COURSE OUTCOMES*

These course outcomes should be consistent with the ones posted on the Curriculum Advisory Committee Website: http://bellevuecollege.edu/CPS/Proposals/lo.aspx. If they are not, they can be updated by faculty without approval (approval is required for new courses and major curriculum changes to existing courses).

CHEM 100 Chemical Exploration (5 credits) & CHEM 105 Chemical Concepts (6 credits)

- Chemical Terms
  - Define chemistry and identify its major sub fields
  - Distinguish between matter and energy
  - List and describe the key elements of the scientific method
  - State the differences between laws and theories
- Measurements
  - Recognize and use prefixes in metric measurements
  - Apply density as a way to relate the volume to the mass of a substance
- Chemical Elements and the Periodic Table
  - Describe the general structure of the atom
  - Identify the subatomic particles which make up the atom
  - Define atomic number and isotope; identify the number of electrons, protons, and neutrons in a specific atom.
  - Distinguish mass number from atomic weight
  - Extract information about an element from the periodic table: for example; the symbol, atomic number, atomic weight, and the number of protons and electrons
  - Explain the differences between elements, compound, and heterogeneous and homogeneous mixtures.
  - Describe the differences between chemical and physical properties
- The Chemical Equation
  - Explain the concept of the mole
  - Compute molar masses of elements and compounds
  - Distinguish between empirical and molecular formulas
  - Balance simple chemical equations
  - Interpret the information conveyed by a balanced chemical equation
  - Show knowledge of the role of chemical reactions in their lives using such examples as acid rain, photosynthesis, industrial synthesis, pharmaceuticals, etc.
- Atomic Structure and the Periodic Table
  - Explain the historical development of atomic theory
  - Identify some of the scientists who contributed to our model of the atom
  - Describe the role of spectroscopy in the development of our model of the atom

* As published on the Curriculum Advisory Committee website (http://intranet.bcc.ctc.edu/curriculum/) which can be accessed from MyBCC.

    - Compare and contrast the Bohr model with the modern atomic model
    - State the relationship between the atomic structure of an element and its position in the periodic table
    - Describe the historical development of the periodic table
    - Identify the location of groups and periods, metals and nonmetals
- Chemical Bonds
    - Explain that every substance, living or inanimate, is chemical
    - Conclude that a given substance has the same structure whether it occurs naturally or is made synthetically
    - Describe briefly the differences between molecular, ionic, and metallic substances, including acids, bases and organic molecules.
- State of Matter
    - Describe the characteristics of a solid, liquid, and gas in terms of visible properties and the kinetic-molecular theory of matter.
    - Apply knowledge of states of matter to current issues such as water and air pollution.
- Application to Current Issues
    - Synthesize course information and apply it to practical, everyday issues such as acid rain, air and water pollution, limited resources on Planet Earth.
    - Develop informed opinions on chemical matters affecting society by applying critical thinking skills to evaluate public issues and current events involving chemistry.
    - Identify and use key reference material in libraries and on the Internet to research a topic related to chemistry
    - Analyze data by distinguishing between opinions, interpretations, and solid evidence.

CHEM 121 Introduction to General Chemistry (6 credits)

Some of these topics are optional, at the instructor's discretion. They are noted below by an asterisk (*).

1. Chemical Terms and Measurements

- Define chemistry and identify its major subfields.
- Distinguish between matter and energy.
- List and describe the key elements of the scientific method.
- Recognize and use prefixes in metric measurements.
- Apply density as a way to relate the volume to the mass of a substance.
- Solve unit conversion and density problems using dimensional analysis and/or ratios and proportions.
- Identify the proper number of significant digits in a laboratory setting.
- Write numbers in scientific notation.

2. Chemical Elements and the Periodic Table

- Describe the general structure of the atom.
- Identify the subatomic particles which make up the atom.
- Define atomic number and isotope; identify the number of electrons, protons, and neutrons in a specific atom.
- Distinguish mass number from atomic weight.
- Extract information about an element from the periodic table: for example; the symbol, atomic number, atomic weight, and the number of protons and electrons.
- Explain the differences between elements, compounds, and homogeneous and heterogeneous mixtures.
- Describe the difference between chemical and physical properties/changes.

3. Introduction to Chemical Calculations and the Chemical Equation

- Explain the concept of the mole.
- Compute molar masses of elements and compounds; use those molar masses in calculations involving masses and moles of chemical substances.
- Distinguish between empirical and molecular formulas.
- Balance simple chemical equations.
- Interpret the information conveyed by a balanced chemical equation.

4. Atomic Structure and the Periodic Table

- Explain the historical development of the atomic theory.
- Identify some of the scientists who contributed to our model of the atom.
- Describe the role of spectroscopy in the development of atomic theory.
- Describe the Bohr model of the atom.
- Explain the weakness of Bohr’s Theory and the need for a quantum mechanical model of the atom.
- Describe the relationship between energy levels, sublevels and orbitals.
- Identify the relationship between the electronic structure of an element and its position in the periodic table.
- Describe the historical development of the periodic table.
- Identify the location of groups and periods; metals and nonmetals.

- Predict trends in the radii of atoms and ionization energies using the Periodic Table.

5. Chemical Bonds and Nomenclature

- Identify the number and location of valence electrons for main group elements.
- Explain why the elements in a periodic group exhibit similar chemical properties.
- Describe briefly the differences between molecular, ionic, and metallic substances.
- Predict the charge of common cations and anions using the octet rule.
- Write Lewis structures for atoms, ions, and molecules.
- Predict the geometry of molecules using VSEPR Theory.
- Define electronegativity and use it to predict the polarity of bonds and molecules.
- Write the formulas and names for simple compounds using the Periodic Table.

6. Gases, Liquids and Solids

- Describe the characteristics of a solid, a liquid, and a gas in terms of visible properties and the kinetic-molecular theory of matter.
- Explain the properties of gases and the relations expressed by the gas laws. (*)
- Describe the energy changes that accompany the heating, cooling, or changing of state of a substance.
- Explain the role that bonding and intermolecular forces play in determining the melting and boiling points of pure substances.

7. Chemical Stiochiometry and Reaction Rates

- State the Law of Conservation of Mass and relate it to the balanced equation.
- Solve stoichiometric problems given a chemical equation.
- Explain the concept of a limiting reactant.
- Describe the collision theory of reactions. (*)
- Sketch the Maxwell-Boltzmann distribution curve and state how the shape of the curve varies with temperature. (*)
- Describe the ways to alter the rate of a reaction; temperature, state of subdivision, concentration, and catalyst. (*)
- Draw potential energy diagrams for exothermic and endothermic reactions showing products, reactants, and the transition state. (*)
- Calculate the Heat of a Reaction. (*)

8. Water and Solutions

- Describe how hydrogen bonding affects the properties of water.
- Describe the dissolving process for ionic and polar substance in water.
- Describe a saturated solution in terms of chemical equilibrium.
- Prepare solutions using concentration units of percent and molarity.
- Solve simple titration problems.
- Describe the differences between strong electrolytes and non-electrolytes.
- Describe weak electrolytes in terms of reversible chemical reactions and equilibrium.
- Identify common acids and bases, both strong and weak.
- Calculate the pH of a solution given the hydronium ion concentration.
- Explain that a buffer solution resists changes in pH.

CHEM 131 Introduction to Organic and Biological Chemistry (6 credits)

- Define Organic chemistry in terms of the role of carbon in organic and biochemistry.
- Identify and classify the major functional groups. These include alkanes, alkenes, aromatics, alkynes, aldehydes, ketones, carboxylic acids, esters, amides, amines, alcohols, and alkyl halides.
- List the typical properties of the individual functional groups.
- Predict reactivity of compounds based on their size and functional group.
- Name and draw the structure for molecules of the main functional groups, including cis-trans and R-S notation.
- Define and recognize the different types of isomerism, including geometric, stereo, and constitutional.
- Explain the importance of molecular shape in terms of function and properties.
- Explain and describe the meaning of primary, secondary, and tertiary substituents.
- Predict general products for basic simple organic reactions.
- Give the mechanism of one common organic reaction.
- Explain how recrystallization and extraction are used for purification.
- Classify basic lipids into their appropriate sub-categories.
- Describe DNA replication and how this is related to aging.
- Describe transcription and how this is related to mutation.
- Explain the importance of protein shape and what intermolecular forces are involved.
- Perform one organic synthesis in lab.
- Define monosaccharides, disaccharides, and polysaccharides.
- Write the structure of glucose, including stereochemistry.
- Explain the difference between alpha and beta bridges and their consequences in terms of human digestion.
- Determine the structure of simple sugars using optical data and the Fischer Proof.

CHEM 161 General Chem I (6 credits)

- Chemistry and Measurement
  - Identify the principle operations and limitations of the scientific method.
  - Describe and distinguish between matter and energy.
  - Recognize and use prefixes in metric measurements.
  - Distinguish between heat and temperature.
  - Apply density as a way to relate the volume to the mass of a substance.
  - Distinguish between accuracy and precision.
  - Express lab results with the proper number of significant digits.
  - Show knowledge of alternate methods for problem solving; such as dimensional analysis, ratios and proportions, and algebraic equations.

- Atoms, Molecules and Ions
  - Explain the historical development of the atomic theory.
  - Identify some of the scientists who contributed to our model of the atom.
  - Describe the general structure of the atom.
  - Define atomic number and isotope; identify the number of electrons, protons, and neutrons in a specific atom
  - Distinguish mass number from atomic weight; calculate the atomic weight of an element from isotopic abundance's.
  - Describe and compare alpha, beta, and gamma radiation in terms of energy and penetrating power.
  - Describe how changes in mass number and atomic number occur in nuclear reactions.
  - Apply the Einstein equation to calculate energy changes in nuclear reactions, binding energies in atoms, and energy release in fission and fusion.
  - Describe briefly the differences between molecular and ionic substances.
  - Explain the differences between elements, compounds, and homogeneous and heterogeneous mixtures.
  - Use the periodic chart to write the formulas and names for simple compounds.
  - Distinguish between physical and chemical properties of a substance.

- Quantum Theory of the Atom
  - Describe electromagnetic radiation in terms of frequency, wavelength, and speed.
  - Explain the concept of quantized energy.
  - Compare the wave and particulate properties of light.
  - Explain how the line spectrum of hydrogen demonstrates the quantized nature of the energy of its electron.
  - Describe the limitations of the Bohr model of the atom.
  - Calculate the energy, frequency and wavelength of a photon emitted or absorbed during an electron transition in the hydrogen atom.
  - Identify the electron transitions that give rise to the Balmer series of spectral lines.
  - State the uncertainty principle and explain its relevance to modern atomic theory.

- Explain the use of the quantum mechanical model of the atom to represent the energy and probable location of electrons.
- Define and explain the relationships between energy levels, sublevels and orbitals.

- Electron Configurations and Periodicity
  - Apply Pauli's exclusion principle.
  - Use the periodic table to write the electron configurations of atoms and ions.
  - Identify the number and location of valence electrons for main group elements.
  - Describe the historical development of the periodic table.
  - Identify the location of groups and periods; metals and nonmetals.
  - Distinguish between metals and nonmetals on the basis of their physical and chemical properties.
  - Use the periodic chart to predict trends in the radii of atoms and ions, ionization energies, electron affinities, and both physical and chemical properties.
  - Explain the relationship between a group on the periodic table and its chemical properties.

- Ionic and Covalent Bonding
  - Describe the differences between covalent, ionic, and metallic bonds.
  - Apply the octet rule to predict the charge of common cations and anions; explain why there are exceptions to the octet rule.
  - Explain variations in electron configurations and ion formation for the transition metals.
  - Write Lewis structures for atoms, ions and molecules.
  - Predict bond lengths from periodic trends in radii.
  - Use bond energies to estimate enthalpies of reactions.
  - Explain how lattice energy varies with ionic charge and ionic radii, calculate the lattice energy.
  - Use resonance structures to model multiple bonding in molecules and poly-atomic ions and then select the most likely resonance structure by calculating formal charges.
  - Predict whether a bond will be ionic, polar covalent, or non-polar by using electronegativites.

- Molecular Geometry and Chemical Bonding Theory
  - Predict shapes of molecules and poly-atomic ions using VSEPR theory.
  - Explain deviations from ideal geometry in terms of loan-pair repulsions.
  - Predict the polarities of molecules.
  - Define isomers and illustrate with examples.
  - Describe the importance of spectroscopic methods in probing the structure of the molecule.
  - Describe the formation of a covalent bond in terms of valence bond theory and hybridization.
  - Demonstrate the formation of molecular orbitals; determine bond order for simple diatomic molecules.

- Chemical Calculations
  - Explain the concept of the mole.
  - Compute molar masses of elements and compounds; use those molar masses in calculations involving masses and moles of chemical substances.
  - Calculate empirical and molecular formulas from percent composition.
  - Use chemical equations to calculate stoichiometric relationships.
  - Use the concept of a limiting reactant in stoichiometric relationships.
  - Prepare solutions using concentration units of percent and molarity.
  - Solve solution stoichiometry problems.

- Chemical Reactions
  - Distinguish between physical and chemical changes.
  - Balance, explain and classify simple chemical equations.
  - Describe the differences between strong electrolytes, weak electrolytes and nonelectrolytes.
  - Identify common acids and bases, both strong and weak.
  - Write chemical equations, including net-ionic equations, for reactions in aqueous solution.

CHEM 162–General Chem II (6 credits)

- Thermochemistry
  - Describe the various forms of energy and the nature of heat and heat transfer.
  - Use specific heat and the sign conventions for heat transfer.
  - Show knowledge of the language of thermodynamics: the system and its surroundings; state functions; exothermic and endothermic reactions; and the first law of thermodynamics.
  - Define the standard enthalpy of formation of a chemical substance; calculate reaction enthalpies from enthalpies of formation.
  - Explain the relationhip between enthalpy change and the quantity of matter present.
  - Apply Hess's law.

- The Gaseous State
  - Explain the properties of gases and the variables expressed by the gas laws.
  - Solve mathematical problems using the appropriate gas laws.
  - Apply the ideal gas law to find gas densities and partial pressures of gases.
  - State the fundamental concepts of the kinetic-molecular theory;
  - Sketch the Maxwell-Boltzmann distribution curve and state how the shape of the curve varies with temperature
  - Explain gas behavior, including diffusion and effusion, using the kinetic-molecular theory.
  - Describe the differences between real and ideal gases.
    Perform stoichiometric calculations involving gas volumes.

- States of matter; Liquids and Solids
  - Compare the properties of the three states of matter and relate those properties to the distance between the particles, molecular motion, structure, and attractive forces.
  - Define dispersion forces, dipole-dipole attractions and hydrogen bonding and recognize when they occur.
  - Explain the liquid properties of surface tension, capillary action, viscosity, vapor pressure, and boiling point; describe how these properties are influenced by intermolecular forces.
  - Sketch heating an cooling curves for a substance; calculate the amount of heat absorbed or evolved during a phase change.
  - Identify features of phase diagrams.
  - Describe the structural units, interparticle forces, general properties and give some examples of each type of solid substance: ionic, metallic, network, and molecular.
  - Define a cubic unit cell in a crystalline lattice and perform simple calculations of unit cell mass and density.

- Solutions
    - Explain the factors that influence the solubility of one substance in another.
    - To define the heat of solution and discuss its various energy components.
    - Predict the influence of pressure and temperature on gas solubility.
    - Define and convert amount molarity, molality, mole fraction and mass fraction (percent, parts per million).
    - Describe and calculate the vapor pressure of a solution
    - Identify the colligative properties, explain the cause of each, and calculate the boinling point and freezing point of a solution of a nonvolatile solute.
    - Discuss the colligative properties of solutions and electrolytes.
    - Explain osmosis and describe its applications.

- Rates of Reaction: Kinetics
    - List and discuss the factors which influence reaction rate.
    - Define reaction rate; obtain average reaction rates and instantaneous reaction rates from concentration versus time data.
    - Explain the terms in a rate equation or a rate law.
    - Use rate data to determine reaction order, write a rate equation, and use a rate equation to predict how a reaction rate varies with changing concentrations.
    - Describe the effect on reaction rate of changes in temperature.
    - Calculate the half-life of a first-order reaction.
    - Use first order kinetics to solve radioactive decay problems.
    - Show by using an energy plot what happens as two reactant molecules interact to form product molecules and how a catalyst affects a reaction rate.
    - Define reaction mechanism and identify rate-determining steps, catalysts, and intermediates.

- Organic Chemistry (optional)
    - Write names and formulas for straight chain alkenes.
    - Draw molecular diagrams for the chair and boat structures of cyclohexane; compare the energies of the two structures.
    - Write names and draw structures for the following functional groups; alkenes, alkynes, alkyl halides, alcohols, ketones, ethers, phenols, carboxylic acids, esters, amides, amines, mono saccharides.
    - Describe physical and chemical behavior of the above types of compounds.

CHEM 163–General Chem III (6 credits)

- Chemical Equilibrium; Gaseous Reactions
    - Discuss how equilibrium is established.
    - Use Q and K to predict whether a reaction is moving in the forward or the reverse direction.
    - Write equilibrium constant expressions, given balanced chemical equations (both homogeneous and heterogeneous).
    - Calculate the new equilibrium constant from the original constant when the equation is reversed or multiplied by some factor.
    - Make qualitative predictions about he extent of reaction based upon equilibrium constant values; that is, be able to predict whether a reaction is product- or reactant-favored.
    - Show how K and Kp are related.
    - Calculate a value of K using equilibrium concentrations or calculate an equilibrium concentration if K is known.
    - Show by using Le Chaterlier's principle how changes in concentrations and temperature affect chemical equilibria.

- Acids and Bases
    - State theories of acids and bases and give examples of acids and bases in each theory.
    - Identify acids, bases, and conjugate acid-base pairs in a proton transfer reaction.
    - Calculate hydronium ion, hydroxide ion, pH, and pOH in aqueous solutions.
    - Describe how effective charge effects acid strength.
    - Write mass action expressions for weak acid or weak base equilibria.
    - Solve word problems involving equilibriums constants.
    - Describe buffer action and how it regulates pH.
    - Solve problems for pH/pOH of salt solutions.
    - Solve titration problems.

- Solubility and Complex Ion Equilibria
    - Write solubility product expressions.
    - Calculate Ksp from solubility data.
    - Calculate ion concentration for sparingly soluble salts; calculate molar solubility of a salt.
    - Describe the common ion effect.
    - Calculate required concentrations for formation of a precipitate.
    - Give examples of complex ions and state their uses. Predict stability of ions using formation or dissociation constants.

- Thermodynamics and Equilibrium
    - Describe heat and work and the nature of energy transfer.
    - Distinguish between a state function and a path dependent property.

- State the first, second and third laws of thermodynamics.
- Explain the concept of entropy; give examples showing how spontaneous processes are accompanied by an increase in the disorder of the system and/or the surroundings.
- Use entropy and enthalpy changes and Gibbs free energy to predict whether a reaction is product favored; describe the affect of temperature changes on spontaneity.
- Define equilibrium in terms of minimum free energy; calculate standard free-energy changes form K and vice versa.
- Relate work to the change in free energy.

- Electrochemistry

  - Define standard terms and processes in redox reactions
  - Write equations for half-reactions involving redox reactions of ions.
  - Balance redox reactions.
  - Perform stoichiometric calculations for redox reactions.
  - Identify parts of a galvanic cell or electrolysis cell.
  - Calculate standard cell voltages and non-standard cell voltages.
  - Calculate the free energy available from a galvanic cell.
  - Calculate equilibrium constants from cell potentials.
  - Diagram both the standard hydrogen electrode as well representative electrolysis/galvanic cells.
  - Solve problems involving current, time, and mass of reagent.

- Metals and Coordination Chemistry

  - List physical properties of most metals.
  - Describe how valence and conduction bands arise in an atomic solid.
  - Explain how conductors, insulators, and semiconductors differ in bad theory terms.
  - Explain how structural isomers arise in complex ions.
  - Describe the origin and behavior of optical isomers.
  - Use metal-ligand bonding theory to predict ion configuration, d-orbital splitting, and color.

CHEM 261 Organic Chemistry I (6 credits)

1. Introduction to carbon compounds and review of bonding theories
- Construct Lewis structures for organic molecules and ions, including applicable resonance structure and formal charge.
- Describe atomic molecular, and hybrid orbitals and how these relate to molecular shape.
- Use VESPR theory to predict bond angles, bond lengths, and polarity.

2. Representative Organic Compounds and Functional Groups
- Describe the properties of carbon-carbon single, double, and triple bonds, including aromatic systems.
- Identify functional groups.

3. Acid base theory
- Relate structure and acid base strength.
- Predict acid base behavior based on pKa, protoc/aprotic solvents, etc.

4. Chemistry and properties of alkanes
- Apply the IUPAC rules for naming alanes, alkyl halides, and alcohols.
- Generate isomers and recognize different types of isomerism.
- Explain properties of cyclic alkanes and use cyclic terminology.

5. Introduction to IR spectroscopy
- Use and describe the EM spectrum and how it relates to energy.
- Describe the basic concepts associated with IR spectroscopy.
- Identify major functional groups on the basis of IR spectra.
- Explain the proper sample prep needed for IR analysis.

6. Stereochemistry
- Identify, name, separate, and determine total number of isomers for chiral compounds (including meso).

7. Nucleophilic Substitution and Elimination
- Describe the chemical and physical properties of alkyl halides
- Classify and rate reactions as Sn1, Sn2, E1, and E2 on the basis of substrate, solvent, nucleophile, and leaving group
- Give detailed mechanisms for Sn1, Sn2, E1, and E2 mechanism and understand their applications in terms of chirality and yield.

8. Alkenes
- Name (including E/Z) and list typical properties of ordinary alkenes
- Devise synthetic pathway to produce Hoffman and Zaitsev alkenes
- Predict basic reactions of alkenes, esp. in regard to Markovinkov's rule
- Write the mechanism for ordinary alkene reactions
- Calculate the index of hydrogen deficiency in alkenes (and alkynes)

CHEM 262 Organic Chemistry II (6 credits)

1. Alkynes

- Name and list typical properties of ordinary alkynes
- Devise synthetic pathways to produce most alkynes
- Predict basic reactions of alkynes
- Write mechanisms for ordinary alkyne reactions.

2. Radical Reactions

- Write general radical mechanisms.
- Describe differences between the halogens for radical reactions.
- Describe differences between the halogens for radical reactions.
- Use radical terminology and explain thermodynamics of radicals.

3. NMR Spectroscopy

- Explain chemical shift, intergration, and splitting patterns
- Deduce structures or predict NMR spectra of typical organic molecules.
- Identify irregular splitting patterns with alkenes, aromatics, an diastereotopic hydrogens
- Determine which atomic nuclei can be visible to NMR
- Explain (on an elementary level) how NMR spectra are obtained
- Explain how NMR samples must be prepared

4. Alcohols and Ethers

- Name and list typical properties of ordinary alcohols and ethers
- Devise synthetic pathways to produce most alcohols and ethers
- Predict basic reactions of alcohols and ethers
- Write mechanisms for ordinary alcohol and ether reactions

5. Conjugated Unsaturated Systems

- Identify, explain, and predict stability of conjugated systems
- Summarize and explain the rules of resonance structures
- Apply resonance theory to explain thermodynamic and kinetic outcomes of appropriate reactions.

6. Aromatics

- Identify aromatic, anti-aromatic, pseudo-aromatic, and non-aromatic compounds, including hetero-cycles
- Name aromatic compounds
- Devise synthetic pathways for aromatic compounds
- Predict basic reactions of aromatics
- Write mechanisms for ordinary aromatic reactions
- Apply aliphatic reaction principles to aromatic side chain reactions
- Explain the unusual stability of benzene and list the reactions that result in its ultimate reduction

CHEM 263 Organic Chemistry III (6 credits)

1. Aldehydes and Ketones

- Name and list typical properties of ordinary aldehydes and detones
- Devise synthetic pathways to produce aldehydes and ketones
- Predict basic reactions of aldehydes, ketones, and alpha-carbons
- Write the mechanism for basic carbonyl reactions.

2. Carboxylic Acids and Derivatives

- Name and list minimal properties of carboxylic acids, acid chlorides, acid anhydrides, esters, amides, and nitriles; list the relative reactivity of each
- Devise synthetic pathways between derivatives and from other families.
- Predict basic reactions of derivatives.
- Write the mechanism for all derivative-to-derivative reactions

3. Dicarbonyls

- Explain the acidity of alpha carbons
- Predict the classic dicarbonyl reactions

4. Amines

- Name and list typical properties of amines, including diazonium salts
- Devise synthetic pathways to produce both aliphatic and aromatic amines
- Predict basic amine reaction
- Write the mechanisms of the Hoffman and Curtius rearrangements

5. Lipids and Amino Acids

- Identify the major lipid families, giving properties of each
- Identify isoprene units in typical terpenes and explain the mechanism of soap
- Show the differences between cationic, anionic, and zwitterionic forms of amino acids, and the implications for gel electrophoresis

6. Proteins and Nucleic Acids

- Explain transcription and replication, and how it relates to mutation.
- Draw all possible DNA and RNA base pairs, including the phosphate backbone.
- Explain the four levels of protein structure, and the intermolecular forces that determine them. Also explain denaturing, induced fit, and chaperoning.
- Show how proteins are sequenced, and our current limitations