SAMSEN WITTAYALAI SCHOOL
ENGLISH PROGRAM

COURSE OUTLINE

Subject: Chemistry 1 (*SC30221*)
Course Classification: ☐ Foundation ☑ Additional
Learning Period: 2 Periods/Week
Credit Unit: 2
Grade Level: Mattayomsuksa 4 (Grade 10)
Semester 1, **Academic Year** 2022
Learning Area: Science and technology
Samsenwittayalai School English Program
Teacher: Asst.Prof.Dr. Jadsada Ratniyom

I. COURSE DESCRIPTION

Study the atomic structures and nuclear notation for given elements, the Bohr atomic model and characteristics of spectra of elements, the electron cloud, electron configurations, the Periodic Table, the relationship between valence electron configuration and the periodic table, the development of the Periodic Table and properties of elements in groups and periods dimension of atomic radius, ionic radius, ionization energy, electronegativity, electron affinity, bonding; ionic bonding, structures of ionic compounds, energy and formation of ionic compounds, reaction of ionic compounds, covalent bonding types of covalent bonds, Lewis structures bond length, bond energy, resonance, molecular geometry, polarity, intermolecular force and network structure.

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 21st 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. Students should be able to search for data and explain scientist atomic structures and explain the development of atomic structures.
4. Students should be able to write the nuclear symbol for a given element, indicate the number of electrons, protons, and neutrons in atoms and define the meaning of isotopes of an element.
5. Students should be able to explain and write the electron configuration in the principal energy levels and sub-energy level for a given element/ion

6. Students should be able to identify periods, groups, and metallic character of the main group and transition metal elements on the periodic table.
7. Students should be able to analyze and state the general periodic trends in atomic sizes, ionic size, electronegativity, ionization energy and determine relative ionization energies from periodic trends.
8. Students should be able to explain and compare properties of transition metal elements and main group elements
9. Students should be able to classify ions in terms of monatomic ions, polyatomic ions, cations, and anions.
10. Students should be able to distinguish between ionic and covalent compounds and give examples of correct formulas for ionic compounds.
11. Students should be able to describe the properties of ionic and covalent compounds and compare and contrast various properties expected for ionic compounds versus covalent compounds.
12. Students should be able to name common ionic compounds, molecular compounds, binary acids, oxoacids, bases, and hydrates given their respective chemical formulas.
13. Students should be able to predict the chemical formulas of common ionic compounds, molecular compounds, binary acids, oxoacids, bases, and hydrates given their respective names.
14. Students should be able to use the Born-Haber cycle to determine lattice energy for an ionic solid.
15. Students should be able to predict the resulting products and write the molecular equation, ionic equation, and net ionic equation; and identify spectator ions given the reactants of a chemical reaction.
16. Students should be able to relate types of bonds, bond length and bond strength.
17. Students should be able to describe the formation of covalent bond, the type of covalent bonds (single bond, double bond, triple bond) present, and the number of lone pairs of electrons using Lewis structures.
18. Students should be able to use Lewis dot symbols to show the formation of both ionic and molecular compounds.
19. Students should be able to identify covalent compounds, the type of covalent bonds present, and the number of lone pairs of electrons using Lewis structures.
20. Students should be able to use Lewis dot and the octet rule to write Lewis structures of compounds and ions.
21. Students should be able to use Lewis structures and bond energies to calculate heats of reaction.
22. Students should be able to rationalize why energy change for breaking chemical bonds is positive and the formation of chemical bonds is negative.
23. Students should be able to predict molecular shapes (AX_2, AX_2E, AX_2E_2, AX_3, AX_3E, AX_3E_2, AX_4, etc.) from Lewis structures.
24. Students should be able to identify using the VSEPR model, what category (and thus the corresponding molecular geometry, angle(s) and sketch) a molecular or ion belongs given its formula.
25. Students should be able to use the concepts of electronegativity, dipole moments, and VSEPR geometries to identify polar and nonpolar molecules.

26. Students should be able to explain the difference between intermolecular and intramolecular forces.
27. Students should be able to identify and give examples of the following forces:
    dipole – dipole; van der Waals; dispersion; hydrogen bonding.
28. Students should be able to define polarizability and its relationship with intermolecular forces.
29. Students should be able to investigate and explain the network covalent solids.
30. Students should be able to describe the formation of metallic bond and general properties of metals.

III. TENTATIVE COURSE OUTLINE

Week	Topics / Contents	Learning outcome	Period(s)
1.	Introductions to the book and course, Chapter 1–Atom and basic concepts	1,2, 3	2
2	Chapter 1– Thomson's experiment and Rutherford's experiment that led to the nuclear model of the atom.	1,2, 3	2
3	Chapter 1–nuclear notation for given elements and its isotope	4	2
4.	Chapter 1–Bohr's atomic structure	1,2, 3	2
5.	Chapter 1–Electron configuration by orbitals	5	2
6.	Chapter 1–Electron configuration by orbitals	5	2
7.	Chapter 1–The Periodic Table: elements in group and periods	6, 8	2
8.	Chapter 1–Periodic trends: Atomic radius, Ionization energy, and electronegativity	7	2
9.	**Mid-term Examination**		
10.	Chapter 2–Introduction to chemical bonding (ionic Vs covalent bond) and nomenclature of compounds	9, 10	2
11.	Chapter 2–Ionic compounds and formulas for ionic compounds	11, 12	2
12.	Chapter 2–Ionic formation, energy for an ionic solid, and ionic properties	13, 14, 15	2
13.	Chapter 2–Covalent Compounds: bond length and bond energy	16, 17	2
14.	Chapter 2–Lewis structure and Drawing Lewis structure	18, 19, 20	2
15.	Chapter 2–enthalpy change for breaking chemical bonds in chemical equations	21, 22	2
16.	Chapter 2–Molecular geometry	23, 24	2
17.	Chapter 2–Polar and non-polar covalent molecules	25	2
18.	Chapter 2–Intermolecular forces	26, 27, 28	2
19.	Chapter 2–network covalent solids, metallic bond and general properties of metals.	29, 30	2
20.	**Final Examination**		

IV. TEACHING METHODS AND MANAGEMENT

☑ Experiment ☑ Lecture/Discussion ☑ Group work

☑ Individual work ☑ Self-learning ☑ Demonstration

V. TEACHING MATERIALS/SUPPLEMENTS

☑ Handouts ☑ Worksheets ☐ Teacher's text book

☑ Exercise s

☑ Commercial Text Book: Silberberg, M. S. (2014). *Chemistry: The molecular nature of matter and change.* New York: McGraw-Hill.

☑ YouTube channel: Tyler DeWitt

VI. ASSESSMENT AND EVALUATION

Indicator/Learning outcome score from SGS	**Formative I**	**Midterm**	**Formative II**			**Final**
	1		10	11	12	
Total score	**15**	**15**	**10**	**10**	**20**	**30**
LO 1: Learners' reading, analytical thinking			10			
LO2: Learners' desirable characteristics				10		
LO 3 to 8	15	15				
LO 9 to 20					20	30
LO 21 to 30						
Total	15	15	40			30

* LO is Learning outcome

VII. ASSIGNMENT

SGS NO.	**Score (points)**	**Assignment**	**Deadline**	**Type**			**Remark**
				Test	**Individual**	**Group**	
1	**15**	Quiz 1	Before Midterm Exam.	✓			
		Homework 1/ worksheet 1/			✓		
Midterm	**15**	Midterm Examination	July 29-30, 2022 August 2-3, 2022	✓			
10	**10**	Lab report	Before Final Exam.		✓		
11	**10**	observing student behavior	throughout this semester				
12	**20**	Quiz 2	Before Final Exam.	✓			
		Quiz 3		✓			
Final	**30**	Final Examination	September 27-October 1, 2022	✓			

Note: 1. Assignment are quiz, homework, exercise report or project etc.

2. The details in assessment and evaluation are tentative.