



GACE® Chemistry Assessment Test II (029) Curriculum Crosswalk

Required Coursework Numbers

Subarea I. Periodicity and Chemical Reactions (52%)																			
<i>Objective 1: Understands how to use the periodic table and the periodic trends in the properties of the elements</i>																			
A. Understands the basis of the periodic table and general layout																			
• Arranged in groups and periods																			
• Atomic number and mass																			
• Symbols of the elements																			
• Metals, nonmetals, metalloids																			
• Transition elements																			
B. Understands the periodic trends in physical and chemical properties of the elements																			
• Atomic/ionic radius																			
• Ionization energy																			
• Electron affinity																			
• Electronegativity																			
• Physical properties, such as boiling/melting points and conductivity																			
• Chemical reactivity																			

Required Coursework Numbers

<i>Objective 2: Understands how equations represent chemical reactions and are used to do stoichiometric calculations</i>																		
A. Understands how to identify, write, and predict products of simple reaction types																		
• Combustion																		
• Neutralization																		
• Decomposition																		
• Synthesis																		
• Dehydration																		
• Single and double replacement																		
• Oxidation-reduction																		
B. Understands how to balance chemical equations																		
• Simple chemical equations																		
• Chemical equations involving oxidation-reduction																		
C. Understands how to perform stoichiometric calculations																		
• Simple calculations based on balanced chemical equations involving moles, mass, and volume																		
• Limiting reagent calculations and percent yield																		
D. Understands important biochemical compounds																		
• Carbohydrates, including simple sugars																		
• Lipids																		

Required Coursework Numbers

• Proteins and amino acids																		
• DNA and RNA																		
• Products of photosynthesis and respiration																		
E. Understands common organic compounds; i.e., is able to identify functional groups																		
• Alcohols																		
• Ketones and aldehydes																		
• Alkanes, alkenes, and alkynes																		
• Ethers																		
• Carboxylic acids																		
• Amines																		
• Benzene																		
<i>Objective 3: Understands chemical equilibrium, reaction kinetics, and oxidation-reduction chemistry</i>																		
A. Understands chemical reaction equilibrium																		
• Equilibrium constants and equilibrium expressions for simple reactions																		
• Le Chatelier's principle																		
B. Understands basic chemical kinetics																		
• Simple rate laws, rate constants, and reaction order																		
• Activation energy and reaction mechanisms, including catalysts																		
• Factors affecting reaction rate, such as concentration, surface area, and temperature																		

Required Coursework Numbers

C. Understands oxidation-reduction reactions and how to determine oxidation states																			
• Oxidation states																			
• Identify oxidation-reduction reactions and half-reactions																			
• Standard reduction potentials																			
• Electrochemical reactivity series																			
• Electrochemical cells																			
Subarea II. Solutions and Solubility; and Acid-Base Chemistry (48%)																			
<i>Objective 1: Understands properties of solutions, including concentration, solubility, dissolution, and equilibrium</i>																			
A. Understands solution terminology and calculations																			
• Dilute, concentrated, saturated, unsaturated, supersaturated																			
• Solvent, solute																			
• Concentration units																			
• Preparation of solutions of varying concentrations																			
B. Understands factors affecting solubility and dissolution rate																			
• Effect of temperature, pressure, surface area, and agitation on rate of dissolving																			
• Effect of temperature and pressure on solubility																			
• Solubility curves																			

Required Coursework Numbers

C. Understands solution phenomena based on colligative properties																	
• Freezing point depression																	
• Boiling point elevation																	
• Vapor pressure effects																	
• Osmotic pressure																	
D. Understands common applications of equilibrium in ionic solutions																	
• Solubility of ionic compounds, including solubility rules and slightly soluble compounds																	
• K_{sp} calculations, including percent dissociation and precipitation																	
• Common ion effect																	
• Electrolytes, nonelectrolytes, and electrical conductivity																	
<i>Objective 2: Understands acid-base chemistry, including pH calculations, titrations, and equilibrium</i>																	
A. Understands how to define and identify acids and bases																	
• Arrhenius acids and bases																	
• Brønsted-Lowry acids and bases																	
• Neutralization and equivalence point																	
B. Understands the pH scale and can perform calculations involving pH and pOH																	
• pH scale																	

Required Coursework Numbers

• Calculation of pH and pOH															
• Calculation of $[H^+]$ and $[OH^-]$															
C. Understands concepts and calculations involving acid-base titrations															
• Use and selection of indicators (e.g., phenolphthalein, litmus paper)															
• Endpoint determination															
• Calculations based on titrations															
D. Understands the equilibrium relationships in acid-base chemistry															
• Strong/weak acids and bases, including common examples															
• Monoprotic and polyprotic acids															
• K_a , K_b , K_w , and percent dissociation															
• Buffer solutions															