

AP Test Review**LAST MINUTE THINGS TO KNOW****These are NOT tested on the AP Chemistry Test**

1. Arrhenius Equation
2. Colligative Properties
3. Quantum Numbers
4. Names of Organic Compounds and Functional Groups
5. Nuclear Chemistry (e.g. radioactive decay)
6. Phase Diagrams

Bits and Pieces

1. Breaking bonds is endothermic and absorbs energy, while forming bonds is exothermic and releases energy.
2. Hydrogen bonding is not a bond.
3. Lone pair electrons do not make a compound polar. Lone pair electrons affect the molecular shape and orientation of polar bonds. Polar bonds that do not cancel make a compound polar.
4. Organic carboxylic acids (RCOOH or RCO_2H) are acidic and amines (NR_3) are basic.
5. Conjugates of strong acids and cations of strong bases are neutral in aqueous solution.
6. Changing states of molecular compounds involves breaking IMFs, not bonds.
7. There are five network covalent solids: graphite, diamond, Si, SiO_2 (silica), and SiC.
8. HF is a weak acid.
9. 22.4 L/mol can only be used for a GAS at STP (1 atm and 0°C). Use density to calculate the volume of other substances.
10. Substances at the same temperature have the same kinetic energy, but have different speeds: a heavier molecule moves slower. Say “heavier” and “lighter”, not “bigger” and “smaller.”
11. Periodic Trends are not explanations. (For example, don't state “F has a higher ionization energy than O because IE increases going across a period.”). Use nuclear charge or electron shell explanation instead.
12. Le Chatelier's Principle by itself is not an explanation. (For example, don't say “by Le Chatelier's Principle, the reaction shifts to the right.”) Use a Q vs. K explanation instead.
13. Gases behave ideally when they are small and have very weak IMFs, and when they're at high temperatures and low pressures.
14. Phenolphthalein is colorless in acidic solution ($\text{pH} < 9$) and pink in basic solution ($\text{pH} > 9$)
15. K_p expressions include only gas pressures.
16. In equilibrium (ICE Box) problems, use the 5% approximation when the initial concentration and K differ by a factor of at least 10^3 .
17. The first step when a weak acid and strong base (or vice versa) are mixed is stoichiometry (use moles and find the limiting reactant).
18. When a weak acid is titrated with a strong base, at halfway point, $[\text{HA}] = [\text{A}^-]$ so $\text{pH} = \text{pK}_a$. At the equivalence point, only $[\text{A}^-]$ is present, so the solution has a basic pH.
19. Entropy (S) is in $\text{J/mol}\cdot\text{K}$, while Free Energy (ΔG) and Enthalpy (ΔH) are in kJ/mol. Remember to change units from J to kJ.
20. $R = 0.0821 \text{ atm}\cdot\text{L}/(\text{mol}\cdot\text{K})$ only in $P\cdot V = n\cdot R\cdot T$. In any formula that involves energy, $R = 8.314 \text{ J/mol}\cdot\text{K}$.
21. Reduction takes place at the cathode, and oxidation takes place at the anode (an ox / red cat).
22. In a Galvanic cell, if $Q < 1$, $E > E^\circ$ because the cell is further from equilibrium.
23. Smaller K_{as} or larger pK_{as} are weaker acids. Weaker acids result in stronger conjugate bases.
24. In a compound, F has an oxidation state of -1 , oxygen is usually -2 (except for peroxide: -1), and hydrogen is usually $+1$ (except for hydride: -1).

25. Ions (not electrons) travel through salt bridges. Electrons travel through the external circuit from the anode to the cathode.
26. Straight line graph for [X] vs. time indicates 0 order reaction, $\ln[X]$ vs. time indicates 1st order reaction, and $1/[X]$ vs. time indicates 2nd order reaction.
27. Only first order reactions have constant half lives ($t_{1/2} = \ln 2/k$)
28. The $1/[X]$ vs. time graph for a 2nd order reaction has a positive slope.
29. Orders in a rate law cannot be determined by the balanced equation, but only by experimental data.
30. Bromine and mercury are liquids at room temperature. Iodine is a solid.
31. "Thermodynamically favorable" means "spontaneous." This is when $\Delta G < 0$, $E > 0$, and $K > 1$.
32. Use Beer's Law for colored solutions.
33. Colors of ions in solution: cobalt is pink, dichromate is orange, chromate is yellow, nickel is green, copper is blue, and permanganate is purple.
34. When a reaction appears to stop, it could be because: (1) it is an irreversible reaction and has reached completion (a reactant has run out), (2) it is a reversible reaction and has reached equilibrium ($Q = K$ and $\Delta G = 0$), or (3) the reaction is going very slowly because it has a very high activation energy.
35. Weak intermolecular forces mean low melting point, low freezing point, and high vapor pressure.
36. Values of K_{eq} change when the temperature changes.
37. When a reaction is doubled, thermodynamic quantities (ΔG , ΔH , and ΔS) are doubled, equilibrium quantities (K) is squared, but electrical potential (E) is unchanged.
38. Si is a semiconductor. Doping it with a Family 13 element (B, Al) creates a p-type semiconductor, while doping it with a Family 15 element (N, P) creates an n-type semiconductor.
39. Mass spectrum shows the types and abundance of the isotopes of an element by their mass number (protons + neutrons). It does not give any information about electrons.
40. Microwaves are involved in molecular rotations, IR radiation is involved in bond vibrations, visible light and UV light are involved in electron transitions (Beer's Law) and x-rays are involved in electron ejections (PES).
41. According to Coulomb's Law, strength of electrostatic interactions is directly related to the charges of the particles and inversely related to the square of their distance/sizes ($F = k \cdot q_1 \cdot q_2 / d^2$). This relates to proton-electron interactions (e.g. ionization energy), strength of ionic bonds (e.g. lattice energy), and strength of IMFs.
42. Precipitation occurs when $Q > K_{sp}$.
43. Compounds with more electrons have a more polarizable electron cloud (not more clouds), resulting in stronger London Dispersion Forces.
44. An ideal buffer has equal moles of a weak acid HA and its conjugate base A^- , and can be prepared with the weak acid and half the moles of a strong base OH^- .
45. 1 amp = 1 C/s

Things NOT Provided on the AP Test (Memorize)

- For gases, $MM = \frac{D \cdot R \cdot T}{P}$
- 0 Order Integrated Rate Law: $[A]_t - [A]_0 = -k \cdot t$
- Nernst Equation: $E = E^\circ - \frac{R \cdot T}{n \cdot F} \ln Q$
- Coulomb's Law: $F = \frac{k \cdot q_1 \cdot q_2}{d^2}$
- Enthalpy of Reaction: $\Delta H_{rxn} = \frac{q}{n_{rxn}}$
- Change in Energy: $\Delta E = q + w$ $w = -P \cdot \Delta V$
- Solubility Rules, lists of Strong Acids and Bases, and Gases that form
- Molecular shapes and bond angles