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AP Chemistry B

1. **Kinetics (25.00%)**

Learning Targets

1.1 I can explain the relationship between the rate of a chemical reaction and experimental parameters.

Learning Target	Descriptor	Definition
4	Proficient	I can explain the relationship between the rate of a chemical reaction and experimental parameters.
3	Developing	I can determine the rates of reactions based on the stoichiometry of equation.
2	Basic	I can explain the kinetics of reactions by comparing reactants over time.
1	Minimal	I can list the factors that influence reaction rates.
0	No Evidence	No evidence shown.

1.2 I can represent experimental data with a consistent rate law expression.

Learning Target	Descriptor	Definition
4	Proficient	I can represent experimental data with a consistent rate law expression.
3	Developing	I can intrepret experimental data and determine rate of reaction.
2	Basic	I can determine overall reaction order.
1	Minimal	I can determine reactant ordres.
0	No Evidence	No evidence shown.

1.3 I can identify the rate law expression of a chemical reaction using data that show how the concentations of reaction species change over time.

Learning Target	Descriptor	Definition
4	Proficient	I can identify the rate law expression of a chemical reaction using data that show how the concentations of reaction species change over time.
3	Developing	I can calculate reaction rates with zero, first and second order equations.
2	Basic	I can determine rate constant from slope of line.
1	Minimal	I can determine reaction order from graph.
0	No Evidence	No evidence shown.

1.4 I can represent an elementary reaction as a rate law expression using stoichiometry.

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Learning Target	Descriptor	Definition
4	Proficient	I can represent an elementary reaction as a rate law expression using stoichiometry.
3	Developing	I can describe the relationship between the speed of a reaction and the collision frequency.
2	Basic	I can infer the rate law from the stoich of the molecular collisions.
1	Minimal	I can identify elementary collisions.
0	No Evidence	No evidence shown.

1.5 I can explain the relationship between the rate of an elementary reaction and the frequency, energy, and orientation of molecular collisions.

Learning Target	Descriptor	Definition
4	Proficient	I can explain the relationship between the rate of an elementary reaction and the frequency, energy, and orientation of molecular collisions.
3	Developing	I can determine the relationship between speed of reaction and the collision frrequency.
2	Basic	I can interpret Maxwell-Boltzmann chart and determine the number of molecules with enough energy to react.
1	Minimal	I can list requirements needed for bond breaking during collisions.
0	No Evidence	No evidence shown.

1.6 I can represent the activation energy and overall energy change in an elementary reaction using a reaction energy profile.

Learning Target	Descriptor	Definition
4	Proficient	I can represent the activation energy and overall energy change in an elementary reaction using a reaction energy profile.
3	Developing	I can communicate the relationship between energy profile and the transition state.
2	Basic	I can determine the energy difference between reactants and transitions state to find activation energy.
1	Minimal	I can identify activation energy from chart.
0	No Evidence	No evidence shown.

1.7 I can identify the components of a reaction mechanism.

Learning Target	Descriptor	Definition
4	Proficient	I can identify the components of a reaction mechanism.

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Learning Target	Descriptor	Definition
3	Developing	I can determine overall equation from elementary reactions.
2	Basic	I can comminicate how elementary steps are parts of the overall mechanism.
1	Minimal	I can identify intermediates in reaction mechanism.
0	No Evidence	No evidence shown.

1.8 I can identify the rate law for a reaction from a mechanism in which the first step is rate limiting.

Learning Target	Descriptor	Definition
4	Proficient	I can identify the rate law for a reaction from a mechanism in which the first step is rate limiting.
3	Developing	I can determine the rate law from the rate determing step in the mechanism.
2	Basic	I can communicate the molecularity of elementary step.
1	Minimal	I can identify rate determining step.
0	No Evidence	No evidence shown.

1.9 I can identify the rate law for a reaction from a mechanism in which the first step is not the rate limiting.

Learning Target	Descriptor	Definition
4	Proficient	I can identify the rate law for a reaction from a mechanism in which the first step is not the rate limiting.
3	Developing	I can determine rate law by using multiple steps in the mechanism.
2	Basic	I can write rate law by replacing intermediates.
1	Minimal	I can identify intermediates.
0	No Evidence	No evidence shown.

1.10 I can represent the activation energy and overall energy change in a multistep reaction with a reaction energy profile.

Learning Target	Descriptor	Definition
4	Proficient	I can represent the activation energy and overall energy change in a multistep reaction with a reaction energy profile.
3	Developing	I can construct a energy profile for a multistep reaction.
2	Basic	I can determine the rate determine step from a energy profile.

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Learning Target	Descriptor	Definition
1	Minimal	I can identify how elementary steps in energy profile.
0	No Evidence	No evidence shown.

1.11 I can explain the relationship between the effect of a catalyst on a reaction and changes in the reaction mechanism.

Learning Target	Descriptor	Definition
4	Proficient	I can explain the relationship between the effect of a catalyst on a reaction and changes in the reaction mechanism.
3	Developing	I can communicate how the speed of reaction occurs based on the influence of a catalyst.
2	Basic	I can communicate how a catalyst lowers activation energy by providing a different reaction pathway.
1	Minimal	I can list different types of catalysts.
0	No Evidence	No evidence shown.

2. Thermodynamics (25.00%)

Learning Targets

2.1 I can explain the relationship between experimental observations and energy changes associated with a chemical and physical transformation.

Learning Target	Descriptor	Definition
4	Proficient	I can explain the relationship between experimental observations and energy changes associated with a chemical and physical transformation.
3	Developing	I can communicate how the bond interactions effect the exchange of energy.
2	Basic	I can communicate energy changes in the system.
1	Minimal	I can identify if reaction is endothermic or exothermic.
0	No Evidence	No evidence shown.

2.2 I can represent a chemical or physical transformation with an energy diagram.

Learning Target	Descriptor	Definition
4	Proficient	I can represent a chemical or physical transformation with an energy diagram.
3	Developing	I can create an energy diagram for exothermic and endothermic reactions.
2	Basic	I can interpret an energy diagram to find activation energy and energy exchange.

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Learning Target	Descriptor	Definition
1	Minimal	I can indentify parts of an energy diagram.
0	No Evidence	No evidence shown.

2.3 I can explain the relationship between the transfer of thermal energy and molecular collisions.

Learning Target	Descriptor	Definition
4	Proficient	I can explain the relationship between the transfer of thermal energy and molecular collisions.
3	Developing	I can communicate the transfer of energy in a system.
2	Basic	I can describe how energy flows to thermal equilibrium.
1	Minimal	I can define average kinetic energy.
0	No Evidence	No evidence shown.

2.4 I can calculate the heat q absorbed or released by a system undergoing heating/cooling based on the amount of the substance, the heat capacity, and the change in temperature.

Learning Target	Descriptor	Definition
4	Proficient	I can calculate the heat q absorbed or released by a system undergoing heating/cooling based on the amount of the substance, the heat capacity, and the change in temperature.
3	Developing	I can calculate q in calorimetry experiments .
2	Basic	I can communicate the first law of thermodynamics.
1	Minimal	I can identify parts of calorimetry equation.
0	No Evidence	No evidence shown.

2.5 I can explain changes in the heat q absorbed or released by a system undergoing a phase transition based on the amount of the substance in moles and the molar enthalpy of the phase transition.

Learning Target	Descriptor	Definition
4	Proficient	I can explain changes in the heat q absorbed or released by a system undergoing a phase transition based on the amount of the substance in moles and the molar enthalpy of the phase transition.
3	Developing	I can calculate energy changes during phase changes.
2	Basic	I can communicate the energy changes and bond transitions during phase change.
1	Minimal	I can define molar heat of fusion and molar heat of vaporization.

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Learning Target	Descriptor	Definition
0	No Evidence	No evidence shown.

2.6 I can calculate the heat q absorbed or released by a system undergoing a chemical reaction in relationship to the amount of the reacting substance in moles and the molar enthalpy of reaction.

Learning Target	Descriptor	Definition
4	Proficient	I can calculate the heat q absorbed or released by a system undergoing a chemical reaction in relationship to the amount of the reacting substance in moles and the molar enthalpy of reaction.
3	Developing	I can determine q with various methods.
2	Basic	I can communicate the positive or negative values of enthalpy change.
1	Minimal	I can define enthalpy change of a reaction.
0	No Evidence	No evidence shown.

2.7 I can calculate the enthalpy change of a reaction based on the average bond energies of bonds broken and formed in reaction.

Learning Target	Descriptor	Definition
4	Proficient	I can calculate the enthalpy change of a reaction based on the average bond energies of bonds broken and formed in reaction.
3	Developing	I can calculate enthalpy with a sumnation of bonds broken minus bonds formed.
2	Basic	I can utilize the stoichiometry of equation to determine bond enthalpy.
1	Minimal	I can define bond energies.
0	No Evidence	No evidence shown.

2.8 I can calculate the enthalpy change for a chemical or physical process based on the standard enthalpies of formation.

Learning Target	Descriptor	Definition
4	Proficient	I can calculate the enthalpy change for a chemical or physical process based on the standard enthalpies of formation.
3	Developing	I can calculate enthalpy with a sumnation of heats of formation.
2	Basic	I can utilize stoichiometry of equation to detemine enthaphy of reaction.
1	Minimal	I can define standard enthalpies of formation.
0	No Evidence	No evidence shown.

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2.9 I can explain the relationship between the enthalpy of a chemical or physical process and the sum of the enthalpies of the individual steps.

Learning Target	Descriptor	Definition
4	Proficient	I can explain the relationship between the enthalpy of a chemical or physical process and the sum of the enthalpies of the individual steps.
3	Developing	I can calculate the overall enathlpy by the sumnation of munipulated enthalpies.
2	Basic	I can determine changes in enthalpy bases on changes in individual equations.
1	Minimal	I can sum up individual equations to overall equation.
0	No Evidence	No evidence shown.

3. Equilibrium (25.00%)

Learning Targets

3.1 I can explain the relationship between the occurrence of a reversible chemical or physical process, and the establishment of equilibrium, to experimental observations.

Learning Target	Descriptor	Definition
4	Proficient	I can explain the relationship between the occurrence of a reversible chemical or physical process, and the establishment of equilibrium, to experimental observations.
3	Developing	I can interpret concepts of equilibrium form a graph of concentrations versus time.
2	Basic	I can communicate processes that are reversible.
1	Minimal	I can define equilibrium.
0	No Evidence	No evidence shown.

3.2 I can explain the relationship between the direction in which a reversible reaction proceeds and the relative rates of the forward and reverse reactions.

Learning Target	Descriptor	Definition
4	Proficient	I can explain the relationship between the direction in which a reversible reaction proceeds and the relative rates of the forward and reverse reactions.
3	Developing	I can determine shifts in equilibrium based on forward and reverse reactions.
2	Basic	I can communicate equilibrium state is reached when the rtaes are equal.
1	Minimal	I can define reversible reactions.
0	No Evidence	No evidence shown.

3.3 I can represent the reaction quotient Qc or Qp for a reversible reaction, and the corresponding equilibrium expressions Kc=Qc or Kp=Pc.

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Learning Target	Descriptor	Definition
4	Proficient	I can represent the reaction quotient Qc or Qp for a reversible reaction, and the corresponding equilibrium expressions Kc=Qc or Kp=Pc.
3	Developing	I can write an equilibrium expression with mass action law.
2	Basic	I can build equilibrium expression with coefficients from reversible reaction.
1	Minimal	I can communicate the parts of equilibrium expression.
0	No Evidence	No evidence shown.

3.4 I can calculate Kc or Kp based on experimental observation of concentrations or pressures at equilibrium.

Learning Target	Descriptor	Definition
4	Proficient	I can calculate Kc or Kp based on experimental observation of concentrations or pressures at equilibrium.
3	Developing	I can determine experimental concentrations for equilibrium expression.
2	Basic	I can communicate relationships between concentrations and equilibrium constant K.
1	Minimal	I can define equilibrium constant K.
0	No Evidence	No evidence shown.

3.5 I can explain the relationship between very large or very small values of K and the relative concentrations of chemical species at equilibrium.

Learning Target	Descriptor	Definition
4	Proficient	I can explain the relationship between very large or very small values of K and the relative concentrations of chemical species at equilibrium.
3	Developing	I can communicate that a large K proceeds to products and a small K proceeds to reactants.
2	Basic	I can determine th value of K.
1	Minimal	I can define what K represents.
0	No Evidence	No evidence shown.

3.6 I can represent a multistep process with an overall equilibrium expression, using the constituent K expressions for each individual reaction.

Learning Target	Descriptor	Definition
4	Proficient	I can represent a multistep process with an overall equilibrium expression, using the constituent K expressions for each individual reaction.

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Learning Target	Descriptor	Definition
3	Developing	I can calculate K for overall reaction.
2	Basic	I can manipulate K based on changes to individual reactions.
1	Minimal	I can explain rules for the munipulation of K.
0	No Evidence	No evidence shown.

3.7 I can identify concentrations or partial pressures of chemical species at equilibrium based on the initial conditions and the equilibrium constant.

Learning Target	Descriptor	Definition
4	Proficient	I can identify concentrations or partial pressures of chemical species at equilibrium based on the initial conditions and the equilibrium constant.
3	Developing	I can calculate concentrations at equilibrium with ICE problem.
2	Basic	I can build an ICE problem.
1	Minimal	I can describe an ICE problem.
0	No Evidence	No evidence shown.

3.8 I can represent a system undergoing a reversible reaction with a particle model.

Learning Target	Descriptor	Definition
4	Proficient	I can represent a system undergoing a reversible reaction with a particle model.
3	Developing	I can predict particles present before and after equilibrium.
2	Basic	I can build a particle model of a system at equilibrium.
1	Minimal	I can identify species in particle model.
0	No Evidence	No evidence shown.

3.9 I can identify the response of a system at equilibrium to an external stress, using LeChatelier's principle.

Learning Target	Descriptor	Definition
4	Proficient	I can identify the response of a system at equilibrium to an external stress, using LeChatelier's principle.
3	Developing	I can predict the changes in reactants and products in response of a system to stresses.
2	Basic	I can determine the effect of stress on pH, temperatuer and color of a solution.

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Learning Target	Descriptor	Definition
1	Minimal	I can define LeChatelier's principle.
0	No Evidence	No evidence shown.

3.10 I can explain the relationship of Q, K and the direction in which a reversible reaction will proceed to reach equilibrium.

Learning Target	Descriptor	Definition
4	Proficient	I can explain the relationship of Q, K and the direction in which a reversible reaction will proceed to reach equilibrium.
3	Developing	I can determine how system will shift back to equilibrium after strees to system.
2	Basic	I can communicate how system shifts from disturbance to system.
1	Minimal	I can indetify stresses to equilibrium.
0	No Evidence	No evidence shown.

3.11 I can calculate the solubility of a salt based on the value of Ksp for the salt.

Learning Target	Descriptor	Definition
4	Proficient	I can calculate the solubility of a salt based on the value of Ksp for the salt.
3	Developing	I can predict the solubility of different salts.
2	Basic	I can determine molar solubility.
1	Minimal	I can define the solubility product constant.
0	No Evidence	No evidence shown.

3.12 I can identify the solubility of a salt, and/or the value of Ksp for the salt, based on the concentration of a common ion already present in solution.

Learning Target	Descriptor	Definition
4	Proficient	I can identify the solubility of a salt, and/or the value of Ksp for the salt, based on the concentration of a common ion already present in solution.
3	Developing	I can calculate the molar solubility with the common ion present.
2	Basic	I can predict the reduced solubility based on the molarity of common ion in solution.
1	Minimal	I can define the common ion effect.
0	No Evidence	No evidence shown.

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13 I can identify the qualitive effect of changes in pH on the solubility of a salt.

Learning Target	Descriptor	Definition
4	Proficient	I can identify the qualitive effect of changes in pH on the solubility of a salt.
3	Developing	I can predict the solubility of salt based a acid or base present.
2	Basic	I can communicate the effects of acid/base solutions on solubility.
1	Minimal	I can identify a weak acid or base.
0	No Evidence	No evidence shown.

4. Acid and Bases (25.00%)

Learning Targets

4.1 I can calculate the values of pH and pOH, based on Kw and the concentration of all species present in a neutral solution of water.

Learning Target	Descriptor	Definition
4	Proficient	I can calculate the values of pH and pOH, based on Kw and the concentration of all species present in a neutral solution of water.
3	Developing	I can determine molarities of hydronium and hydroxide in solution.
2	Basic	I can define acid/base theory.
1	Minimal	I can identify acid bases species.
0	No Evidence	No evidence shown.

4.2 I can calculate pH and pOH based on concentrations of all species in a solution of a strong acid or a strong base.

Learning Target	Descriptor	Definition
4	Proficient	I can calculate pH and pOH based on concentrations of all species in a solution of a strong acid or a strong base.
3	Developing	I can determine molarities of strong acids and strong bases.
2	Basic	I can communicate the dissociation of strong acids and bases.
1	Minimal	I can identify the strong acids and strong bases.
0	No Evidence	No evidence shown.

4.3 I can explain the relationship among pH, pOH and concentrations of all species in a solution of a monoprotic weak acid or weak base.

Learning Target	Descriptor	Definition
4	Proficient	I can explain the relationship among pH, pOH and concentrations of all species in a solution of a monoprotic weak acid or weak base.

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Learning Target	Descriptor	Definition
3	Developing	I can calculate Ka and Kb
2	Basic	I can communicate what Ka and Kb represent.
1	Minimal	I can identify weak acids and weak bases.
0	No Evidence	No evidence shown.

4.4 I can explain the relationship among the concentrations of major species in a mixture of weak acid and strong acids and bases.

Learning Target	Descriptor	Definition
4	Proficient	I can explain the relationship among the concentrations of major species in a mixture of weak acid and strong acids and bases.
3	Developing	I can calculate pH or pOH using IRF and ICE problems.
2	Basic	I can utilize the correct formula for species present.
1	Minimal	I can identify the dominent species present.
0	No Evidence	No evidence shown.

4.5 I can explain results from the titration of a mono- or polyprotic acid, in relation to the properties of the solution and its components.

Learning Target	Descriptor	Definition
4	Proficient	I can explain results from the titration of a mono- or polyprotic acid, in relation to the properties of the solution and its components.
3	Developing	I can communicate equivalence and half equivalence points during titration.
2	Basic	I can predict different species present during different parts of titration.
1	Minimal	I can identify major points on titration curve.
0	No Evidence	No evidence shown.

4.6 I can explain the relationship between the strength of an acid or base and the structure of the molecule or ion.

Learning Target	Descriptor	Definition
4	Proficient	I can explain the relationship between the strength of an acid or base and the structure of the molecule or ion.
3	Developing	I can predict conjugate acid/base pairs in reactions.

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Learning Target	Descriptor	Definition
2	Basic	I can communicate different types of acid/base pairs.
1	Minimal	I can identify conjugate acid/base pairs.
0	No Evidence	No evidence shown.

4.7 I can explain the relationship between the predominant form of a weak acid or base in solution at a given pH and the pKa of the conjugate acid or the pKb of the conjugate base.

Learning Target	Descriptor	Definition
4	Proficient	I can explain the relationship between the predominant form of a weak acid or base in solution at a given pH and the pKa of the conjugate acid or the pKb of the conjugate base.
3	Developing	I can determine higher concetrations of acid base species based on location on titration curve.
2	Basic	I can predict the higher concentration of acid/base pairs in solution based on pH.
1	Minimal	I can define acid base indicators.
0	No Evidence	No evidence shown.

4.8 I can explain the relationship between the ability of a buffer to stabilize pH and the reactions that occur when an acid or a base is added to a buffered solution.

Learning Target	Descriptor	Definition
4	Proficient	I can explain the relationship between the ability of a buffer to stabilize pH and the reactions that occur when an acid or a base is added to a buffered solution.
3	Developing	I can communicate the effects on acid base pairs in large concentrations on the resistance to change of pH.
2	Basic	I can determine the buffered region on a titration curve.
1	Minimal	I can define a buffered solution.
0	No Evidence	No evidence shown.

4.9 I can identify the pH of a buffer solution based on the identity and concentrations of the conjugate acid-base pair used to create the buffer.

Learning Target	Descriptor	Definition
4	Proficient	I can identify the pH of a buffer solution based on the identity and concentrations of the conjugate acid-base pair used to create the buffer.
3	Developing	I can calculate pH with the H-H equation.

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Learning Target	Descriptor	Definition
2	Basic	I can determine the molarities of the weak acid and weak base in the buffered region.
1	Minimal	I can identify parts of the H-H equation.
0	No Evidence	No evidence shown.

4.10 I can explain the relationship between the buffer capacity of a solution and the relative concentrations of the conjugate acid and conjugate base components of the solution.

Learning Target	Descriptor	Definition
4	Proficient	I can explain the relationship between the buffer capacity of a solution and the relative concentrations of the conjugate acid and conjugate base components of the solution.
3	Developing	I can communicate how increasing the concentratoins of weak acid and bases can resist change in pH.
2	Basic	I can determine what the solution is buffered for acid or base addition.
1	Minimal	I can define buffer capacity.
0	No Evidence	No evidence shown.

Submitted on 11/23/2021 by