

Potential Research Topics for Chemistry 30

Demonstrate skill with diagrams, flowcharts, tables, graphs, scatter plots, multiple linked documents, etc.

1. Thermochemical Change

- a. Identify and explain a selection of different fuels used by communities in urban, rural and remote areas.
- b. Evaluate the impact of the combustion of various energy sources including fossil fuels and biomass on personal health, environment, and describe the technologies used by early peoples to mitigate the harmful effects of combustion.
- c. Multiple linked document about the use of alternative fuels
- d. Compare energy changes associated with a variety of chemical reactions through analysis of data and energy diagrams.
- e. Evaluate the economic and environmental impacts of different fuels by relating carbon dioxide emissions and heat content of the fuel. (relate to Alberta power plants)
- f. Design, evaluate, and model “a heating device”

2. Electrochemical Change

- Describe the process(es) used by early peoples to extract metals from ores
- Analyze redox reactions used in industry and commerce (pulp and paper, textiles, water treatment, food processing)
- Analyze applications for voltaic or electrolytic cells (batteries, electroplating, refining metals from ore, electrowinning, sanitizing swimming pools, etc)
- Evaluate the economic importance to modern society of electrochemical cells (fuel cells & their importance to transportation, recycling metals, reduction of emissions from smokestacks)
- Design, build and test a battery. Get feedback and look for modifications to improve the battery

3. Chemical changes of Organic Compounds

- Describe processes where organic compounds are commonly used (hydrogenation to produce margarine, esterification for flavouring, hydration for alcohols, etc)
- Describe historical organic processes for waterproofing, tanning, dyeing, medicines, salves and insect repellents
- Describe chemical technology as it relates to synthetic compounds (plastics, medicines, hydrocarbon fuels, pesticides, etc)
- Analyze the contributions and limitations on societal decision making for the use of petrochemicals, pharmaceuticals, pesticides
- Explore aspects of present day reliance on extracted or synthesized nutrients (vitamin supplements, meal replacements, nutraceuticals vs REAL food)
- Petrochemical industry in Alberta (hydrocracking, catalytic reforming, bitumen upgrading, production of methanol, ethylene glycol, polyethylene, polyvinyl chloride, urea formaldehyde, nano-science and nano-technology, etc)

- Use of organic compounds and the quality of life (greenhouse gas production, climate change, dioxins, recycle of plastics, CFCs and HCFC's, trans-fats in the diet)
- Describe a process to build a polymer (demonstrate for class) Safety, WHMIS, process variables, disposal will need to be addressed.

4. **Chemical equilibrium focusing on acid base systems**

- Apply equilibrium theories to analyze everyday events (carbon dioxide escaping from open bottles, role of oceans in carbon cycle, solubility of gases in lake water, acid deposition, blood gases for deep sea diving, buffers in living systems)
- Describe equilibrium principles in an industrial process (Haber Bosch for making ammonia, Down cell for making sodium and chlorine, Solvay process for producing sodium carbonate, production of methanol, etc)
- Design and prepare a buffering system to have water resist a pH change when small amounts of strong acid or base is added.
- Design, illustrate and explain a reversible reaction. If equipment necessary is available, demonstrate to the class.