**AP Chemistry Exam Tips**

1. Sleep well the night before.
2. Eat breakfast.
3. Dress appropriately. Take socks and a sweatshirt in case the testing room is cold.
4. Take your favorite pens, pencils, and a calculator you are familiar with.
5. As soon as you break the seal on the MC booklet, number your periodic table with the 1-8 or so down the side that corresponds to the principal quantum energy level, *n*, for the *s* and *p* block elements AND number 1-8 across the top of the representative elements to remind you how many valence electrons are present. While you’re at it, label the *s1* through *p*6 to also speed you along. And label the most probable ion charges (+1,+2,+3,+4,-3,-2,-1,0). It’s a 30 second investment that translates into quick points!
6. You have 90 minutes for these 60 questions. That is 1.5 minutes per question. Don’t use more than 1.5 minutes on any one question. If you feel a question will take too long, circle it and go back later. But be mindful of the scantron. You will not have time after the 90 minutes to fill it in. So fill it in as you go, making sure you’re checking the question number.
7. At the break take deep long breaths to clear your mind. Go to the bathroom (it is timed and bathroom breaks count in your time).
8. Repeat the periodic table labeling process as soon as you break the seal on your FR booklet (unless you were charming enough to get to keep your already pristinely labeled periodic table from the MC section).
9. Make your fast pass…survey the main topic each of the 7 free response questions deals with and start with your favorite (hopefully that’s equilibrium since you KNEW that was coming). Keep an eye on the time…don’t spend more than 20 minutes on that first question. The first 3 should be 20 minutes and the last 4 should be 9 minutes each.
10. Expect some easy parts—it really isn’t a trick. Sometimes the easiest part is at the bottom. Always read to the end.
11. Generally, each part 2 question is connected. Especially the i, ii, and iii questions where you use your previous answer. In that case, even if your previous answer is wrong, you can still get points for carrying through the math. In fact, if you don’t know the answer to (i) just put anything reasonable and carry on to (ii). When there is a break in the question with new information, most of the time the question has started over. It’s like a fresh new question.
12. When answering questions about lab errors normally they are referring to a calculation that you have just completed. Find the value the student accidentally messed up first and carry through your math to determine the final answers change. Remember it is not enough to just state the amount changed. Be specific: did it increase, decrease, or remain the same AND why?
13. Double check your units and sig. figs. No calculator vomit allowed!
14. Always remember, when in doubt, calculate the moles of something! Masses, volumes, and many other units are not comparable.

**Lab Question Tips**

1. Calorimetry: The specific heat of liquid water is 4.184 J/g K. The density of water is 1.00g/ml , therefore, if a question mentions 100 mL of water was used it is also 100g. Most likely you will be asked to calculate the heat released by a substance in which the heat was absorbed by the water. In this case use q=mcΔT with m= mass of water or solution. Be mindful of units. They may give units in kJ/mol in which case you will need to make the units match. And be aware that some heat can be lost to the surroundings, making your calculated value lower than accepted.

2. Titrations: To set up a titration you will need to rinse the burette with water AND the titrant and then fill the tip of the burette to ensure there are no air bubbles. If a solid acid is used, the amount of water added is irrelevant and only used to dissolve the acid. Then you will be asked to calculate the molar mass. In that case, find the equivalence point, multiple MxV of the base to find moles of the base. These are equal to the moles of acid. Finally divide the mass of the solid acid by moles. For liquid acids, other questions arise… There are two major points on a titration curve.

a. Equivalence Point: At this point only moles of acid = moles of base, therefore, MaVa=MbVb. You can use this point to find the unknown molarity or volume and to judge the type of acid and base you used. SA+SA= neutral solution. WA+SB = Basic Salt which re-reacts with water to form more OH-. SA+WB + Acidic Salt which re-reacts with water to form H+.

b. Half Equivalence Point: The pH=pKa of the weak acid or pOH=pKb of the weak base. And, the weak acid or base moles = its conjugates moles (salt). Used to find the equilibrium constant.

3. Mole Questions: One method for determining the amount of a given substance in solution is to form a precipitant that includes the substance. The precipitant is then filtered, and dried to constant mass. This process is called gravimetric analysis. For example if we wanted to determine the amount of chloride ions present in a given solid, we would weigh the solid sample, dissolve the sample in water, add an excess of silver nitrate solution to form the precipitant silver chloride. This precipitant would be filtered, and dried to constant mass. From the mass of silver chloride formed we can determine the moles of silver chloride and the moles of chloride ion in the original sample. The steps of a Typical Gravimetric Analysis:

SAMPLE WEIGHED 🡪 SAMPLE DISSOLVED 🡪 PRECIPITATE FORMED 🡪 PRECIPITATE FILTERED 🡪 PRECIPITATE DRIED 🡪 PRECIPITATE WEIGHED

4. Beer’s Law: The absorbance of light is proportional to the concentration of the solution it is shined through. The solution is added to a spectrophotometer that sends light through a specific path length (b) determined by the circumference of the cuvette or test tube the solution is in. The wavelength of that light has to be correlated to a color opposite of the color of the solution. A blue solution would need a red color for example. Use the formula A=abc on your reference table to determine the concentration (c). Always check your units. The formula can also be modified to A1/C1 = A2/C2 if the solution type and test tube remain the same.

**AP Net Ionic Equations Practice Problems**

*Rules: Group 1 ions, nitrates, acetates (with the exception of acetic acid), ammonia ions, and strong bases completely ionize. Strong acids ionize a Hydrogen ion in water and all Hydrogen ions in basic solutions.*

**Practice Exams**

1. Write a balanced net ionic equation for the reaction between Sr(NO3)2 and Na2CO3 that produces a precipitate.
2. Write the balanced net ionic equation for the reaction that occurs when HC2H3O2(*aq*) and NaOH(*aq*) are combined.
3. Write the net ionic equation for the formation of the precipitate CuCl.

**2014**

1. A student is given the task of determining the I- content of tablets that contain KI and an inert, water-soluble sugar as a filler. A tablet is dissolved in 50.0 mL of distilled water, and an excess of 0.20 *M* Pb(NO3)2(*aq*) is added to the solution. A yellow precipitate forms, which is then filtered, washed, and dried. The data from the experiment are shown in the table above.
	1. For the chemical reaction that occurs when the precipitate forms,
		1. write a balanced, net-ionic equation for the reaction, and
		2. explain why the reaction is best represented by a net-ionic equation.
2. (e) In another experiment, the student places a new Sn electrode into a fresh solution of 1.0 *M* Cu(NO3)2 .

| Half-Reaction | *E* ° (V) |
| --- | --- |
| Cu+ + *e*- 🡪Cu(*s*) | 0.52 |
| Cu2+ + 2*e*- 🡪 Cu(*s*) | 0.34 |
| Sn4+ + 2*e*- 🡪Sn2+ | 0.15 |
| Sn2+ + 2*e*- 🡪Sn(*s*) |  −0.14 |

* + 1. Using information from the table above, write a net-ionic equation for the reaction between the Sn electrode and the Cu(NO3)2 solution that would be thermodynamically favorable. Justify that the reaction is thermodynamically favorable.

**2015**

1. (a) Write the net-ionic equation for the reaction between KC6H7O2(*aq*) and HCl(*aq*).

| Compound | Melting Point (°C) |
| --- | --- |
| LiI | 449 |
| KI | 686 |
| LiF | 845 |
| NaF | 993 |

1. (b) Identify a compound from the table that can be dissolved in water to produce a basic solution. Write the net ionic equation for the reaction that occurs to cause the solution to be basic.

**2016**

1. (f) A student prepares a solution containing equimolar amounts of HC2H3O2 and Na C2H3O2. The pH of the solution is measured to be 4.7. The student adds two drops of 3.0M HNO3(aq) and stirs the sample, observing the pH remains 4.7. Write a balanced, net ionic equation for the reaction between HNO3(aq) and the chemical species in the sample that is responsible for the pH remaining at 4.7.
2. (f) Write the balanced net ionic equation between the following half reactions:

 I2(s) + 2e- 🡪 2I-(aq) 0.54V

 S4O62-(aq) + 2e- 🡪 2S2O32-(aq) 0.08V

**2017**

1. (c) (i) Explain why the addition of 0.100M NaOH(aq) to 0.100M HNO2(aq) can result in the formation of a buffer solution. Include the net ionic equation that occurs when the student adds the NaOH(aq) to the HNO2(aq).

**2018**

1. (d) Write the net ionic equation for the reaction given:

 Na2S2O3(aq) + 4NaOCl(aq) + 2NaOH(aq) 🡪 2Na2SO4(aq) + 4NaCl(aq) + H2O(l)

1. (b) (ii) Write the balanced net ionic equation for the overall reaction that occurs as the cell operates, given the total voltage is 1.54V and,

 Ag+ + e- 🡪 Ag(s) 0.80V

 Cr+3 + 3e- 🡪 Cr(s) -0.74V

**2019**

2. (b) A chemistry teacher wants to prepare Br2. The teacher has access to the following three reagents: NaBr(aq), Cl2(g), and I2(s).

 Half-Reaction E° at 25°C (V)

Br2 + 2e- → 2Br- 1.07

Cl2 + 2 e- → 2Cl- 1.36

I2 + 2e- →2I- 0.53

Using the data in the table above, write the balanced equation for the thermodynamically favorable

reaction that will produce Br2 when the teacher combines two of the reagents. Justify that the reaction is thermodynamically favorable by calculating the value of E° for the reaction.

3. (a) Na2CO3(aq) + Ca(NO3)2(aq) → 2NaNO3(aq) + CaCO3(s)

Write the net ionic equation for the reaction that occurs when the solutions of Na2CO3 and Ca(NO3)2 are mixed.

**2021**

1. (d) (i) H2NNH2(aq) + H2O(l) → H2NNH3+(aq) + OH-(aq)

 In aqueous solution, the compound H2NNH2 reacts according to the equation above. A 50.0 mL sample of 0.25M H2NNH2 (aq) is combined with a 50.0 mL sample of 0.25 M HCOOH(aq). Write the balanced net ionic equation for the reaction that occurs when H2NNH2 is combined with HCOOH.

1. (c) At high temperatures, SiH4 decomposes to form solid silicon and hydrogen gas. Write a balanced equation for the reaction.
2. (a) A student is given the task of determining the molar concentration of a CuSO4 solution using two different procedures, precipitation and spectrophotometry. For the precipitation experiment, the student adds 20.0 mL of 0.200 M Ba(NO3)2 to 50.0 mL of the CuSO4( aq). The reaction goes to completion, and a white precipitate forms. The student filters the precipitate and dries it overnight. Write a balanced net ionic equation for the precipitation reaction.

**2022**

7. (b) Silver oxalate, Ag2C2O4(s), is slightly soluble in water. The molar solubility increases when it is dissolved in 0.5 M HClO4(aq) instead of neutral distilled water. Write a balanced, net-ionic equation for the process that occurs between species in solution that contributes to the increased solubility of Ag2C2O4(aq) in HClO4(aq).

**2023**

1. (f)(i) Another compound of manganese, MnO2, is used in alkaline batteries, represented by the following diagram. Some half-reactions are given in the table.



Based on the half-reactions given in the table, write the balanced net ionic equation for the reaction that has the greatest thermodynamic favorability.

 3. (a) CaCO3(s) + 2HCl(aq) → CaCl2(aq) + CO2(g) + H2O(l)

 Write the balanced net ionic equation for the reaction.