



**SAMSEN WITTAYALAI SCHOOL  
ENGLISH PROGRAM**

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**COURSE OUTLINE**

**Subject:** Chemistry (SC33221)

**Learning Period:** 3 Periods/Week

**Grade Level:** Mattayomsuksa 6/14-16

**Learning Area:** Science

**Teacher:** Dr. Jirayu Sitanurak

**Course Classification:**  Additional

**Credit Unit:** 1.5 Units

**Semester 1, Academic Year 2022**

**Samsenwittayalai School English Program**

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**I. COURSE DESCRIPTION**

Study a fundamental aspect of chemistry explaining characteristics of a chemical reaction at equilibrium state. Firstly, students will investigate reversible reactions. Secondly, students will be provided some basic principles of chemical equilibrium including dynamic equilibrium, quantitative determination of equilibrium constant using molar concentration, factors affecting chemical equilibrium and Le Chatelier's principle. Furthermore, concept of chemical equilibrium will be extended to dissociation of acids, bases and salts in an aqueous solution. Three theories of acid-base which are Arrhenius, Bronsted-Lowry and Lewis will be investigated. Identification of conjugated acid- base pairs will be shown. Students will study concept, calculation and measurement of pH of aqueous solutions. Chemical reactions of acid-base which are neutralization reaction, proton transfer reaction and electron transfer reaction will be studied. Lastly, students will study and experiment titration and its applications. Principle, calculation and preparation of buffer solution will also be investigated.

By using the scientific processes, seeking knowledge, searching data, investigating, analyzing, comparing, explaining, discussing and conclude.

For improving the scientific knowledge and understanding so that the students can make use of the knowledge to make decision, develop scientific skill including the 21<sup>st</sup> century skills in information technology, critical thinking and problem-solving and communicating. They can also communicate the knowledge and can use the knowledge in every day's life, leading to scientific mind, ethics, virtues and appropriate attitudes.

## II. LEARNING OUTCOMES

1. Learners' reading, analytical thinking and writing skills meet the criteria prescribed by the respective educational institutions.
2. Learners' desirable characteristics meet the criteria prescribed by the respective educational institutions.
3. Experiment and explain meaning of reversible reaction and chemical equilibrium.
4. Explain change in concentration of chemicals and chemical rate of forward and backward reaction from the beginning until the system reaches equilibrium.
5. Deduce expressions for equilibrium constant and calculate its value.
6. Calculate the quantities of chemical compositions present at equilibrium state.
7. Determine value of equilibrium constants and chemical concentrations of a multi-step chemical reaction.
8. State Le Chatelier's principle and apply it to qualitatively deduce the effect of changes in concentration, pressure or temperature on a system at equilibrium.
9. Give some examples and explain chemical equilibrium found in living organisms and industrial processes.
10. Determine acids and bases by use of the Arrhenius theory, the Bronsted-Lowry theory and Lewis theory.
11. Identify conjugated acid-base pairs according to the Bronsted-Lowry theory.
12. Calculate and compare strength of acid and base.
13. Calculate  $[H^+]$ ,  $[OH^-]$ , pH and pOH values for acidic and alkaline aqueous solutions.
14. Write neutralization equations and qualitatively determine pH values of the resulting solutions.
15. Write hydrolysis equation of salt solutions and qualitatively determine their pH values
16. Describe, experiment and explain choice of suitable indicators for acid-base titrations.
17. Quantitatively determine concentration of unknown solutions employing acid-base titrations.
18. Qualitatively and quantitatively explain chemical compositions, properties and pH values of a buffer solution.
19. Searching and demonstrating applications of acids and bases found in our daily life.

### III. TENTATIVE COURSE OUTLINE

Week	Topics / Contents	Learning outcome(s)	Period(s)
1	Course Orientation	-	1
	<b>Unit 1: Chemical equilibrium</b>	3	2
	1.1 Reversible reaction		
2	1.2 Dynamic equilibrium	4	3
3-4	1.3 Writing equilibrium constant expression 1.4 Calculating value of equilibrium constant and the quantities of chemical compositions 1.5 Calculating the equilibrium constant of multi-step reactions	5-7	6
5-6	1.6 Disturbing the equilibrium and Le Chatelier's principle	8-9	6
7-8	<b>Unit 2: Further aspects of equilibria – ionic equilibrium</b>	10-12	6
	2.1 Acids-bases Equilibrium		
	2.2 Acids-bases Theories		
	2.3 Conjugated acid-base pairs 2.4 Strength of acids-bases		
9	<b>Mid-term Exam</b>	3-9	-
10-11	2.5 pH calculations and its measurement ( <i>cont.</i> )	13	6
12	2.6 Salt and hydrolysis	13, 15	3
13	2.7 Buffer solution	13, 18	3
14-17	<b>Unit 3: Stoichiometry of acids and bases</b>	14-17, 19	12
	3.1 Titration		
18	<b>Final Exam</b>	10-19	-

### IV. TEACHING METHODS AND MANAGEMENT

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|---|--|---|
| <input checked="" type="checkbox"/> Experiment      | <input checked="" type="checkbox"/> Lecture/Discussion | <input checked="" type="checkbox"/> Group work    |
| <input checked="" type="checkbox"/> Individual work | <input checked="" type="checkbox"/> Demonstration      | <input checked="" type="checkbox"/> Self-learning |

### V. TEACHING MATERIALS/SUPPLEMENTS

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|---|--|---|
| <input checked="" type="checkbox"/> Handouts  | <input checked="" type="checkbox"/> Worksheets | <input checked="" type="checkbox"/> Samples/ Models |
| <input checked="" type="checkbox"/> Commercial Text Book                                      |  |   |
| ...Chang, R. Chemistry. 10 <sup>th</sup> ed.; Singapore: McGraw-Hill Companies. Inc., 2010... |  |   |

## VI. ASSESSMENT AND EVALUATION

Indicator/Learning outcomes	Formative I	Midterm	Formative II			Final
	Score from SGS		1	10	11	
Total score	15	15	10	10	20	30
1. Learners' reading, analytical thinking and writing skills			10			
2. Learners' desirable characteristics				10		
3. Learning outcomes No. 3-9	15	15				
4. Learning outcomes No. 10-19					20	30
<b>Total</b>	15	15	40			30

## VII. ASSIGNMENT

SGS No.	Score (points)	Assignment	Dead line	Type	
				Individual	Group
1	15	Quiz, worksheet and oral test	Before Midterm Exam	✓	
Midterm	15	Mid-term Exam		✓	
10	10	Learners' reading, analytical thinking and writing skills	Before Final Exam	✓	
11	10	Learners' desirable characteristics		✓	
12	20	Quiz, Experimental report and Practical exam		✓	
Final	30	Final Exam		✓	