



CHM 1025

Final Exam Review

Academic Resources

Welcome!

- Lead: Erin Kaufman
- Support: Angelica Caraballo-Santiago
- Please have your periodic table and a calculator!

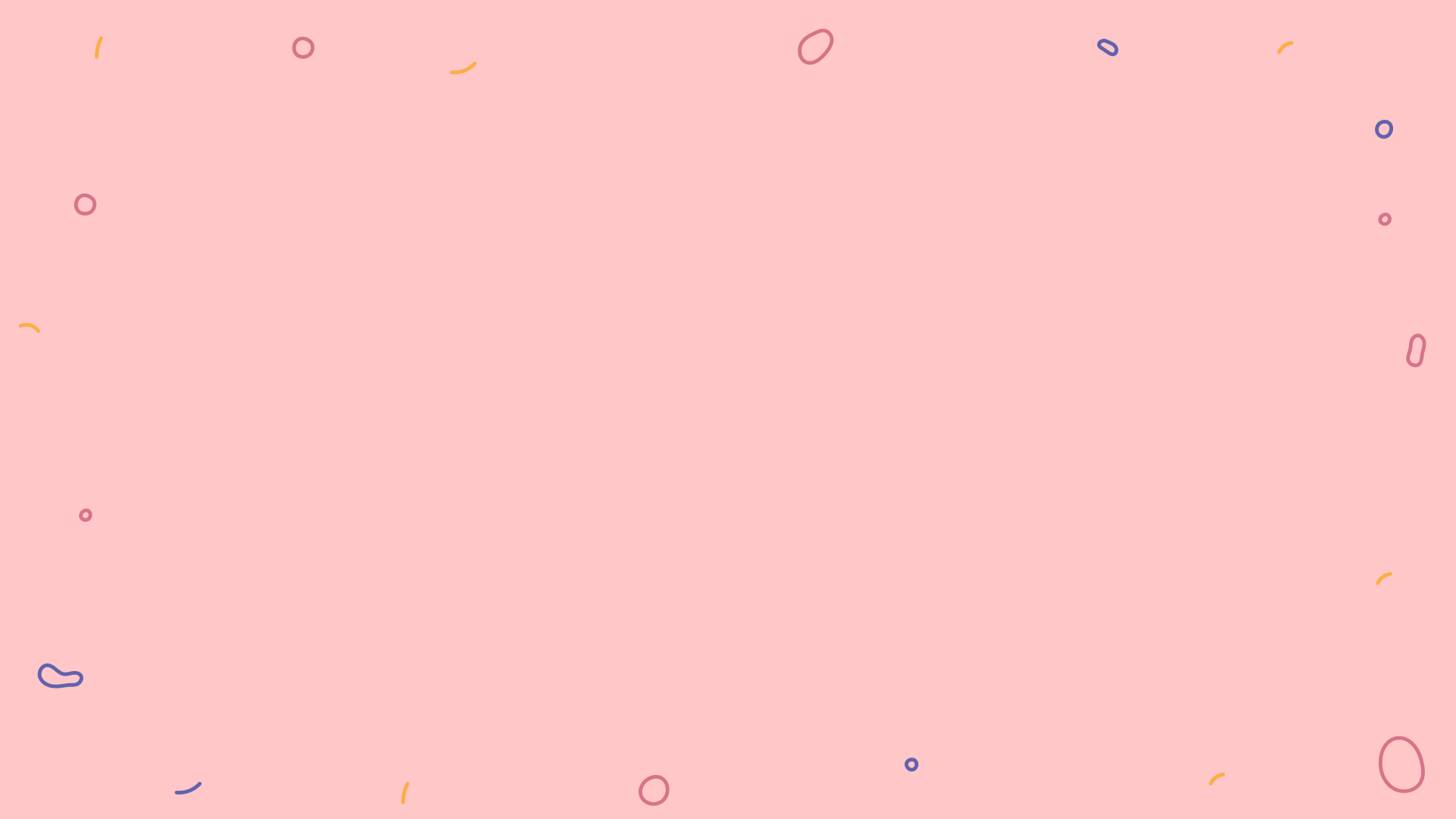
Limiting Reagent

The background is a solid light pink color. It is decorated with various small, hand-drawn shapes in blue, yellow, and red. These shapes include circles, ovals, and irregular lines, scattered across the page, giving it a festive or celebratory appearance.

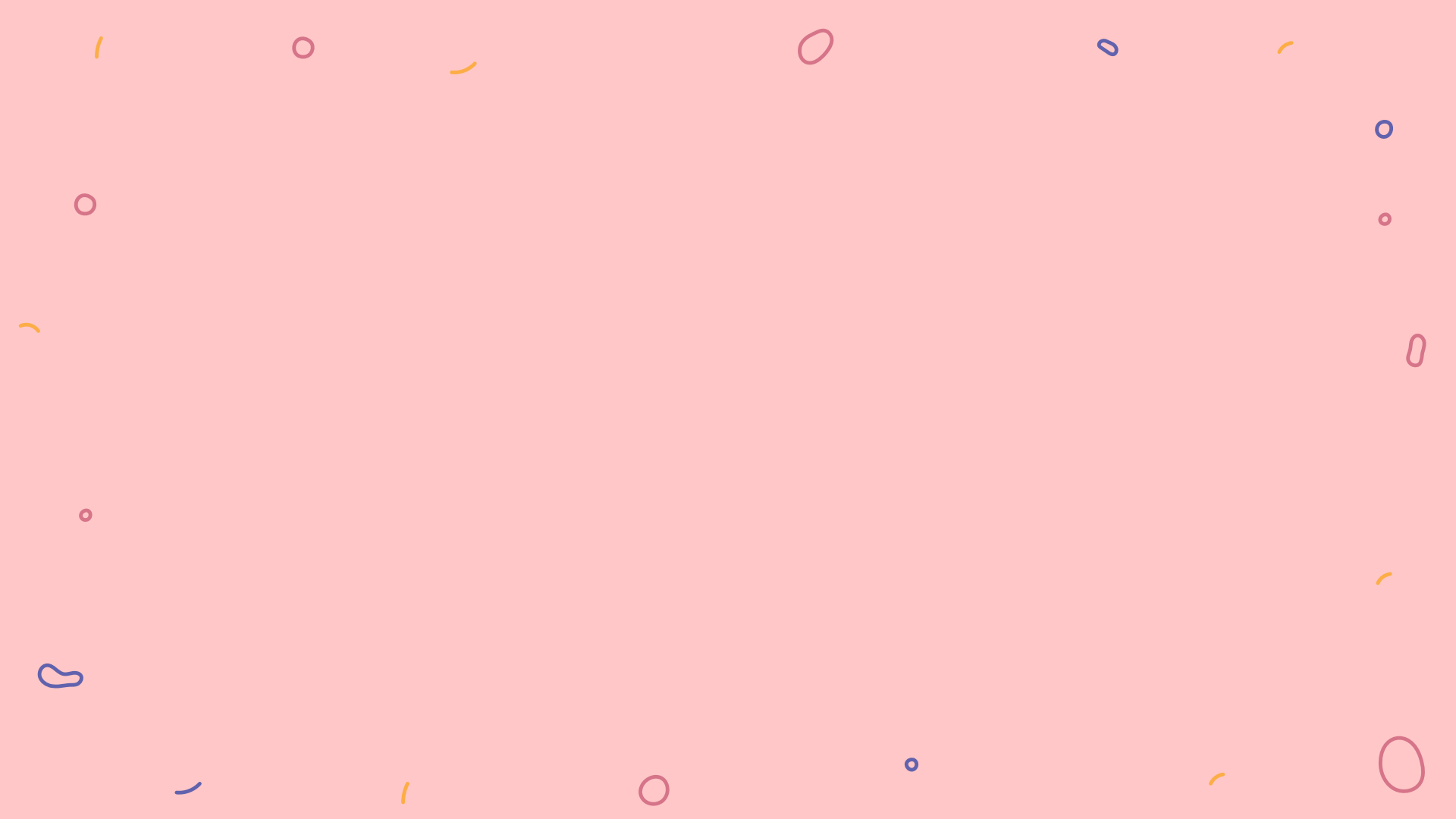
What is limiting reagent?

- Two reagents react, you need to find out how much of each reacted
- There will be less of one reagent available to react, this will be your limiting reagent
- Use dimensional analysis to:
 - Determine how much of each reagent reacts
 - Determine limiting reagent
 - Use limiting reagent to determine how much product is formed

Consider the following reaction: $4\text{NH}_3 + 5\text{O}_2 \rightarrow 4\text{NO} + 6\text{H}_2\text{O}$. If 3.25 g NH_3 are allowed to react with 3.50 g O_2 , how many grams of NO are formed?



Consider the following reaction: $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$. If you use 30g of N_2 and 10 g of H_2 , what is the mass of the excess reagent?



Redox Reactions

The background is a solid light pink color. It is decorated with various small, colorful shapes scattered around the edges, resembling confetti or abstract doodles. These shapes include small circles, teardrop-like forms, and irregular loops in shades of blue, yellow, and pink.

Finding Oxidation Numbers

- Oxidation number
 - The hypothetical charge of an atom if all of its bonds to different atoms were fully ionic
- Group 1 metals: always +1
- Group 2 metals: always +2
- Oxygen: usually -2
- Hydrogen: usually +1
- Halogens: usually -1
- Elements by themselves = 0!

What is the oxidation number of each atom in Fe_2O_3 ?

What is the oxidation number of each atom in H_2CO_3 ?

How Oxidation Numbers Relate to Redox

- Loss of electrons: oxidation
 - Charge gets more positive
- Gain of electrons: reduction
 - Charge gets more negative
- Remember: LEO the lion goes GER!
 - (Loss of Electrons=Oxidation, Gain of Electrons=Reduction)



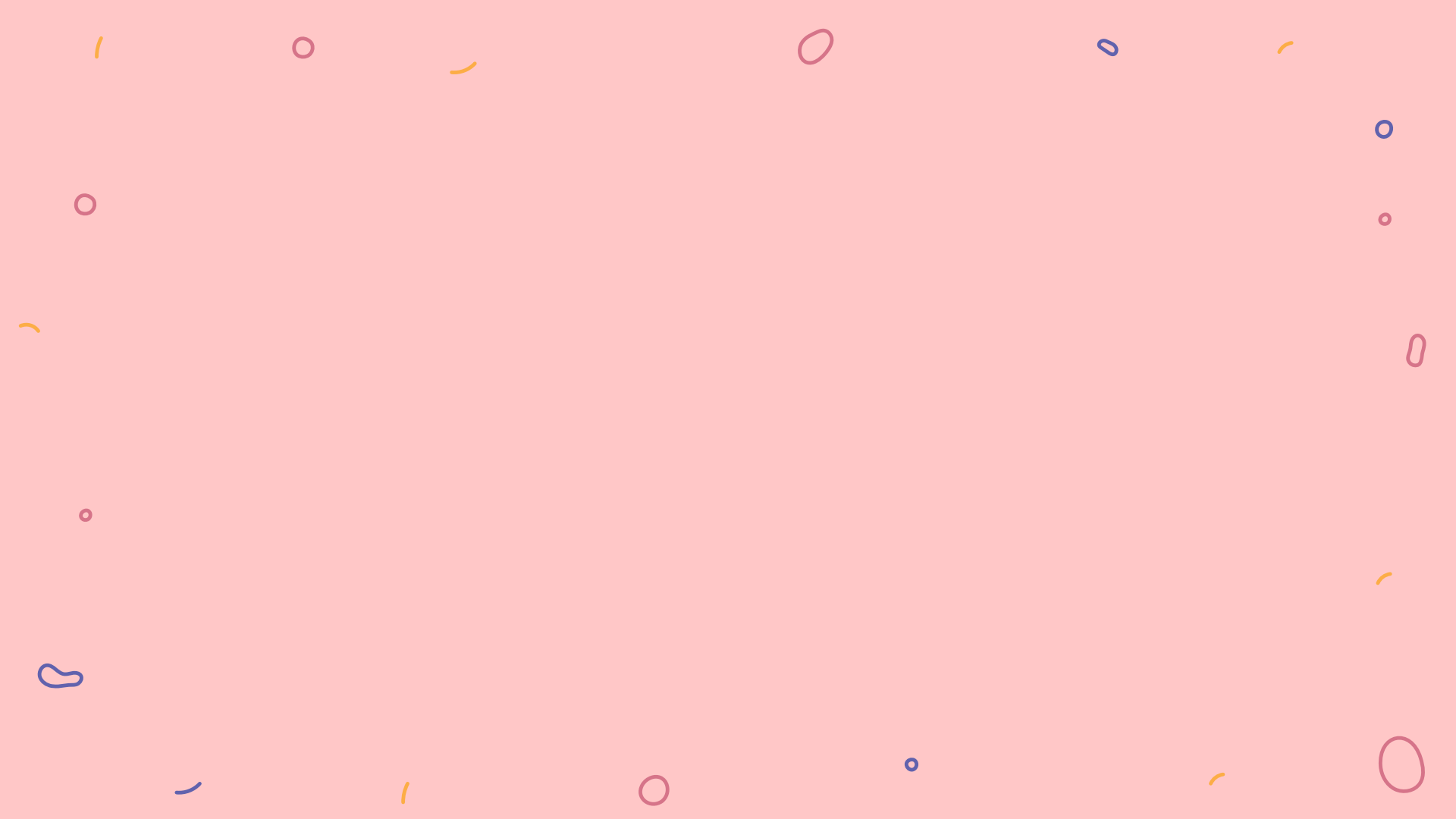
In the reaction, $2\text{HCl} + \text{Zn} \rightarrow \text{H}_2 + \text{ZnCl}_2$, which reactant is oxidized and which reactant is reduced?

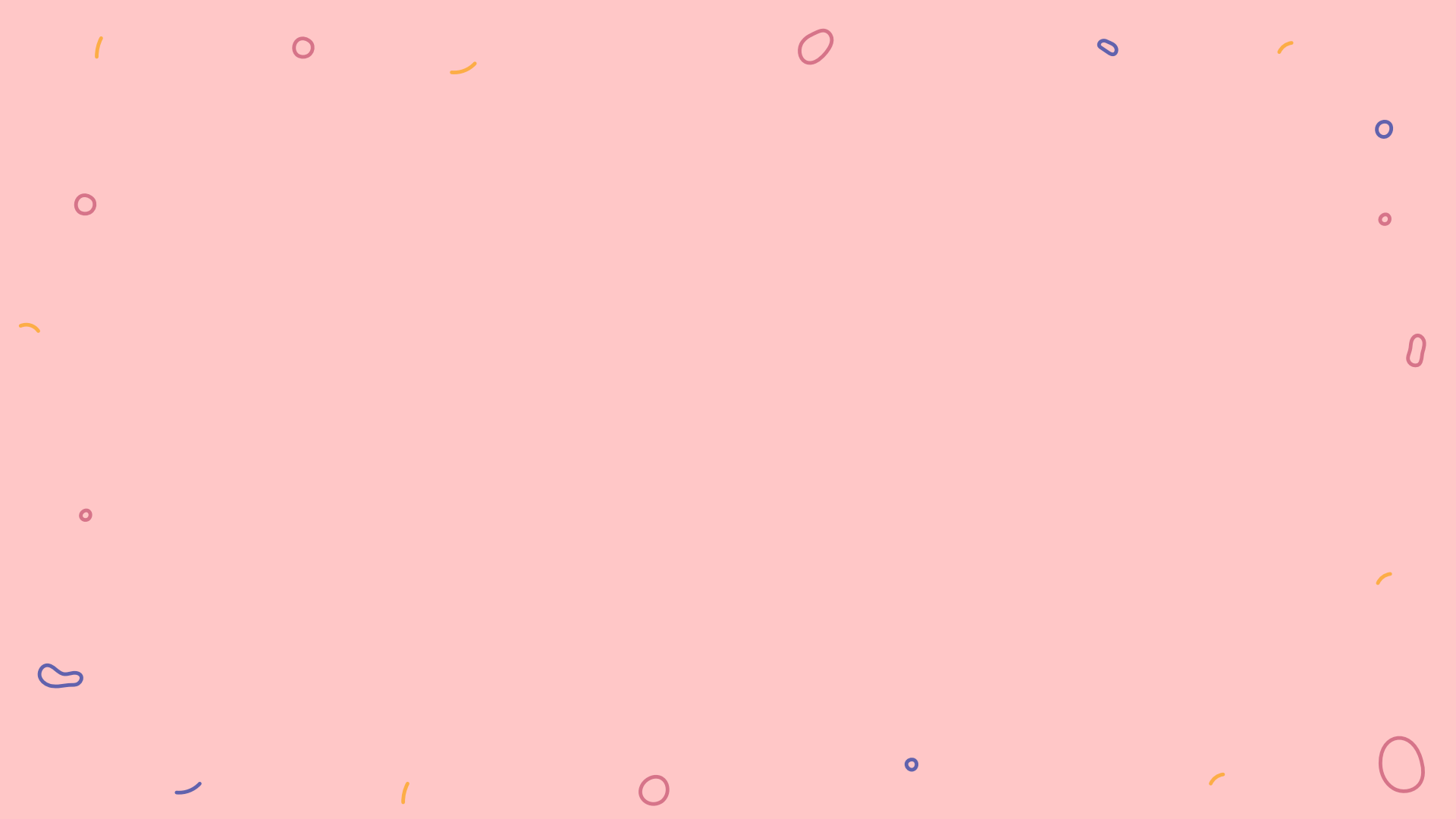
In the reaction, $\text{Au} + 4\text{H}^+ + \text{NO}_3^- + 4\text{Cl}^- \rightarrow \text{AuCl}_4^- + 2\text{H}_2\text{O} + \text{NO}$, which reactant is the oxidizing agent?

Balancing Redox Reactions

- Half reaction method
 - Balance each species individually
 - Electrons are included
 - Ensure that electrons lost= electrons gained
 - Combine half reactions

Balance $\text{MnO}_4^- + \text{SO}_3^{2-} \rightarrow \text{MnO}_2 + \text{SO}_4^{2-}$ using the half reaction method





Titration

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Titration

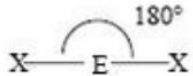
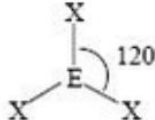
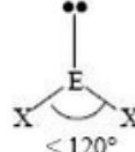
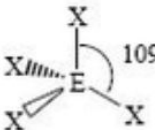
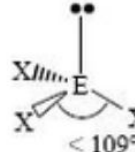

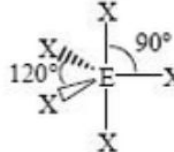
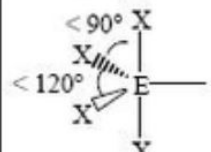
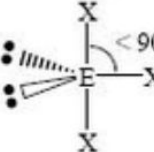
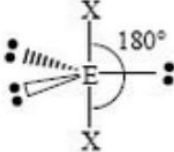
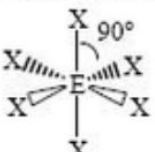
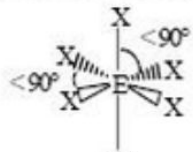
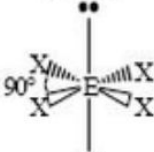
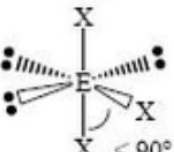
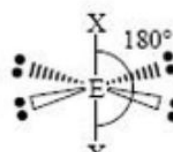
- You will have an acidic/basic solution
- You want it to become neutral, so you add base (acidic solution) or acid (basic solution)
- Titration stops when the solution is neutral

It takes 83 mL of a 0.45 M NaOH solution to neutralize 235 mL of an HCl solution. What was the initial concentration of the HCl solution?

It takes 38 mL of 0.75 M NaOH solution to completely neutralize a 0.092 M solution of sulfuric acid (H_2SO_4). What was the initial volume of the sulfuric acid solution, in mL?

Molecular Geometry

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Steric No.	Basic Geometry 0 lone pair	1 lone pair	2 lone pairs	3 lone pairs	4 lone pairs
2	 <p>Linear</p>				
3	 <p>Trigonal Planar</p>	 <p>Bent or Angular</p>			
4	 <p>Tetrahedral</p>	 <p>Trigonal Pyramidal</p>	 <p>Bent or Angular</p>		
5	 <p>Trigonal Bipyramid</p>	 <p>Sawhorse or Seesaw</p>	 <p>T-shape</p>	 <p>Linear</p>	
6	 <p>Octahedral</p>	 <p>Square Pyramid</p>	 <p>Square Planar</p>	 <p>T-shape</p>	 <p>Linear</p>

What is the molecular geometry of NH_3 ?

What is the molecular geometry of SF₆?

Naming

The background is a solid light pink color. It is decorated with various small, hand-drawn style elements scattered around the perimeter. These include small circles in shades of blue, pink, and yellow, as well as short, curved lines in the same color palette. The overall aesthetic is clean, modern, and slightly whimsical.

Ionic Compounds

- Cation, then anion
- Normal ending for cation, -ide ending for anion
- Remember: polyatomic anion names may not adhere to this, use THEIR name
 - Ex. sulfate ion
- Transitions metals' charge indicated in name
 - Determine using deductive reasoning with anion
 - Ex. FeCl_2 is iron (II) chloride

Covalent Compounds

- Name non-metal furthest to the left by its elemental name
- Name the other non-metal by its elemental name and -ide ending
- Use prefixes to indicate the number of that element in the molecule
 - 1-mono, 2-di, 3-tri, 4-tetra, 5-penta, 6-hexa, 7-hepta, 8-octa, 9-nona, 10-deca-
- If mono is the first prefix, you do not need to include it
- Example: N_2O_4 is dinitrogen monoxide

What is the molecular formula of iron (III) oxide?

What is the molecular formula of carbon tetrachloride?

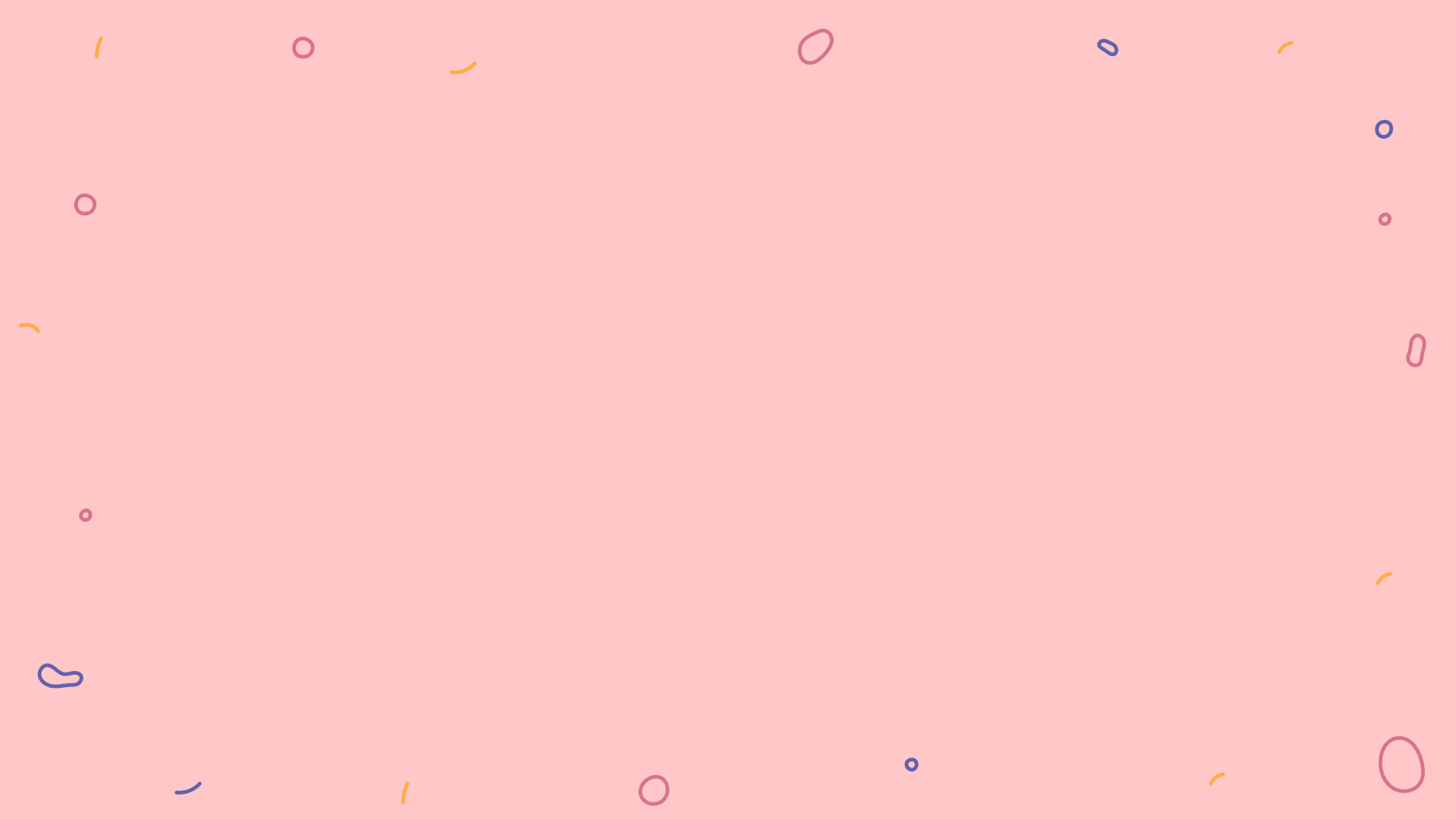
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Empirical vs. Molecular Formula

Empirical vs. Molecular Formula

- Empirical formula
 - The simplest formula that shows the combination of atoms
 - No associated molar mass
- Molecular formula
 - Variant of empirical formula
 - Must be given molar mass in order to determine

A compound is 40.3% carbon, 6.7% hydrogen, and 53% oxygen by mass, and has a molar mass of 60.05 g/mol. What is its molecular formula?



Specific Heat

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Specific Heat (c)

- Characteristic of a substance
 - Not dependent on total mass!
- Amount of heat per unit mass required to raise the temperature by 1°C
- Equation: $q=mc\Delta t$
 - Question types
 - Can be asked about q , m , or Δt , and you will be given c and 2 variables
 - Can be asked to find c , given 2 variables (one of them being q)

Given that the specific heat of water is $4.184 \text{ J/g} \cdot ^\circ\text{C}$, if a water sample increases 3°C when given 50 J of heat, how much water was in the sample, in grams?