The Hong Kong Polytechnic University

Subject Description Form

Subject Code	ABCT1D19
Subject Title	Fun Facts of Scientific Discoveries
Credit Value	3.0
Level	1
Pre-requisite/ Co-requisite/ Exclusion	NIL
Objectives	This subject aims to captivate students' curiosity and engagement in learning science using examples of impactful stories and interesting experiments. By exploring impactful science stories and engaging in exciting experiments, students will learn the fundamental principles and experimental observations, as well as developing their critical thinking for life-long learning during the learning process.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: a. understand the fundamentals and importance of selected chemical experiments; b. investigate the principle of chemical reactions and the possible observation; c. demonstrate analytical and critical thinking for the potential impact of science on human and environment; d. appreciate the science and technology via interesting experiments; e. appreciate the importance of lifelong learning, teamwork, and communication skills.
Subject Synopsis/ Indicative Syllabus	Basic principles and fundamentals of interesting and important chemistry and biology experiments will be introduced. The mechanism and possible application of science and technology will be discussed in this course. Details of Indicative Syllabus: **(a) Impactful stories in science** Examples: - cause of global warming and the importance of carbon neutrality - discovery of porous materials including (activated carbon, zeolite, and metal-organic frameworks) and their properties - discovery of a new MOF (from lab to pilot plant scale)

	- development on organic thermoelectric materials: from design to synthesis - making sense of organometallic complexes, as well as semiconducting materials - discovery of organic light-emitting diodes (OLEDs) - story of aggregation-caused quenching (ACQ) and aggregation-induced emission (AIE) phenomena **(b) Science of interesting and eye-catching experiments** (I) Fundamental principles of selected experiments will be discussed and demonstrated. Factors that affect the experiments will be discussed. (II) Laboratory learning for interesting experiments - The emission behaviours of various aggregations containing perylene and 1,1,2,3,4,5-hexaphenylsilole (HPS) as representative luminophores will be investigated to discern the distinct phenomena of aggregation-caused quenching (ACQ) and aggregation-induced emission (AIE) - The experimental design involved preparing a series of solutions containing different aggregation states of perylene and 1,1,2,3,4,5-hexaphenylsilole (HPS), measuring the luminescent properties of the solutions, observing ACQ and AIE phenomena, and exploring their luminescence mechanisms from the perspective of molecular crystal structure
Teaching/Learning Methodology	**Lectures:** Impactful science stories will be discussed. Scientific principles and fundamentals of selected interesting and eye-catching experiments will be introduced and discussed. The chemical and biological principles of the selected experiments will be further investigated and discussed. History and technological advancement in science will be introduced. Examples will be used to demonstrate the scientific principles. **Tutorials:** Students are required to search for information and discussion is encouraged for selected topics and their project work. In-class tutorial questions will be used to draw students' interest, understanding and discussion. Group poster/oral presentation or project preparation may be arranged. Finally, logical thinking will be developed using the tutorial questions. **Laboratories:** Simple interesting experiments will be conducted. Students can acquire basic scientific and technological skills for the development of analytical thinking as well as critical and creative ideas to carry out experiments and scientific report writing. Students will also develop their team cooperation through group practical classes. **Group activities**: (1) students are required to work in groups for learning activities in-class or out-of-class; (2) students will be required to prepare a mini project and deliver a oral/poster presentation on selected topics.

	Through presentation, their higher order thinking, such as problem analysis and solving skills, critical and creative thinking, can be evaluated. Their group effort such as preparation of group presentation and discussion, their critical and creative thinking mind can be solicited and consolidated. During the project preparation, students will have opportunity to apply their lifelong learning skills, analytical skills as well as critical thinking for problem identification, data collection, analysis and interpretation as well as drawing conclusion and recommendation for further action. In this subject, students are required to do extensive reading (on literatures, reference books and government reports/websites and internet) and analyze information for possible action formulation via self-study and group discussion. Students will also be required to write an individual report on their findings for learning consolidation, idea elaboration as well as developing scientific thinking for their future study.
Assessment Methods in Alignment with Intended Learning Outcomes	

Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)				
		a	b	c	d	e
1.Test and Assignment	30%	✓	✓	✓		✓
2. Laboratory work	15%		✓	✓	✓	✓
3.Group Project	35%	✓	✓	✓		✓
4.In-class tutorials	20%	✓	✓	✓		✓
Total	100 %					

Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:

Test and Assignment:
Assess the students' understanding of the basic scientific aspects related to the interesting experiments. The students' higher order thinking, such as analytical and problem-solving skills, critical thinking and creative thinking, will be evaluated. [Outcomes 1, 2, 3 and 5]

Laboratory work:
Student performance during the laboratory classes will be assessed, and their report will be graded. The students' higher order thinking, such as the analytical mind, data collection as well as report writing skill will be assessed and evaluated. Students will develop their teamwork skill during practical classes. [Outcomes 2, 3, 4 and 5]

In-class tutorials, group learning activities, project work and presentation:

	Students will be assessed based on their individual performance in group learning activities, presentation skills and prepared content, as well as response to questions raised by subject lecturer(s), peers. The team spirit and individual contribution to the presentation will also be evaluated. [Outcomes 1,2,3 and 5]	
Student Study Effort Expected	Class contact:	
	▪ Lecture	29 Hrs.
	▪ Tutorial	4 Hrs.
	▪ Laboratory	6 Hrs.
	Other student study effort:	
	▪ Preparation of presentation; laboratory; preparation of reports	50 Hrs.
	▪ Self study (reading on literatures, reference books, textbooks and reports)	39 Hrs.
	Total student study effort	128 Hrs.
Reading List and References	1. Lecture notes and supplementary materials (for some special topics) will be given. 2. Nobel prize website: https://www.nobelprize.org/ 3. Energy & Environment Series: Carbon Capture and Storage, by Mai Bui and Neil Mac Dowell 4. Adsorption by powders and porous solid: Principles, methodology and applications, 2nd edition, by F. Rouquerol, etc. 5. The organometallic chemistry of the transition metals, sixth edition, by Robert H. Crabtree 6. OLED displays fundamentals and applications 7. Handbook of aggregation-induced emission, Vol 3, by Youhong Tang, Ben Zhong Tang	