4 x 50 minutes	Speech, discussion and structured task, quiz	1,2,3,5
3	Able to differ diseases	Type of diseases	1. infection diseases 2. disease due to dietary faultness 3. genetic diseases 4. Psychological diseases	6 x 50 minutes	Speech, discussion and structured task, quiz	
4	Able to order the step of drug mechanism and interaction in human body	Drug mechanism in human body	1. type of drugs 2. relation of structure and biological activity of drug	6 x 50 minutes	Speech, discussion and structured task, quiz	1, 2, 3
5	Able to explain disease diagnose type both conventional or modern	Diseases diagnose	1. Conventional Diagnose (tests for microbiology, kolesterol, bloof sugar, urine, SGPT, SGOT, etc) 2. sophisticated diagnose	4 x 50 minutes	Speech, discussion and structured task, quiz	1, 2, 5

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
			Mutakhir (PCR, ELISA, RFLP, etc)			
6	Able to explain vaccine and gen therapy	Vaccine and gen therapy	1. Definition and type of vaccine 2. Production of vaccine 3. Gen therapy and application	6 x 50 minutes	Speech, discussion and structured task, quiz	2,4,6
		MID Semester	2 X @.100 minutes	4 x 50 minutes		

REFERENCES:

1. Foye, W., (1988), *Kimia Medisinal*, UGM Press, Yogyakarta
2. Suryohudoyo, P., (2000), *Kapita Selekt: Ilmu Kedokteran Molekuler*, Sagung Seto, Jakarta.
3. Devlin, T.M., (1997), *Textbook of Biochemistry With Clinical Correlations*, Fourth Edition, Wiley-Liss, Inc, USA.
4. Strachan, T., dan Read, A.P., (1999), *Human Molecular Genetics 2*, Second Edition, Wiley-Liss, Inc., New York.
5. Luduena, R.F., (1995), *Learning Biochemistry: 100 Case Oriented Problems*, Wiley-Liss, Inc., New York.
6. Maulik, S., dan Patel, S., (1997), *Molecular Biotechnology: Therapeutic Application and Strategies*, Wiley-Liss, Inc., New York.



LECTURING PROGRAM OUTLINES

Course : **FOOD BIOCHEMISTRY**
Code /SKS/Semester : PAK 262/3 SKS/IV
Description : it discusses food biochemistry aspect, relation of food and society and the way to process the food.
Standard of Competency : able to identify food from plant and animal and able to apply the management of food stuff.
Prerequisite : organic chemistry I

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1	Able to explain the relation of food and society	introduction	food and society	50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 5, 6, 7
2	Able to describe plant animal foodstuff	Food diversivication	<u>Animal food:</u> ✓ meat ✓ fish ✓ egg ✓ milk <u>plant:</u> ✓ serealia ✓ sugar ✓ oil	9x 50 minutes	Speech, discussion and structured task, quiz	1,2,5
3	Able to identify Food additive and contaminant and the effect to the human health	Food additive and contaminant	✓ Type of additives ✓ Type of contaminants ✓ Effect of additive and contaminant to human health	4x50 minutes	Speech, discussion and structured task, quiz	1, 3, 4, 7

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
4	Able to identify toxic substances in food stuff	Food hygienity	<ul style="list-style-type: none"> ✓ Toxic substances in foodstuff ✓ Pollution resistance of foodstuff ✓ Storage of foodstuff 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
5	Able to apply food processing and preserving	Food processing and preservation	<ul style="list-style-type: none"> ✓ Type of food processing ✓ Effect of food processing to foodstuff property ✓ Food preservation ✓ Effect of preservation to food stuff property 	6x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
6	Able to relate to recent foodstuff technology	Special topics	<ul style="list-style-type: none"> ✓ Recent foodstuff technology 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7

REFERENCES:

1. Belitz, H.D., and Grosch, W., 1987, *Food Chemistry*, second edition, springer verlag, Berlin, Germany.
2. Buckle, K.A., Edwards, R.A., Fleet, G.H., dan Wooton, M., 1987, *Ilmu Pangan*, UI Press (penterjemah: Hari Purnomo dan Adiono).
3. deMan, J.M., 1997, *Kimia Makanan*, (penerjemah: Prof. Dr. Kosasih Padmawinata), edisi kedua, penerbit ITB, Bandung.
4. Frazier, W.C., and Westhoff, D.C., 1998, *Food Microbiology*, McGraw Hill Book Co., Singapore.
5. Prawirokusuma, S., 1991, *Biokimia Nutrisi*, edisi satu, BPFE, Yogyakarta.
6. Sediaoetama, A.J., 1989, *Ilmu Gizi*, jilid II, Penerbit Dian Rakyat, Jakarta.
7. Winarno, F.G., 1992, *Kimia Pangan dan Gizi*, Gramedia Pustaka Utama.



LECTURING PROGRAM OUTLINES

Course : **BIOMOLECULAR TECHNOLOGY**

Code /SKS/Semester : PAK 365/3 SKS/IV

Description : it discusses food biochemistry aspect, relation of food and society and the way to process the food.

Standard of Competency : able to identify food from plant and animal and able to apply the management of food stuff.

Prerequisite : Biochemistry II

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1	Able to explain the relation of food and society	introduction	food and society	50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 5, 6, 7
2	Able to describe plant animal foodstuff	Food diversivication	<u>Animal food:</u> ✓ meat ✓ fish ✓ egg ✓ milk <u>plant:</u> ✓ serealia ✓ sugar ✓ oil	9x 50 minutes	Speech, discussion and structured task, quiz	1,2,5
3	Able to identify Food additive and contaminant and the effect to the human health	Food additive and contaminant	✓ Type of additives ✓ Type of contaminants ✓ Effect of additive and contaminant to human health	4x50 minutes	Speech, discussion and structured task, quiz	1, 3, 4, 7

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
4	Able to identify toxic substances in food stuff	Food hygienity	<ul style="list-style-type: none"> ✓ Toxic substances in foodstuff ✓ Pollution resitance of foodstuff ✓ Storage of foodstuff 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
5	Able to apply food processing and preserving	Food processing and preservation	<ul style="list-style-type: none"> ✓ Type of food processing ✓ Effect of food processing to foodstuff property ✓ Food preservation ✓ Effect of preservation to food stuff property 	6x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
6	Able to relate to recent foodstuff technology	Special topics	<ul style="list-style-type: none"> ✓ Recent foodstuff technology 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7

REFERENCES:

1. Brown, T.A., 1995, *Gene Cloning: An Introduction*, 3 rd edition, Chapman & Hall.
2. Glick, B.R. and Pasternak, J.J (1994), *Molecular Biotechnology: Principles and Applications of Recombinant DNA*, ASM Press, Washington
3. Sambrook, J. and Russel D.W. (2001), *Molecular Cloning: A Laboratory Manual*, Cold Spring Harbor Laboratory Press, New York
4. Watson, J.D., Hopkins, N.H., Roberts, J.W., Steits, J.A., *Molecular Biologi of The Gene*, Volume II, 4th edition, Benjamin/Cumming, Menlo Park, 1987.
5. Watson, J.D., Gilman, M., Witkowski, J.,and Zoller, M., 1998, *Recombinant DNA*, W.H. Freeman and Company, New York.



LECTURING PROGRAM OUTLINES

Course : **TECHNICAL OF BIOCHEMISTRY RESEARCH**
Code /SKS/Semester : PAK 363/3 SKS/V
Description : it discusses food biochemistry aspect, relation of food and society and the way to process the food.
Standard of Competency : able to identify food from plant and animal and able to apply the management of food stuff.
Prerequisite : Biochemisty II

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1	Able to explain the relation of food and society	introduction	food and society	50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 5, 6, 7
2	Able to describe plant animal foodstuff	Food diversivication	<u>Animal food:</u> ✓ meat ✓ fish ✓ egg ✓ milk <u>plant:</u> ✓ serealia ✓ sugar ✓ oil	9x 50 minutes	Speech, discussion and structured task, quiz	1,2,5
3	Able to identify Food additive and contaminant and the effect to the human health	Food additive and contaminant	✓ Type of additives ✓ Type of contaminants ✓ Effect of additive and contaminant to human health	4x50 minutes	Speech, discussion and structured task, quiz	1, 3, 4, 7

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
4	Able to identify toxic substances in food stuff	Food hygienity	<ul style="list-style-type: none"> ✓ Toxic substances in foodstuff ✓ Pollution resistance of foodstuff ✓ Storage of foodstuff 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
5	Able to apply food processing and preserving	Food processing and preservation	<ul style="list-style-type: none"> ✓ Type of food processing ✓ Effect of food processing to foodstuff property ✓ Food preservation ✓ Effect of preservation to food stuff property 	6x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
6	Able to relate to recent foodstuff technology	Special topics	<ul style="list-style-type: none"> ✓ Recent foodstuff technology 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7

REFERENCES:

1. Pelczar, M.J. dan Chan, E.C.S (1986), *Dasar-Dasar Mikrobiologi*, UI-Press, Jakarta
2. Slamet Sudarmadji (1996), *Teknik Analisa Biokimiawi*, Liberty, Yogyakarta
3. Deutscher, M.P. (1990), *Guide to Protein Purification*, Academic Press Limited, London
4. Sambrook, J. and Russel D.W. (2001), *Molecular Cloning: A Laboratory Manual*, Cold Spring Harbor Laboratory Press, New York
5. Glick, B.R. and Pasternak, J.J (1994), *Molecular Biotechnology: Principles and Applications of Recombinant DNA*, ASM Press, Washington



LECTURING PROGRAM OUTLINES

Course : **Analysis of (Raw) Material Industry**
Code /SKS/Semester : PAK 249/3 SKS/V
Description : it discusses of raw material industry analysis aspect
Standard of Competency : able to identify food from plant and animal and able to apply the management of food stuff.
Prerequisite : quantitative analysis II

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1	Able to explain the relation of food and society	introduction	food and society	50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 5, 6, 7
2	Able to describe plant animal foodstuff	Food diversivication	<u>Animal food:</u> ✓ meat ✓ fish ✓ egg ✓ milk <u>plant:</u> ✓ serealia ✓ sugar ✓ oil	9x 50 minutes	Speech, discussion and structured task, quiz	1,2,5
3	Able to identify Food additive and contaminant and the effect to the human health	Food additive and contaminant	✓ Type of additives ✓ Type of contaminants ✓ Effect of additive and contaminant to human health	4x50 minutes	Speech, discussion and structured task, quiz	1, 3, 4, 7

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
4	Able to identify toxic substances in food stuff	Food hygienity	<ul style="list-style-type: none"> ✓ Toxic substances in foodstuff ✓ Pollution resitance of foodstuff ✓ Storage of foodstuff 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
5	Able to apply food processing and preserving	Food processing and preservation	<ul style="list-style-type: none"> ✓ Type of food processing ✓ Effect of food processing to foodstuff property ✓ Food preservation ✓ Effect of preservation to food stuff property 	6x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
6	Able to relate to recent foodstuff technology	Special topics	<ul style="list-style-type: none"> ✓ Recent foodstuff technology 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7

Reference: 1. Austin Gorge T, 1984, Shreve's Chemical Proses Industries, Mc Graw Hill, Inc
2. Cotton, F.A , at all, 1980, Advanced Inorganic Chemistry, Wiley Int, New York



LECTURING PROGRAM OUTLINES

Course : **ADVANCED ANALYTICAL CHEMISTRY I**
Code /SKS/Semester : PAK 341/3 SKS/IV
Description : it discusses of Advanced Analytical Chemistry
Standard of Competency : able to identify material using recent analytical concept
Prerequisite : Instrumental analysis

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1	Able to explain the relation of food and society	introduction	food and society	50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 5, 6, 7
2	Able to describe plant animal foodstuff	Food diversivication	<u>Animal food:</u> ✓ meat ✓ fish ✓ egg ✓ milk <u>plant:</u> ✓ serealia ✓ sugar ✓ oil	9x 50 minutes	Speech, discussion and structured task, quiz	1,2,5
3	Able to identify Food additive and contaminant and the effect to the human health	Food additive and contaminant	✓ Type of additives ✓ Type of contaminants ✓ Effect of additive and contaminant to human health	4x50 minutes	Speech, discussion and structured task, quiz	1, 3, 4, 7

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
4	Able to identify toxic substances in food stuff	Food hygienity	<ul style="list-style-type: none"> ✓ Toxic substances in foodstuff ✓ Pollution resitance of foodstuff ✓ Storage of foodstuff 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
5	Able to apply food processing and preserving	Food processing and preservation	<ul style="list-style-type: none"> ✓ Type of food processing ✓ Effect of food processing to foodstuff property ✓ Food preservation ✓ Effect of preservation to food stuff property 	6x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
6	Able to relate to recent foodstuff technology	Special topics	<ul style="list-style-type: none"> ✓ Recent foodstuff technology 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7

REFERENCES:

Recent journals



LECTURING PROGRAM OUTLINES

Course : **ADVANCED ANALYTICAL CHEMISTRY II**
Code /SKS/Semester : PAK 342/3 SKS/IV
Description : it discusses of Advanced Analytical Chemistry
Standard of Competency : able to identify material using recent analytical concept
Prerequisite : Instrumental analysis

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1	Able to explain the relation of food and society	introduction	food and society	50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 5, 6, 7
2	Able to describe plant animal foodstuff	Food diversivication	<u>Animal food:</u> ✓ meat ✓ fish ✓ egg ✓ milk <u>plant:</u> ✓ serealialia ✓ sugar ✓ oil	9x 50 minutes	Speech, discussion and structured task, quiz	1,2,5
3	Able to identify Food additive and contaminant and the effect to the human health	Food additive and contaminant	✓ Type of additives ✓ Type of contaminants ✓ Effect of additive and contaminant to human health	4x50 minutes	Speech, discussion and structured task, quiz	1, 3, 4, 7

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
4	Able to identify toxic substances in food stuff	Food hygienity	<ul style="list-style-type: none"> ✓ Toxic substances in foodstuff ✓ Pollution resitance of foodstuff ✓ Storage of foodstuff 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
5	Able to apply food processing and preserving	Food processing and preservation	<ul style="list-style-type: none"> ✓ Type of food processing ✓ Effect of food processing to foodstuff property ✓ Food preservation ✓ Effect of preservation to food stuff property 	6x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
6	Able to relate to recent foodstuff technology	Special topics	<ul style="list-style-type: none"> ✓ Recent foodstuff technology 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7

REFERENCES:

1. Popovich, O., dan Tomkin, R.P.T., 1981, *Nonaqueous Solutions Chemistry*, John Wiley and Sons
2. Fritz, J.S., 1973, *Acid-base Titrations in Nonaqueous Solvents*, Allyn and Bacon, Boston
3. Brenner, A., 1967, *Electrolysis of Nonaqueous System*, in *Advanced in Electrochemistry and Electrochemical Engineering*, P. Delahay and C. W. Tobias, vol V, *Electrochemical Engineering*, C. W. Tobias, Wiley-Intersciences, New York
4. Alders, L., 1959 *Liquid-liquid Extraction*, Theory and Practise, edisi Ke-2, Elsevier, Amsterdam
5. Ritcey, G. M., Editor, 1974, *Proceedings International Solvent Extraction Conferences*, Soc. Of Chemical Industry, London: *Advences in Extractive Metallurgy*, Pubication of Min, and Met., London



LECTURING PROGRAM OUTLINES

Course : CHEMISTRY OF FOOD ANALYSIS
Code /SKS/Semester : PAK 244/3 SKS/IV
Description : it discusses of analysis of food using recent methods
Standard of Competency : able to measure food composition
Prerequisite : Instrumental analysis

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1	Able to explain the relation of food and society	introduction	food and society	50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 5, 6, 7
2	Able to describe plant animal foodstuff	Food diversivication	<u>Animal food:</u> ✓ meat ✓ fish ✓ egg ✓ milk <u>plant:</u> ✓ serealia ✓ sugar ✓ oil	9x 50 minutes	Speech, discussion and structured task, quiz	1,2,5
3	Able to identify Food additive and contaminant and the effect to the human health.	Food additive and contaminant	✓ Type of additives ✓ Type of contaminants ✓ Effect of additive and contaminant to human health	4x50 minutes	Speech, discussion and structured task, quiz	1, 3, 4, 7



LECTURING PROGRAM OUTLINES

Course : **ANALYTICAL CHEMISTRY I**
Code /SKS/Semester : PAK 140/3 SKS/II
Description : it discusses of qualitative analytical chemistry using wet and dry methods
Standard of Competency : able to do qualitative analysis
Prerequisite : Basic chemistry II

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1	Able to explain the relation of food and society	introduction	food and society	50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 5, 6, 7
2	Able to describe plant animal foodstuff	Food diversivication	<u>Animal food:</u> ✓ meat ✓ fish ✓ egg ✓ milk <u>plant:</u> ✓ serealia ✓ sugar ✓ oil	9x 50 minutes	Speech, discussion and structured task, quiz	1,2,5
3	Able to identify Food additive and contaminant and the effect to the human health	Food additive and contaminant	✓ Type of additives ✓ Type of contaminants ✓ Effect of additive and contaminant to human health	4x50 minutes	Speech, discussion and structured task, quiz	1, 3, 4, 7

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
4	Able to identify toxic substances in food stuff	Food hygienity	<ul style="list-style-type: none"> ✓ Toxic substances in foodstuff ✓ Pollution resitance of foodstuff ✓ Storage of foodstuff 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
5	Able to apply food processing and preserving	Food processing and preservation	<ul style="list-style-type: none"> ✓ Type of food processing ✓ Effect of food processing to foodstuff property ✓ Food preservation ✓ Effect of preservation to food stuff property 	6x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
6	Able to relate to recent foodstuff technology	Special topics	<ul style="list-style-type: none"> ✓ Recent foodstuff technology 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7

REFERENCES:

1. LW. Aurand, Woods AE, dan Wells MR, 1987, Food Composition and Analysis, Van Nostrand Reinhold Co, New Torh.
2. FG. Winarno, Kim Pangan dan Gizi
3. Sudarmadji S, 1987, Analisis Pangan dan Pertanian, Gajah Mada Preso

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
4	Able to identify toxic substances in food stuff	Food hygienity	<ul style="list-style-type: none"> ✓ Toxic substances in foodstuff ✓ Pollution resitance of foodstuff ✓ Storage of foodstuff 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
5	Able to apply food processing and preserving	Food processing and preservation	<ul style="list-style-type: none"> ✓ Type of food processing ✓ Effect of food processing to foodstuff property ✓ Food preservation ✓ Effect of preservation to food stuff property 	6x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
6	Able to relate to recent foodstuff technology	Special topics	<ul style="list-style-type: none"> ✓ Recent foodstuff technology 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7

REFERENCES:

1. Vogel's , 1995, Qualitative Inorganic Analysis.
2. Emil J.Slewiniski, 1988, Chemical Principles in the Laboratory with Qualitative Analysis.



LECTURING PROGRAM OUTLINES

Course : INSTRUMENTAL ANALYSIS CHEMISTRY
Code /SKS/Semester : PAK 242/3 SKS/IV
Description : it discusses of instrumental analysis using spectrometry and electrometry
Standard of Competency : able to do instrumental analysis
Prerequisite : Analytical chemistry II

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1	Able to explain the relation of food and society	introduction	food and society	50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 5, 6, 7
2	Able to describe plant animal foodstuff	Food diversivication	<u>Animal food:</u> ✓ meat ✓ fish ✓ egg ✓ milk <u>plant:</u> ✓ serealia ✓ sugar ✓ oil	9x 50 minutes	Speech, discussion and structured task, quiz	1,2,5
3	Able to identify Food additive and contaminant and the effect to the human health	Food additive and contaminant	✓ Type of additives ✓ Type of contaminants ✓ Effect of additive and contaminant to human health	4x50 minutes	Speech, discussion and structured task, quiz	1, 3, 4, 7

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
4	Able to identify toxic substances in food stuff	Food hygienity	<ul style="list-style-type: none"> ✓ Toxic substances in foodstuff ✓ Pollution resitance of foodstuff ✓ Storage of foodstuff 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
5	Able to apply food processing and preserving	Food processing and preservation	<ul style="list-style-type: none"> ✓ Type of food processing ✓ Effect of food processing to foodstuff property ✓ Food preservation ✓ Effect of preservation to food stuff property 	6x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
6	Able to relate to recent foodstuff technology	Special topics	<ul style="list-style-type: none"> ✓ Recent foodstuff technology 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7

REFERENCES:

1. H. Wilard, L.L. Merritt, Jr., J.A. Dean, and F.A. Settle, Jr., "*Instrumental Methods of Analysis*", 6th ed., Van Nostrand, Princeton, N.Y., 1981, Chaps. 2 and 3.
2. G.W. Ewing, "*Instrumental Methods of Chemical Analysis*", 4th ed., Mc.Graw-Hill, NewYork, 1975, Chaps. 2 and 3.
3. H.H.Baur, G.D.Christian, and J.E. O'Reilly (eds.), "*Instrumental Analysis*", Allyn and Bacon, Boston, 1978, Chaps. 6 and 7.
4. D.A.Skoog and D.M. West, "*Principles of Instrumental Analysis*," 2nd ed., Saunders, Philadelphia, 1980, Chaps. 6 and 7.
5. G.D.Christian, "*Analytical Chemistry*", 3rd ed., Wiley, New York, 1980, pp 411-413.
6. D.A.Skoog and D.M. West, "*Principles of Instrumental Analysis*," 2nd ed., Saunders, Philadelphia, 1980, Chap. 8,9 and 16



LECTURING PROGRAM OUTLINES

Course : ENVIRONMENTAL CHEMISTRY
Code /SKS/Semester : PAK 242/3 SKS/IV
Description : it discusses of environmental chemistry
Standard of Competency : able to do instrumental analysis
Prerequisite : Analytical chemistry II

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1	Able to explain the relation of food and society	introduction	food and society	50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 5, 6, 7
2	Able to describe plant animal foodstuff	Food diversivication	<u>Animal food:</u> ✓ meat ✓ fish ✓ egg ✓ milk <u>plant:</u> ✓ serealia ✓ sugar ✓ oil	9x 50 minutes	Speech, discussion and structured task, quiz	1,2,5

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
3	Able to identify Food additive and contaminant and the effect to the human health	Food additive and contaminant	<ul style="list-style-type: none"> ✓ Type of additives ✓ Type of contaminants ✓ Effect of additive and contaminant to human health 	4x50 minutes	Speech, discussion and structured task, quiz	1, 3, 4, 7
4	Able to identify toxic substances in food stuff	Food hygienity	<ul style="list-style-type: none"> ✓ Toxic substances in foodstuff ✓ Pollution resitance of foodstuff ✓ Storage of foodstuff 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
5	Able to apply food processing and preserving	Food processing and preservation	<ul style="list-style-type: none"> ✓ Type of food processing ✓ Effect of food processing to foodstuff property ✓ Food preservation ✓ Effect of preservation to food stuff property 	6x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
6	Able to relate to recent foodstuff technology	Special topics	<ul style="list-style-type: none"> ✓ Recent foodstuff technology 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7

REFERENCES:

1. William, R.B., Culp, G.L., 1986, *Handbooks of Public Water Systems*, Van Nostrand Reinhold, New York.
2. APHA (American Public Health Associations), 1986, *Standard Methods: For Examination of Water and Waste Water*, 14th ed., APHA, Washington D.C.
3. Sandell, E., B. dan H Onishi, 1978, *Colorimetric Determination of Traces of Metals*, 4th edition, Interscience, New York.
4. Radojevic, M. dan Bashkin, V. N., 1999, *Practical environmental Analysis*, Royal Society of Chemistry, Cambridge.
5. DEKES RI, KEP-MEN 2003 tentang Baku Mutu Air.
6. P. O'Neill, 1993, *Environmental Chemistry*, 2nd ed., Chapman and Hall, London.
7. B.J. Alloway and D.C. Ayers, 1994, *Chemical Principles of Environmental Pollution*, Blackie, London.
8. R.M. Harrison (ed.), 1992, *Understanding our Environment: An Introduction to Environmental Chemistry and Pollution*, 2nd ed., Royal Society of Chemistry, Cambridge.



LECTURING PROGRAM OUTLINES

Course : **CHEMOMETRY**
Code /SKS/Semester : PAK 242/3 SKS/IV
Description : it discusses of environmental chemistry
Standard of Competency : able to do instrumental analysis
Prerequisite : Analytical chemistry II

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
1	Able to explain the relation of food and society	introduction	food and society	50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 5, 6, 7
2	Able to describe plant animal foodstuff	Food diversivication	<u>Animal food:</u> ✓ meat ✓ fish ✓ egg ✓ milk <u>plant:</u> ✓ serealia ✓ sugar ✓ oil	9x 50 minutes	Speech, discussion and structured task, quiz	1,2,5

NO	BASIC COMPETENCIES	MAIN TOPIC	SUB MAIN TOPIC	TIME ALLOCATION	LECTURING EXPERIENCES	REF.
3	Able to identify Food additive and contaminant and the effect to the human health	Food additive and contaminant	<ul style="list-style-type: none"> ✓ Type of additives ✓ Type of contaminants ✓ Effect of additive and contaminant to human health 	4x50 minutes	Speech, discussion and structured task, quiz	1, 3, 4, 7
4	Able to identify toxic substances in food stuff	Food hygienity	<ul style="list-style-type: none"> ✓ Toxic substances in foodstuff ✓ Pollution resitance of foodstuff ✓ Storage of foodstuff 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
5	Able to apply food processing and preserving	Food processing and preservation	<ul style="list-style-type: none"> ✓ Type of food processing ✓ Effect of food processing to foodstuff property ✓ Food preservation ✓ Effect of preservation to food stuff property 	6x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7
6	Able to relate to recent foodstuff technology	Special topics	<ul style="list-style-type: none"> ✓ Recent foodstuff technology 	4x50 minutes	Speech, discussion and structured task, quiz	1, 2, 3, 4, 5, 6, 7

REFERENCES:

1. J.C. Miller and J.N. Miller, 1988, *Statistics for Analytical Chemistry*, Ellis Horwood Limited, Chichester.
2. G.W. Ewing, "*Instrumental Methods of Chemical Analysis*", 4th ed., Mc.Graw-Hill, New York, 1975, Chaps. 2 and 3.
3. H.H.Baur, G.D.Christian, and J.E. O'Reilly (eds.), "*Instrumental Analysis*", Allyn and Bacon, Boston, 1978, Chaps. 6 and 7.
4. D.A.Skoog and D.M. West, "*Principles of Instrumental Analysis*," 2nd ed., Saunders, Philadelphia, 1980, Chaps. 6 and 7.
5. G.D.Christian, "*Analytical Chemistry*", 3rd ed., Wiley, New York, 1980, pp 411-413.
6. D.A.Skoog and D.M. West, "*Principles of Instrumental Analysis*," 2nd ed., Saunders, Philadelphia, 1980, Chap. 8,9 and 16