General Chemistry

Lecture Worksheet 1 – The Essence of Chemistry

Written by YF2W on November 13, 2024

Course	Unit 1	Chapter 1
General Chemistry	Molecular Structure and Properties	Introduction

This worksheet is part of the MEEP curriculum on General Chemistry. The corresponding lecture and other general chemistry lectures are available below.

- Corresponding Lecture: https://yfmeep.com/lecture-1-the-essence-of-chemistry/
- General Chemistry: https://yfmeep.com/learn/chem/genchem/

Information regarding Project MEEP can be accessed here: https://yfmeep.com/home/

Lecture Preview Questions

Answer the following questions using a few sentences.

1. How did chemistry as an academic discipline come to be?

2. Why are billions of dollars spent on chemical research per year?

3. What is the scientific method and why do chemists use it?

4. What are the principles of green chemistry and why should we care?

Review

All multiple-choice questions have only 1 best answer. All free-response questions only require less than 30 words.

What are examples of ancient civilization technologies that eventually formed the basis of various branches of chemistry?

A. The discovery of fire
B. Fermenting beer and wine
C. Extracting chemicals from plants for medicine and perfume
D. Making alloys through bronze
E. All of the above

_____ wrote *The Sceptical Chymist* in 1661 that advocated for a more rigorous approach to experimentation among chemists.

_____ constructed the world's first electrical battery by stacking pairs of alternating _____ and _____ separated by cloth or cardboard soaked in brine connected by a wire.

French chemists _____ and _____ invented the world's first _____ that was used to _____.

Match the chemists with their contributions in chemistry.

Dalton	Formulated the concept of thermodynamic equilibrium
Berzelius	Organized the periodic table
Gay-Lussac	Pioneered radioactive chemistry
Avogadro	Introduced the classical system of chemical symbols
Mendeleev	Concluded linear relationship between gas volume and temperature under same pressure
Gibbs	Known for Dalton's law of partial pressures
Skłodowska-Curie	Discovered half-life
Rutherford	Equal volumes of gases contain equal number of molecules under the same temperature and pressure

Use the following options to respond to the following questions. They can be used more than once or not be used at all.

A. Biochemistry
B. Inorganic chemistry
C. Nuclear chemistry
D. Physical chemistry

You are interested in studying the rates of chemical reactions and how you can control those rates.

You are interested in the interactions between light and matter – how different wavelengths of light can impact chemical reactions.

You are interested in using radiation to conjure images of malignant diseases, such as cancer and tuberculosis.

You are interested in nuclear reactions as a means to generate electricity more efficiently and safely.

You are interested in compounds like ammonia, organometallic reagents, bioinorganic compounds, and solid-state compounds.

You are interested in developing pharmaceutical drugs, disease-resistant crops, genetic engineering techniques, etc.

Arrange the following sentences in order to produce the scientific method. Depending on sources, the exact steps and phrasing of the scientific method may vary.

Research the question and form a hypothesis.

Analyze and interpret the data.

Test the hypothesis and record data.

Observe and define a question.

Publish results and the cycle repeats.

Which of the following actions are not considered academically rigorous and scientific?

A. Comprehensive recording of experimental data.
B. Coming up with a new hypothesis in light of experimental data not supporting the original hypothesis.
C. Fabricate data to justify hypothesis.
D. Ensuring that the experiments can be replicated by others.

Pair the descriptions of the principles of green chemistry with the correct principles.

	Synthetic methods should be designed to maximize incorporation of all materials used in the process into the final product.
	The use of auxiliary substances should be made unnecessary wherever possible and, innocuous when used.
	Energy requirements should be recognized for their environmental and economic impacts and should be minimized.
	Substances and the form of a substance used in a chemical process should be chosen to minimize the potential for chemical accidents, including releases, explosions, and fires.
	Analytical methodologies need to be further developed to allow for real-time, in-process monitoring and control prior to the formation of hazardous substances.
	Catalytic reagents (as selective as possible) are superior to stoichiometric reagents.
	Chemical products should be designed so that at the end of their function they break down into innocuous degradation products and do not persist in the environment.
	It is better to prevent waste than to treat or clean up waste after it has been created.
	Chemical products should be designed to preserve efficacy of function while reducing toxicity.
	A raw material or feedstock should be renewable rather than depleting whenever technically and economically practicable.
	Unnecessary derivatization should be minimized or avoided if possible.
	Wherever practicable, synthetic methods should be designed to use and generate substances that possess little or no toxicity to human health and the environment.