

KIT 357/2 –Industrial Practical

Course objective: To acquire skill and understanding of several chemical techniques related to industrial processes through laboratory experiments.

Experiment Title	Content	Number of lecture hours	Expected outcome – upon completion of this course, the students should be able to...
1. Processing of silica by sol-gel method	<ul style="list-style-type: none">• The application of sol-gel process for preparing silica• The basic parameters which influence the sol-gel process	3	<ul style="list-style-type: none">• Understand the sol-gel process and the reactions involved• Explain factors which influence the sol-gel process• Understand the relationship between the time of gel formation and pH
2. Preparation of an azo dye: 1-(p-methoxyphenylazo)-2-naphthol	<ul style="list-style-type: none">• Introduction to a method of preparing azo compounds• Exercise on the basic laboratory techniques	6	<ul style="list-style-type: none">• Understand the reaction principles that occur during the diazotisation and azo coupling process• Understand theoretically how a coloured compound is formed from a non-coloured starting materials• Know the techniques of crystallisation, thin layer chromatography, IR and UV-VIS spectroscopy.• Know how to purify an organic compound
3. The dyeing of textile fibres	<ul style="list-style-type: none">• Introduction to textile pretreatment and dyeing methods• Methods of testing the dyeing quality	6	<ul style="list-style-type: none">• Know the scouring and bleaching methods of cotton fabric• Understand several technical terms used in dyeing• Know the methods of reactive and disperse dyeing• Know how to control the quality of dyeing

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4. Corrosion of metals	<ul style="list-style-type: none"> • Study on the corrosion process of iron metal in the following aspects: <ol style="list-style-type: none"> a. Reaction at anode and cathode b. The effects of cathode's surface area, oxygen concentration and stress on the rate of corrosion c. Controlling corrosion by cathodic control d. Controlling corrosion by passive or oxide layer e. The use of inhibitor to control corrosion 	3	<ul style="list-style-type: none"> • Understand the general principles of corrosion on metal specimens and to determine the operational area of corrosion • Identify factors which influence corrosion • Know some effective methods to control corrosion
5. Determination of fatty acid composition in palm oil by gas-liquid chromatography	<ul style="list-style-type: none"> • Study on the method of determination of the composition of fatty acids in cooking oil by GLC 	3	<ul style="list-style-type: none"> • Understand the working principle of GLC in separating components of a substance • Know how to interpret GLC chromatogram to determine the composition of palm oil

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6. Determination of phosphorus content in palm oil	<ul style="list-style-type: none"> • Study on the method of determination of the total phosphorus content in cooking oil by chemical method 	3	<ul style="list-style-type: none"> • Understand the reactions in converting the phosphorus ion into a coloured complex which can be measured by a colorimeter or spectrophotometer
7. Extraction of metals	<ul style="list-style-type: none"> • Introduction to a hydrometallurgical method for extraction of metals • Study on the parameters that affect the effectiveness of the extraction process 	6	<ul style="list-style-type: none"> • Know how to extract metals from ores by the hydrometallurgical method • Understand the factors that affect the digestion process and metal recovery
8. Emulsion polymerization of styrene	<ul style="list-style-type: none"> • Method of preparation of polystyrene by emulsion polymerization • Study on the effects of emulsifying agent concentration on the rate of polymerization 	3	<ul style="list-style-type: none"> • Understand the emulsion term • Understand how an emulsifying agent functions • Understand the influence of the amount of emulsifying agent to the weight of polymer formed

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9. Preparation and properties of copolymers of styrene and methyl acrylate	<ul style="list-style-type: none"> • Method of preparation of two homopolymers and a series of copolymers from styrene and methyl acrylate. Study on the solubility and the glass transition temperature (T_g) of the homopolymers and copolymers 	3	<ul style="list-style-type: none"> • Differentiate between homopolymer and copolymer terms • Know how to prepare a homopolymer and a copolymer by radical polymerization • Understand the principle of Differential Scanning Calorimetry to determine the T_g of polymers • Understand the effects of structure upon polymer properties
10. Solution polymerization of methyl methacrylate	<ul style="list-style-type: none"> • Study on the kinetics of the polymerization of methyl methacrylate in toluene solution • Use of gel permeation chromatography to determine molar mass 	3	<ul style="list-style-type: none"> • Understand the function of solvents to reduce the viscosity of the reaction medium during polymer preparation and to facilitate heat transfer. • Determine the percentage conversion of monomers to polymers. • Determine the initial rate of polymerization from a plot of % conversion versus time • Determine the order of the reaction • Determine the number-average, weight average and molar mass distribution of polymer samples by gel permeation chromatography

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11. Determination of copper and iron contents in palm oil by Atomic Absorption Spectrophotometry	<ul style="list-style-type: none"> • Determination of the copper and iron contents of palm oil by Atomic Absorption Spectrophotometry (AAS) • The principles of AAS technique 	3	<ul style="list-style-type: none"> • Understand the principles of the AAS technique to determine metal ions content in palm oil products
12. Lignin Extraction from black liquor of oil palm empty fruit bunch	<ul style="list-style-type: none"> • Application of pulping process onto oil empty fruit bunch • Collection of black liquor from the process • Extraction of lignin from the black liquor • Confirmation of the present of lignin via IR 	3	<ul style="list-style-type: none"> • Understand that EFB can be transformed into paper. • Understand the method to recycle the pulping waste (black liquor) into lignin • Appreciate the idea of green chemistry by recycling the waste wisely
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