When Responding to the AP Chemistry Free Response Questions…

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Sources: Released Free-Response Questions with Samples and Commentary/Chief Reader (C.R.) Reports
AACT Webinars: Lessons Learned from AP Chemistry Exam

Last updated : April 15th, 2024

Write This…	…Not That!	Rationale
For All Questions		
Handwriting that is clear, legible, dark enough and large enough to be scanned and read by someone who doesn't know you	Messy, illegible, light, tiny writing that cannot be read	Answers deemed illegible by a reader and the table leader will earn no points on corresponding parts/questions – remember all papers are SCANNED
Variables that are clearly denoted and appropriately used	Variables that are incorrectly represented	Variables have specific meaning and must be correctly denoted/abbreviated; case matters for many variables: • M (not m) for molarity, • K (equilibrium constant) vs k (rate constant) • m is meters, not minutes, moles or molarity, etc.
Numerical answers that are supported by work	Numerical answers on their own	Work is required to be shown in order for points to be earned
Abbreviations that are generally accepted (M, min, s, IMF, LDF, etc.)	Abbreviations that are not generally accepted/ are incorrect/ change the meaning (ex: mol for molecule, CL instead of Coulomb's Law, etc)	Abbreviations still must convey the correct information; if in doubt, define or avoid them – don't create ambiguity in an answer by using an abbreviation
Answer the specific question first, then "justify", "explain" etc.	Burying the answer in the text of the response	Make it easy to follow your answer and give you points
Answers that are concise and direct	Burying the answer in a long response	Make it easy to follow your answer and give you points
Names of specific elements and compounds, "reactants", "products", etc.	"it"	Ambiguous
Symbols that match that in a provided key for a diagram	Making up symbols for a diagram	Use the provided key to ensure that you are clear in your answer (ref 2023 #5b)
A justification or explanation when it is requested as part of the question	Only the answer without supporting it	Justification/explanation required to earn point
"mass", "volume", etc.	"size"	Be specific to indicate understanding
References to specific data or graphs when prompted to "explain how the data…", "using the table below…" or something similar	Generalizations about the data without specifically citing provided data or trials	Required to earn point (ref. 2023 #3b)
Elements that match the symbol given in the prompt	Elements that are do not match the symbol in the prompt	Be careful – some elements have similar symbols! (Ex: Cl and C) (ref. 2023 #1)
An answer with units if "include units" is stated in the problem	An answer without units	If "include units" is written in the prompt, correct unit is required to earn full points
Complete dimensional analysis/work with units	Incomplete dimensional analysis without units	Including units clearly shows intended work, and allows points for "implied" calculations to be earned

For All Questions (cont.)

Write This…	…Not That!	Rationale
Values with units that match constants and that are the same throughout the equation	Values with units that do not match other values/constants	Values must be the same unit through an equation, for both constants and variables
Answers expressed to the correct number of significant figures, based on data given in the problem	Answers with an incorrect number of significant figures or significant figures limited by molar mass, constants, etc.	1 pt traditionally is assessed somewhere in the FR for significant figures (typically found in a laboratory data question)
Answers that only refer to substances/data included in the prompt	Answers with justifications based on situations or data that are not indicated in the prompt	Do not claim something happened that was not present in prompt– any valid assumptions would be stated
Analysis of given data in a thoughtful way that is based on chemical principals	Saying that data is wrong, that the data is impossible, calling the test writers liars, etc.	The AP Exam is never going to try to trick you- it will not give false or impossible data
Answers that refer to specific and correct glassware, used correctly (ex: buret rinsed then filled), and values read correctly from figures	Answers that use incorrect glassware for the task, particularly with regard to precision and/or misread figures of glassware	Glassware has different specialized uses, and should be appropriately referenced/used/read based on the task (ex. 2023 #4b)
Explanation of an application of usage of a term	Definition of a term	A definition is not required on the exam – an explanation of how this term applies is needed
An explanation of the reason behind an observation of phenomena.	Stating a law/rule or observation without explaining the chemical principles or phenomena behind the law/rule/trend.	Simply stating the end result without discussing the reason for that result does not fully answer the question. Evidence and reasoning must both be included. (ex. 2019 #4, 2023 #7c)
Using deductive reasoning to make conclusions or approximate values when the terms "estimate" or "justify" are in the prompt	Using long, time-intensive math reasoning when "calculate" is not indicated in the prompt	While correct calculations will earn credit, the loss in this type of answer is the amount of time spent on the calculations when an assessment without lengthy calculations can be done instead (ex: 2018 #2e-f, 2019 #3g)
Answers that pay attention to the relative scale on graphs	Answers that make assumptions on the scale without examining data	Don't assume that marked lines automatically are increments of 1, 10, etc. – use the data to determine the scale (ex. 2019 #5a)
Answers that make absolute comparisons (greater than 1, less than 1)	Answers that make vague comparisons (more, less)	If it is possible to justify an answer with values, do that to demonstrate that you understand the underlying principle (C.R. 2023)
Write out the value of R (and all constants) in your work	Showing the variable instead of the value of the constant	The correct symbol used correctly will earn full points, HOWEVER – students that write out the value are more likely to use the correct value in their calculation (C.R.R. 2023)
Correct symbols or terms	Incorrect symbols	Be sure to use the correct < or >, if in doubt, use words instead (C.R.R. 2023)
Algebraic rearrangements that correctly follow order of operations and isolate the desired term	Incorrect algebra	Be careful to rearrange equations correctly – watch when to multiple/divide, and what is in numerator or denominator (ex. 2021 #3d, 2023 #5b, 2023 #7bii)

Unit 1: Atomic Structure and Properties

Write This…	…Not That!	Rationale
"period"	"shell" when referring to elements and their location on the Periodic Table	Elements are in a period, electrons are in a shell
Ion electron configurations that show electrons were removed from valence shell orbitals	Ion electron configurations that show electrons were removed from inner orbitals	Ions form by electrons being lost from the outermost shell; this may or may not be the electrons that were filled last in the electron configuration (Ref. 2018 #3a)
Reference reasons for periodic trends (i.e. effective nuclear charge, Coulomb's law, polarizability, etc.)	Stating the trend as the reason ("because it is to the left", "because it is further down the periodic table", etc.)	State the actual reason not the memory aid (Ref. 2021 #2h, 2022 #3b)
"Effective nuclear charge increases"	"It wants to have a full octet"; "it's close to having a full octet"	State the actual reason not the memory aid
"Species X has a more polarizable cloud of electrons"	"It has more electrons", "it has more mass", "it has more surface area", "it is bigger"	State the actual reason not the memory aid
"Electrons in higher energy levels are farther from the nucleus, resulting in a larger atom/ion."	"More electrons/more energy levels makes the atom/ion bigger."	Explanation of reason, not just statement of fact, required for point (Ref. 2016 #1)
Using the difference in mass from given lab data to determine the mass of a desired product	Using lab data without removing the mass of species not in the desired product	Difference in mass is used to account for mass of filter paper, drying agent, unreacted starting material, etc. (Ref. 2021 #3b)

Unit 2: Molecular and Ionic Compound Structure and Properties

Explaining properties of a solid/substance by discussing the components and bonds within	Attributing properties of a solid/substance to its type without explaining the structural reason	Structural features are required to justify properties of a substance (i.e. types of bonds, mobile charges, etc) (Ref. 2021 #6a)
"ionic compound"	"molecule" when discussing an ionic compound	A molecule is a covalent compound
"ions"	"atoms" when discussing ionic compounds	Ionic compounds contain ions – this shows the understanding that it is the charges that form the bond
"atoms"	"ions" when discussing covalent compounds	Covalent compounds do not contain ions
"Coulombic attraction"	"Opposites attract"	State the actual reason not the memory aid
Lewis structures that obey the octet rule	Lewis structures that violate the octet rule	Lewis structures must obey the octet rule, except in the case of expanded octets (Ref 2021 #1c)
Lewis structures that are complete with necessary lone pairs and/or resonance	Lewis structures that are missing lone pairs and/or resonance (if needed for correct structures)	Lewis structures are incorrect without necessary lone pairs/resonance
Multiple bonds when there are not enough valence electrons to satisfy the octet rule	Multiple bonds when the octet rule for the structure would have been satisfied without them	Multiple bonds are only needed when there are not enough valence electrons to satisfy the octet rule
VSEPR geometry/hybridization that considers the 3D arrangement of atoms in a molecule	VSEPR geometry/hybridization that considers a molecule based on its 2D representation	VSEPR/hybridization are used to describe the 3D arrangement of atoms in a molecule; failing to recognize the difference between the way a Lewis structure is drawn and the way the actual molecule is arranged may lead to an incorrect analysis of structure (ref. 2018 #2d)

Molecular geometries that consider the impact of lone pairs on the overall geometry (i.e. molecular geometries)	Molecular geometries that treat lone pairs and bonding pairs the same (i.e. electron group geometries)	The molecular and electron group geometries are identical only if all electron groups are bonding (ref. 2023 #2di)

Unit 3: Intermolecular Forces and Properties

Write This…	…Not That!	Rationale
Hydrogen bonding, dipole-dipole, London dispersion forces, etc. when asked to identify intermolecular forces	Ionic bonds, covalent bonds, metallic bonds when asked to identify intermolecular forces	Intermolecular forces are attractions between molecules; bonds are intramolecular forces (within molecules)
Discussion of ALL intermolecular forces when prompted to do so	Neglecting IMFs that may be weaker	If asked to state all IMFs, all points will not be earned if some of the IMFs are not stated (ref. 2018 #4a and 2019 #2c)
"Has hydrogen bonds between the molecules"	"Has hydrogen bonds"	Is unambiguous - Shows that you understand hydrogen bonds are not actually bonds
Electrical conductivity is a property of an ionic solution due to the charges on the dissociated ions	Electrical conductivity is due to the ionic precipitate, electrical conductivity is due to the water	Conductivity is due to the ability of a ion to carry charge; precipitate would not influence in solid form; pure water is non-conductive, (ref. 2019 #3e)
"Overcome intermolecular forces"	"break up" a solid/liquid, break covalent bonds	IMFs should be used to justify phase changes
Ion interactions when discussing ionic compounds	LDF's when discussing ionic compounds	Ionic compounds have ions with whole charges, which dominate interactions
"Coulombic attraction"	"Opposites attract"	State the actual reason not the memory aid
Describe the process of overcoming intermolecular forces/polarity	"Like dissolves like"	State the actual reason not the memory aid
Identify specific intermolecular forces at play	"stronger intermolecular forces"	Shows your understanding of the particulate-level chemistry
Recognizing the difference in number of hydrogen bonding sites when comparing physical properties	Treating all species that form any amount of hydrogen bonds the same	The number of available hydrogen bonding sites impacts the physical properties (Ref 2022 #4b)
LDFs increase with an increasing number of electrons and therefore polarizability	LDFs increase with increasing size/mass	Increased number of electrons in an atom is what increases LDF; increased size is not the reason for increased strength of LDF
Intermolecular forces in discussing physical properties (MP, BP, solubility, etc): "Stronger intermolecular forces increase boiling point"	Intramolecular forces ("bonds") in discussing physical properties: "Stronger covalent bonds increase boiling point"	Bonds are not broken and so intramolecular forces are not the determining factors for physical properties (phase changes, solubility) (ref. 2018 #4a, 2019 #2c, 2022 #4b)
Pressure is caused by the collision of gas particles with the walls of a container.	Pressure is caused by the collision of gas particles.	Unclear wording – implies pressure is caused by gas particles colliding with each other not with the container (ref. 2019 #4c)
Use correct R value with corresponding units to those used in work (and correctly report final unit)	R value with mismatched units	Units used in Ideal Gas Law must match units on the R value (ref. 2018 #4b and 2019 #2d) and must be correct R (ref 2023 #5a)
Comparison of R_f values in chromatography	Comparison of absolute height of spots on chromatograms	Take into account a difference in the distance the solvent front travelled between different chromatograms (ref. 2017 #4)
Discussion of intermolecular forces between analyte molecules and stationary/mobile phases	Repulsions between analyte molecules and stationary/mobile phases	The movement in chromatography is determined by the attraction for the stationary/ mobile phase (ref. 2017 #4)

"Solution" when an ionic compound is dissolved in water	"Liquid" instead of solution	An ionic compound dissolved in water is a solution, not a liquid (the word liquid indicates a molten compound) (ref. 2019 #3e)
Particle view diagrams with ions and polar molecules orientated in the correct direction relative to each other	Incorrectly oriented dipoles	Drawings must demonstrate understanding of interactions at the molecular level (ex. 2015 #4)
Solutions are prepared using volumetric flasks (most often), or most precise glassware provided in prompt	Solutions are prepared in beakers or graduated cylinders	Volumetric flasks are designed to make precise solutions and are only marked at 1 volume, they are filled so the bottom of the meniscus rests on the calibration mark after the solid has been completely dissolved (Ref. 2021 #3e, 2022 #3c)

Unit 4: Chemical Reactions

Write This…	**…Not That!**	**Rationale**
Net ionic equations only containing species that change	Aqueous ionic compounds in their undissociated form, spectator ions	Including these is not a net ionic, it's a molecular or complete ionic
Polyatomic ions that are shown as a compound with the correct charge in solution	Polyatomic ions that are broken down into elemental ions in solution	Polyatomic ions themselves do not dissociate in solution, they only dissociate from the other ion in an ionic compound
Net ionic equations with correct species, ionic charges and stoichiometric coefficients	Net ionic equations that contain incorrect formulas or ions without associated charges or that are not stoichiometrically balanced	Net ionic equations must correctly represent the ions and other species (ref. 2018 #6a, 2019 #3a, 2021 #1di)
Determination of the concentration of an analyte in a titration that takes into account the stoichiometry of the reaction	Applying $M_1V_1=M_2V_2$ as a blanket method for determining concentration at an end point if the stoichiometry is not 1:1	While acid-base titrations are often 1:1, not all titrations (especially REDOX titrations) follow this stoichiometry; in situations that are not 1:1, the stoichiometric ratios must be accounted for in calculations (ref. 2018 #3e)
Justification of whether a species is oxidized/reduced by referencing oxidation numbers	A justification of oxidation/reduction that uses charge on an ion	Oxidation numbers are assigned to individual atoms in the reaction, and they are not automatically the same as the charge in a polyatomic ion (ref. 2019 #7a, 2022 #2a)
Particle view diagrams that pay respect to stoichiometric ratios	Ignoring stoichiometry in particle views	Must show ions dissociated with the correct ratios relative to the molecular formula/reaction that may be at play/limiting and excess reagents (ref. 2018 #2a, 2019 #3b, 2023 #7a)

Unit 5: Kinetics

A rate law based only on reactants	A rate law that includes products	Rate laws are based only on reactants
A rate law that includes the rate constant k as part of it	A rate law without k being included	Incomplete rate law if k is not included
Value of k with units	Value of k without units	Units required to earn point (Ref 2022 #5a)
Specific parts of the molecules that must collide in order for the reaction to occur	"Collision must occur in the correct orientation"	Show your understanding of the collision theory

A validation of a proposed mechanism by showing that the rate law matches the slow (rate-determining step) and the mechanism matching the overall stoichiometry for the reaction.	A justification of a mechanism just by saying "it matches the rate law" or "the intermediates cancel to give the overall process".	The rate law must be discussed as matching the rate-determining step, and the overall stoichiometry should always match for any proposed mechanism – an understanding of the rate determining step must be demonstrated. (ref. 2019 #6b, 2022 #5b)
Recognizing that the half-life is constant for a first-order reaction	Failing to recognize that half-life is constant for a first order reaction	Half life is constant for first order reactions only and can be used to identify a first order of a reaction if given time versus concentration data

Unit 6: Thermodynamics

Write This…	**…Not That!**	**Rationale**
"Thermodynamically favorable", "thermodynamically feasible"	"Spontaneous"	Preferred AP language
Values with correct signs	Values with incorrect signs	Necessary for correct calculations and determinations – watch signs based on bonds breaking and forming, heat flow in calorimetry indicated by temperature changes, signs that may change in application of Hess' Law, etc.
Changing the sign of q_{system} when using the value of q for surroundings	Using the q_{system} value for calculations involving the surroundings without changing the sign	$q_{system} = -q_{surroundings}$ (Ref. 2021 #3b)
Using values of q recognizing that it is the amount of energy absorbed/released during a thermodynamic change	Using values of q interchangeably as values of ΔH without taking the entire situation into account.	ΔH and q do not have identical meaning; ΔH is the enthalpy change for a reaction whereas q is the overall amount of heat exchanged for the situation. Stoichiometric relationships, the component of the system being examined, etc. may influence how q should be manipulated to determine ΔH (ref. 2018 #1)
In using $q=mc\Delta T$ for solutions, using mass of ENTIRE solution for m	Using mass of only one component of solution	When using $q=mc\Delta T$, the mass of the entire system being examined must be used
Using both $q=mc\Delta T$ and heat of fusion/vaporation calculations for a situation in which a substance goes through both a phase change and a temperature change	Using only $q=mc\Delta T$ for a situation in which a substance goes through both a phase change and a temperature change	When a substance experiences a temperature change and a phase change, the two quantities of heat are calculated separately and summed (Ref 2022 #1c)
Use a thermometer to measure temperature values, and then subtract to find ΔT	Use a thermometer to measure ΔT	A thermometer doesn't measure ΔT, it measures T values that can then be used to calculate ΔT (ref. 2019 #1e)
$\Delta H°=\Sigma$(enthalpies of bonds broken) – Σ(enthalpies of bonds formed) when calculating $\Delta H°_{rxn}$ from bond energies	$\Delta H°_{rxn} = \Delta H_{products} - \Delta H_{reactants}$ when calculating $\Delta H°_{rxn}$ from bond energies	Applying the wrong formula will give an incorrect sign for the $\Delta H°_{rxn}$ (ref. 2017 #2b)
Multiplying bond energy values by stoichiometric factors as well as number of bonds in a molecule when calculating ΔH from bond energies	Only using number of bonds in a single molecule without taking stoichiometric factors into account	Stoichiometry factors represent the number of molecules taking part in the reaction, so number of bonds in a single molecule must be multiplied by this coefficient (ref. 2019 #2g)

Unit 7: Equilibrium

Write This…	…Not That!	Rationale
Beginning K expressions with K=	Not including K= at the beginning of a K expression	K expressions must begin with K= (Ref 2021 #1a)
Correct formulas (including charges!) for all species in equilibrium expressions	Substitutions, abbreviations, chargeless ions, other shorthand that may work out in calculations but does not represent the correct species	Equilibrium expressions must be written formally when requested
K expressions that include only aqueous and gases species	K expressions that include solid and liquid species (including water)	Solids and liquids are not included in K expressions (Ref 2021 #1a)
In K_p expressions: $P_{species}$	In K_p expressions: [species]	Concentration (which is indicated by brackets around the species) is not used in K_p - partial pressures are (ref. 2022 #2e, 2023 #2e)
K expressions with EITHER concentration "[ ]" or partial pressures "P"	K expressions that include both concentration "[ ]" and partial pressures "P" in the same expression	Equilibrium expressions are written for either concentration values or partial pressure values, not both at the same time in a single expression (ref. 2019 #2e)
K without units	K with units	K is a unitless constant
"K is greater than 1, indicating that the products are present in a higher concentration and therefore equilibrium lies to the right"	"K is large"	Use specific values to demonstrate understanding about the meaning of K relative to the equilibrium position (ref. 2017 #2d)
"Proceeds"	"Shift" – if equilibrium has not yet been established (i.e. a precipitate has not yet been formed when evaluating K_{sp})	If equilibrium is not yet established, then it cannot "shift" – rxn will proceed in a certain direction until equilibrium is established
Calculations of K expressions that use concentrations/partial pressures at equilibrium	Calculations of K expressions that use initial concentrations/partial pressures	K values can only be calculated using equilibrium values; if initial values are given, an ICE table (or similar method) should be used to determine equilibrium values before calculating the K value (ref. 2018 #5b)
Using stoichiometric factors in ICE tables	Neglecting stoichiometry when calculating change in equilibrium scenarios	Stoichiometry ratios impact how much an initial value is changed during the establishment of equilibrium (ref. 2019 #2f)
"x has been assumed to be so small relative to the original concentrations that it can be ignored"	Nothing about why you ignore x to avoid quadratics	Show you understand why you are making the decision
Discussion of Q vs. K	"reduce the stress", or "due to Le Châtelier's Principle"	Preferred AP language-shows a deeper understanding of chemical principals (ref. 2018 #5c, 2022 #2g)
K_{sp} expressions that only contain the ions	K_{sp} expressions that contain or imply a species in the denominator	Solids and liquids are not included in equilibrium expressions
Answers that consider whether a new system has been created that will reach equilibrium or an established system at equilibrium is being disrupted	Assuming that all new conditions utilize Le Châtlier's Principle	There is a difference between stressing an established equilibrium (Q vs K and Le Chat discussion) versus creating a new system that utilizes the same reaction (K calculations/ICE tables) (ref. 2023 #7c)

Unit 8: Acids and Bases

Write This…	…Not That!	Rationale
"The solution is neutral when $[H_3O^+] = [OH^-]$."	"The solution is neutral when pH=7."	True definition of neutral – neutral is only pH of 7 when $K_w = 1.0 \times 10^{-14}$ (at 298 K)
"The pH > 7 because the salt produced in the neutralization behaves as a base: $A^- + H_2O \rightleftharpoons HA + OH^-$"	"The pH > 7 because it's a battle between weak acid and strong base and strong base wins."	State the actual reason not the memory aid
HCl, HBr, HI, $HClO_4$, HNO_3 as strong acids	Any other acid as strong	These are the strong acids listed in the Course and Exam Description
$K_w = K_a \times K_b$ for a conjugate pair	$K_w = K_a \times K_b$ for an unrelated acid/base pair	This equation only holds true for conjugate acid-base pairs
A buffer system containing a weak acid and its conjugate base (or a weak base and its conjugate acid)	A buffer system that contains a strong acid or base; a buffer containing any acid/base with a common ion	A buffer results from the presence of a weak acid or base and its conjugate; a strong-strong system will neutralize without buffering
"This buffer has a higher buffering capacity because it contains a higher concentration of weak acid/base and its conjugate to react with added H^+ or OH^- ions."	"Higher volume of weak acid/base"	Buffering capacity is related to the presence of both the weak species and its conjugate.
Identifying a salt as making a good choice for a specified buffer because the pK_a is close to the desired pH for the buffer.	Identifying a salt as making a good choice for a specified buffer because the pK_b is close to the desired pH for the buffer.	An effective buffer is one in which is pKa of the weak acid is approximately equal to the target pH. (ref. 2019 #3h)
Answers that justify the relative concentrations of weak acid and conjugate base to the half-equivalence point on a titration curve	Answers that fail to recognize the importance of the half-equivalence point	Considering the position of a weak acid/strong base titration curve relative to the half-equivalence point can be used to deduce features of the titration because at this point pKa=pH and [WA]=[A-] (Ref 2022 1e)

Unit 9: Applications of Thermodynamics

Write This…	…Not That!	Rationale
Reference number of molecules and phases when justifying a change in ΔS based on a reaction	Making vague references to "similar structures" or no justification	An increase in ΔS is due to an increase in number of gaseous products (ref. 2017 #2c)
Multiplying ΔS° values by stoichiometric factors when calculating $\Delta S°_{rxn}$	Ignoring stoichiometry when calculating $\Delta S°_{rxn}$	Correct application of the equation $\Delta S°_{rxn} = \sum \Delta S°_{products} - \sum \Delta S°_{reactants}$ (Ref. 2021 #2e, 2022 #2b)
Using consistent units when applying $\Delta G = \Delta H - T\Delta S$	Not having all 3 thermodynamic factors in the same unit (either kJ or J)	Units must be consistent when used in equations (Ref. 2022 #2cii)
Justify thermodynamic favorability in terms of both enthalpy and entropy	A thermodynamic favorability discussion referencing only enthalpy or entropy	Thermodynamic favorability depends on both ΔH and ΔS
Arrangement/Dispersions of matter or energy along with particle-level reasoning for explaining the sign of ΔS	Disorder, chaos	Disorder is the effect, not the cause, of an increase in entropy (ref. 2019 #1g)

ΔG determines thermodynamic favorability	Referencing ΔH or ΔS alone as determining thermodynamic favorability	All the thermodynamic properties contribute to favorability – hence using ΔG = ΔH-TΔS which takes all into account (ref. 2019 #1h)
Use of correct value of R with thermodynamic data (that corresponds to energy units)	R value that does not correspond to the units needed in the problem	Units of the R value must match those used in the problem, and correct units must be applied at the end, or the answer is incorrect (ref. 2018 #2b)
"Ions flow through the salt bridge to maintain a charge balance in each half-cell."	"Electrons flow through the salt bridge to equilibrate charge."	Electrons do not flow through the salt bridge; ions flow through the salt bridge, electrons flow through the wire (ref. 2018 #6a)
Loss of mass of electrode is due to atoms of electrode going into solution as ions	Loss of mass of electrode is due to loss of electrons	Electrons have extremely small (negligible in this case) mass (ref. 2014 #3)
Discussion of Q vs. K for changes in cell potential after a change, or qualitative discussion of Nernst Equation	Discussion of Le Châtelier's principle	An galvanic cell does not attain equilibrium while working – when it does, it stops producing current (is "dead") (ref. 2014 #3)
An equation that is balanced with respect to both number of atoms and charge	An equation that is unbalanced in atoms, charge or both; an equation that shows electrons	Recognize that equations need to be balanced with respect to both atoms and charge – this means that half-reactions may need to multiplied by a coefficient to balance charge for the overall reaction, even if atoms are already balanced, and then the electrons on both sides cancel out and are not written (ref. 2018 #3d)
E° values that are positive for galvanic cells and negative for electrolytic cells	E° values that have the wrong sign	Galvanic cells are thermodynamically favorable as proceed as designed with a + E°, electrolytic cells are thermodynamically unfavorable with a - E° and require an external driving force (Ref. 2021#5b)
E° value not multiplied by stoichiometric factors	E° value that has been multiplied by a stoichiometric value	E° is intensive and therefore does not change if the half-cell is multiplied by a stoichiometric factor to balance charge (ref. 2018 #6b, 2022 3e)
Standard cell potential when discussing a REDOX reaction	Standard reduction potential when discussing a REDOX reaction	A redox reaction contains both oxidation and reduction; therefore the E° for the reaction is the sum of the standard reduction potentials of both the oxidation and reduction half-reactions
When writing $E°_{cell}$ for favorable redox reactions, one rxn must be reversed so that $E°_{cell}$ is positive	An $E°_{cell}$ that is negative for redox reactions that proceed in the forward direction	There has to be thermodynamic favorability, which depends on the $E°_{cell}$, in order for the rxn to work (ref. 2019 #2b)
Using the cell potential for E° in ΔG = -nFE° calculations	Using a half-cell potential for E° in ΔG = -nFE° calculations	This equation uses the full cell potential, not for a half-reaction (ref. 2018 #6b)
Performing calculations with mass and current (using Faraday's constant) that account for the number of moles of electrons transferred	Performing calculations with mass and current (using Faraday's constant) without considering the number of moles of electrons transferred	Stoichiometry between the moles of the target species and the moles of electrons transferred in the reaction must be included (Ref. 2021 #5c)