COMPOUND CHALLENGE

Compound Challenge

Game Theme
Chemical Compounds

Grade Level
VIII-X

Game Type
Card Game

Game Overview

- This card game is designed to enhance students' knowledge and skills in forming chemical compounds by applying valency rules. Students will learn how to combine elements to form compounds, reinforcing their understanding of atomic interactions and chemical bonding. The game offers a hands-on approach to practicing valency and compound formation, making abstract chemistry concepts more concrete and engaging. To engage in this gameplay effectively, players should use their knowledge of valency and chemical bonding to determine if a valid compound can be formed. Also, players must think carefully about which cards to use and which compounds to form to maximize their score.
- By the end of the gameplay, players will be able to apply their knowledge of valency rules to create and validate chemical compounds.
- The game is divided into two levels:
  - Level 1 focuses on forming compounds using elements with valency 1 and 2.
  - Level 2 increases complexity by requiring compounds that involve elements with valency 3.
- A complete game set, for one group, includes the following materials:
  - 52 element cards
  - Answer sheet

Gameplay Instructions

- There are 52 element cards, each representing a specific element. The number of cards for each element varies based on the game setup. Each card has an element symbol on the front.
- Elements have different valencies, and students must combine them based on these valencies to form valid compounds.
- Students will play this game in group of four.

Level 1: Forming Compounds with Valency 1 and 2

- Players in Level 1 will focus on forming simpler compounds, primarily 1-atom or 2-atom compounds. These involve elements with valency 1 or 2, making it easier to combine elements.
- Use 32 cards representing elements with valency 1 and 2. Examples of Valency 1 elements include Hydrogen (H), Chlorine (Cl), Sodium (Na), Fluorine (F). Examples of Valency 2 elements: Oxygen (O), Calcium (Ca), Carbon (C), Sulfur (S).
- Shuffle the cards without looking at the faces (element symbols).
- The distributor places four cards face-up in the center of the table.
- Deal 7 cards to each player. First, deal 4 cards to each player.Then deal 3 more cards to each player
- Any player can begin the game and try to form a compound consisting of 1 or 2 valency using one of the element cards in their hand and one of the cards in the center.
- For example:
    - 1 card of Na (Sodium, valency 1) + 1 card of Cl (Chlorine, valency 1) - Players combine these two elements to form Sodium Chloride (NaCl):
    - 1 card of O (Oxygen, valency 2) + 2 cards of H (Hydrogen, valency 1) - Players combine these to form Water (H_2O):
- If players successfully form a compound, they collect the two cards (their card and the card from the center) and set them aside for scoring.
- If the player cannot form a valid compound, they must place one of their cards from their hand face-up in the center and pass their turn.
- The next player takes their turn following the same process (either forming a compound by matching valencies or placing a card in the center).
- Players can only play one card per turn.
- Each correctly formed compound that adheres to valency rules for valency 1 and 2 earns the player 10 points. The game continues until all players have used the cards in their hands.
- Once all cards have been played, the points are tallied. The player with the highest score wins the round, and the pair with the highest combined score wins the match.

Level 2: Forming Compounds with Valency 3

- In Level 2, players are required to form more complex compounds, including 3-atom compounds and those requiring balancing to account for higher valency elements. Players may need to balance the number of atoms used to create valid compounds.
- Use all 52 cards, representing elements with valency 1, 2, and 3.
- Shuffle the deck without looking at the faces (element symbols). The distributor places four cards face-up in the center of the table.
- Deal cards to each player in the following order: First, deal 5 cards to each player. Then deal 4 more cards to each player. Finally, deal 3 cards to each player.
- Any player begins the game and tries to form a valid chemical compound by combining one of the element cards in their hand with two cards from the center (or one from their hand and two from the center), following valency rules for valency 3 elements.
- Examples of Compounds in Level 2:
  - 1 card of N (Nitrogen, valency 3) + 3 cards of H (Hydrogen, valency 1) – Players combine these to form Ammonia (NH_3).
  - 3 cards of Al (Aluminum, valency 3) + 2 cards of O (Oxygen, valency 2), Players combine these to form Aluminum Oxide (Al_2O_3)
- If the player successfully forms a compound, they collect the cards and set them aside for scoring.
- If the player cannot form a valid compound, they must place one of their cards from their hand face-up in the center and pass their turn.
- The next player, moving clockwise, takes their turn following the same process (either forming a compound by matching valencies or placing a card in the center).
- Players can only play one card per turn.
- Each correctly formed compound that adheres to valency rules for valency 3 earns the player 20 points.
- The game continues until all players have used the cards in their hands.
- Once all cards have been played, the points are tallied. The player with the highest score wins the round, and the pair with the highest combined score wins the match.

Debreifing and Reflection

After gameplay, engage students with the following prompts:

- How did the game help you understand the role of valency in compound formation?
- Which compound combinations were most difficult to form, and why? What did this teach you about the ratios of atoms in real chemical formulas?
- How did this activity improve your ability to identify chemically valid compounds and distinguish between correct and incorrect valency pairings?

Adaptations for Gamplay

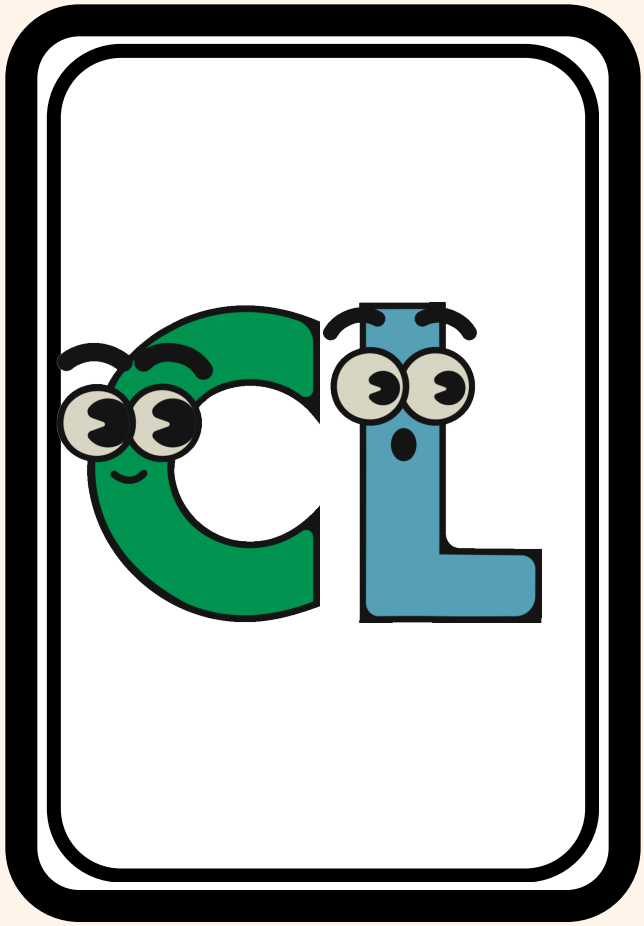
For lower grades: Teachers can simplify the game by reducing the number of cards or selecting only basic elements with lower valency. Additionally, they can limit the game to the formation of simpler 1-atom compounds to make the learning experience more accessible for younger students.

For higher grades: For more advanced students, teachers can introduce additional elements and increase complexity by incorporating more challenging compounds that require 3 or 4 atoms, encouraging students to apply higher-level balancing and chemical bonding concepts.





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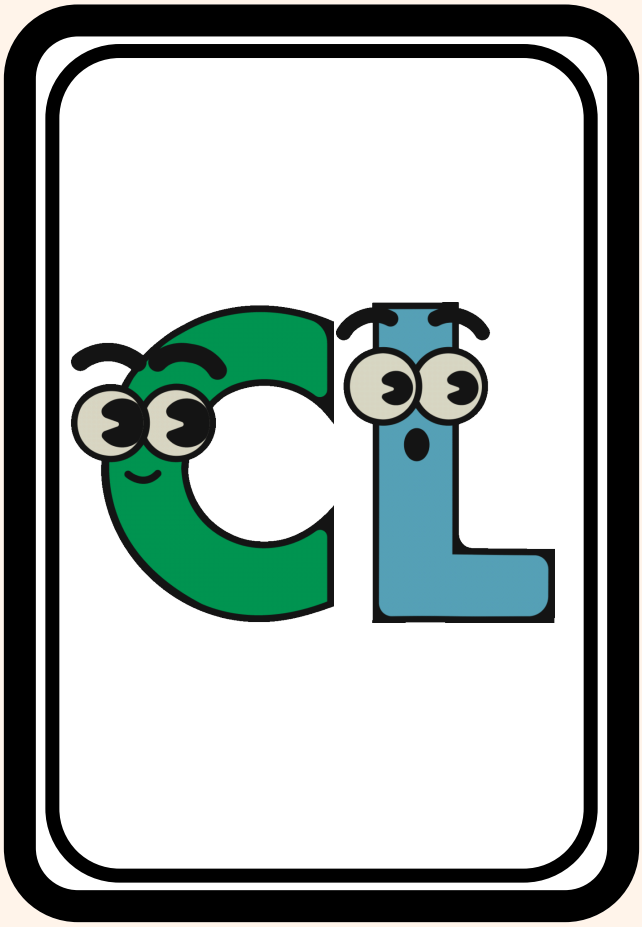
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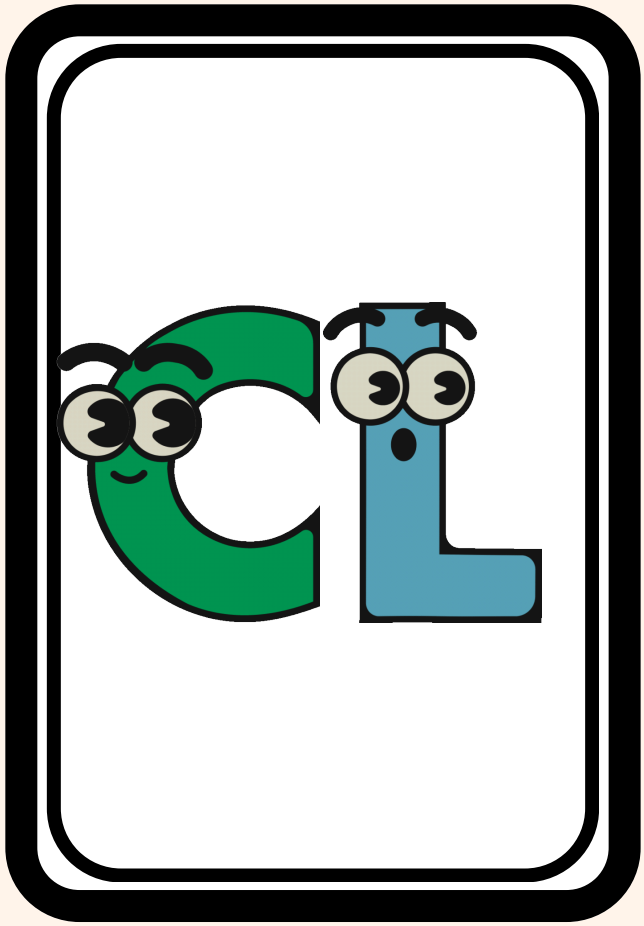
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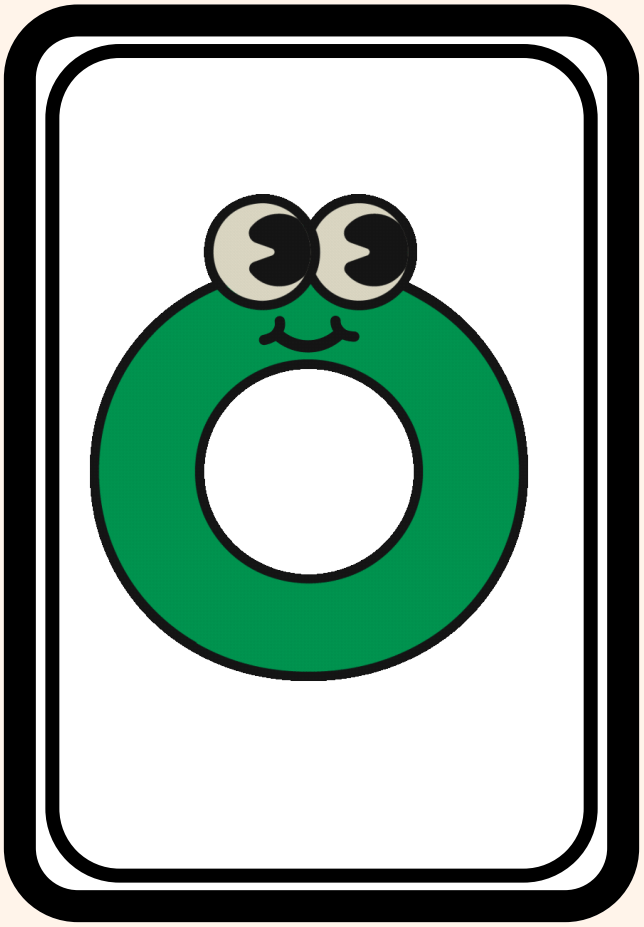
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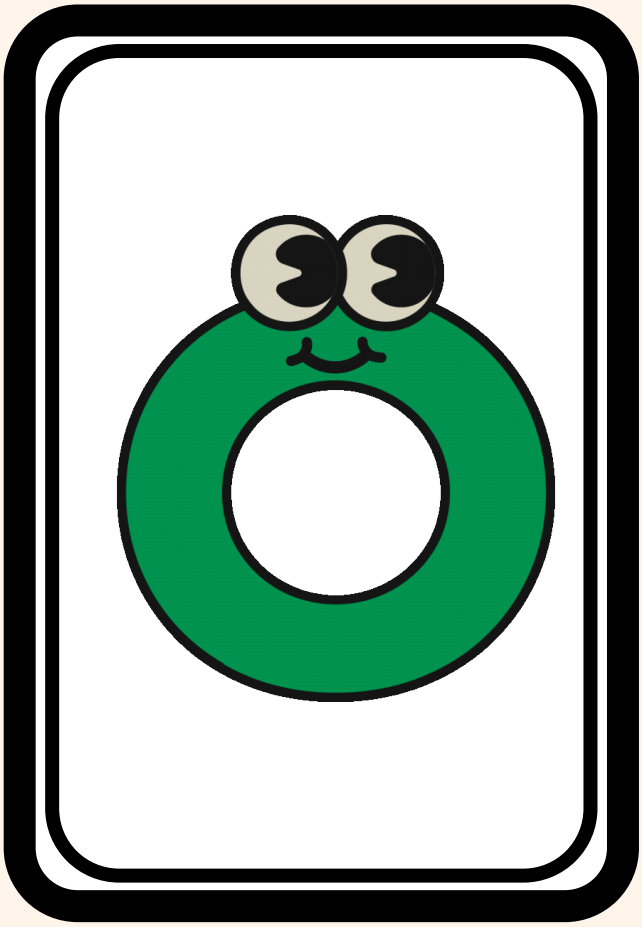
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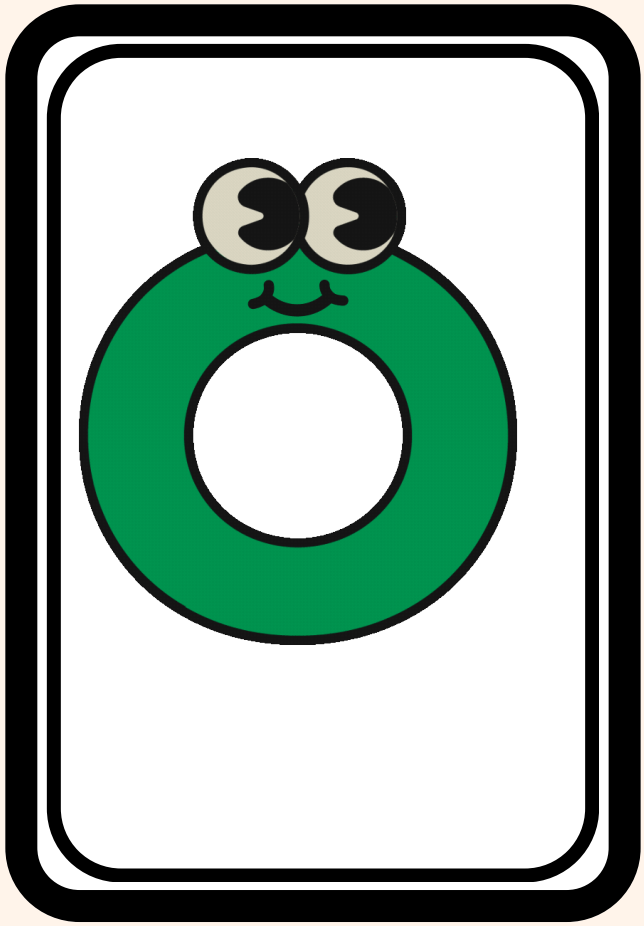
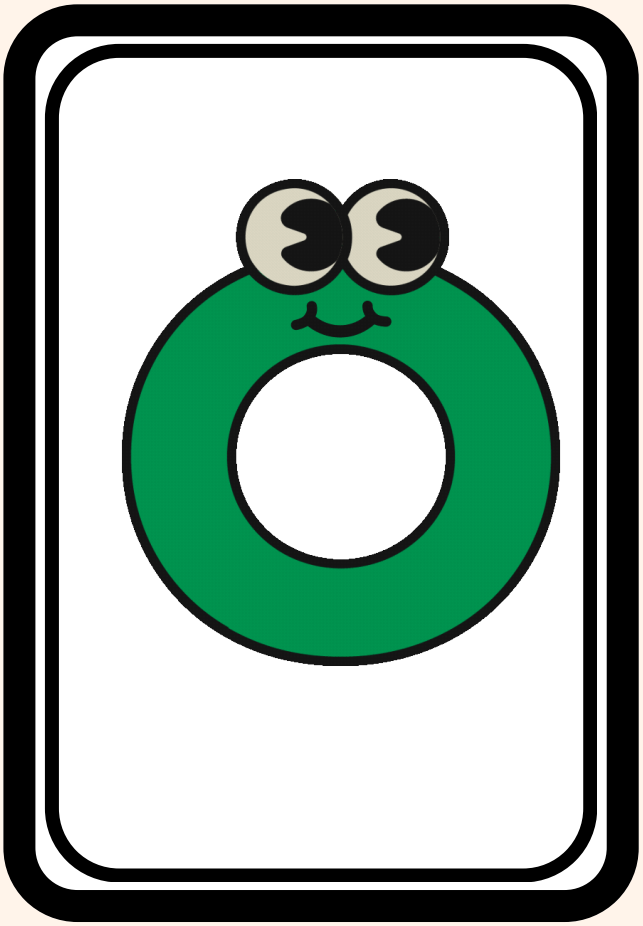
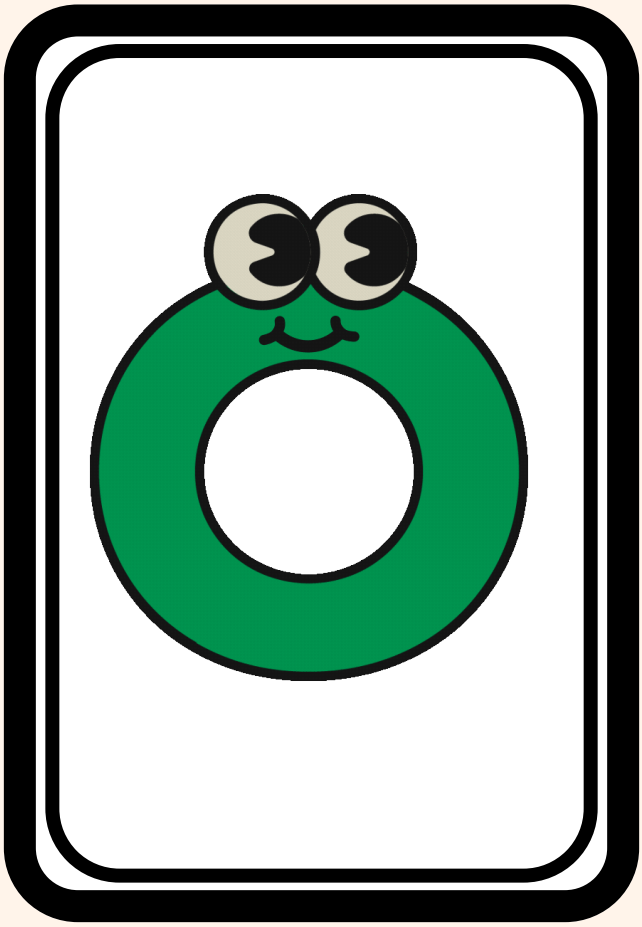
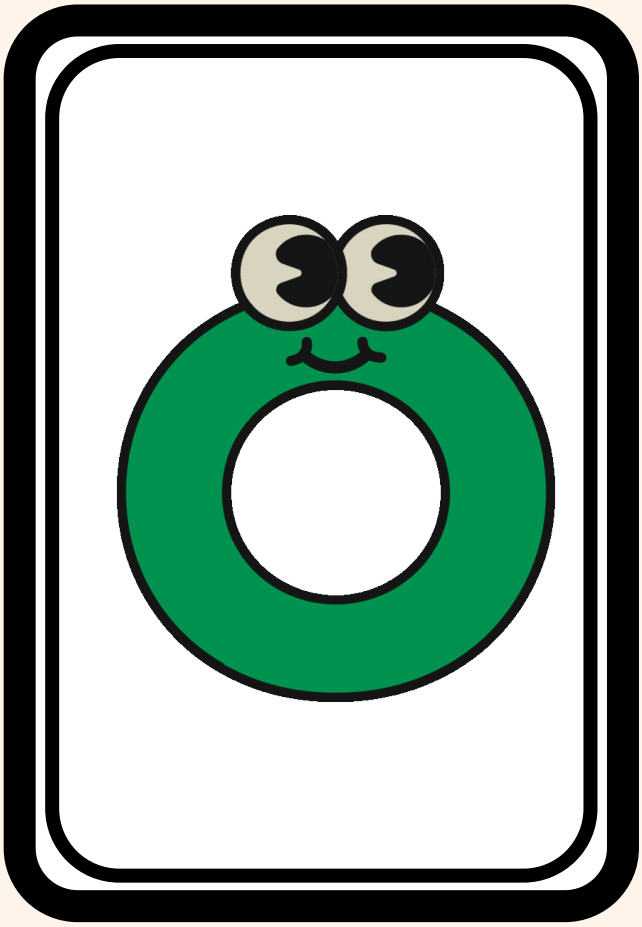

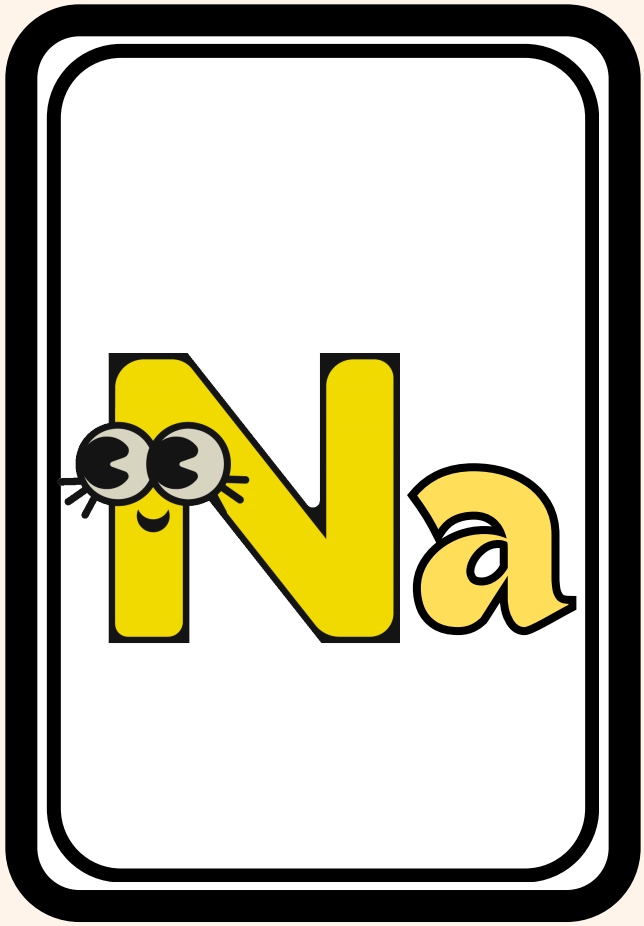
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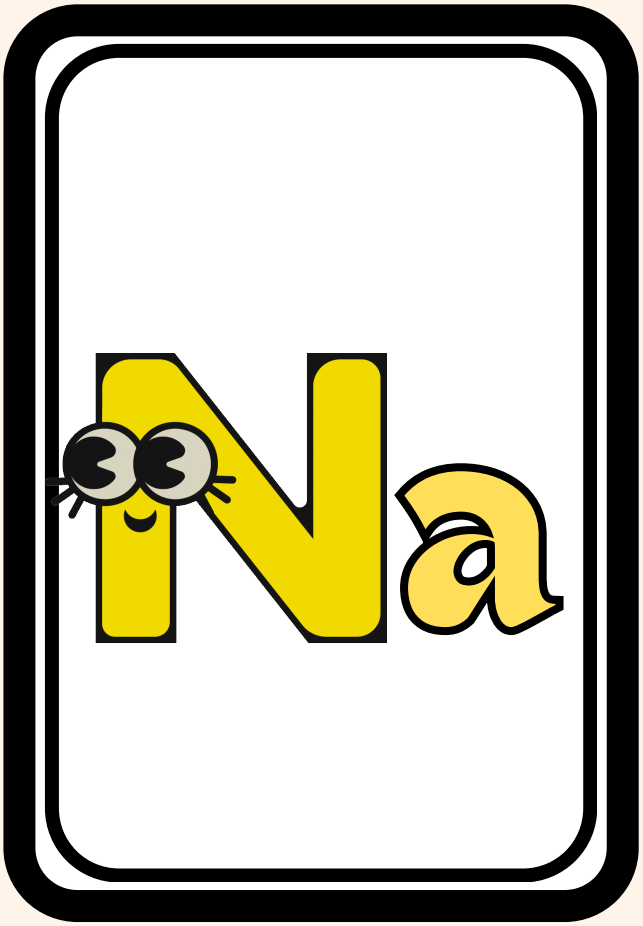
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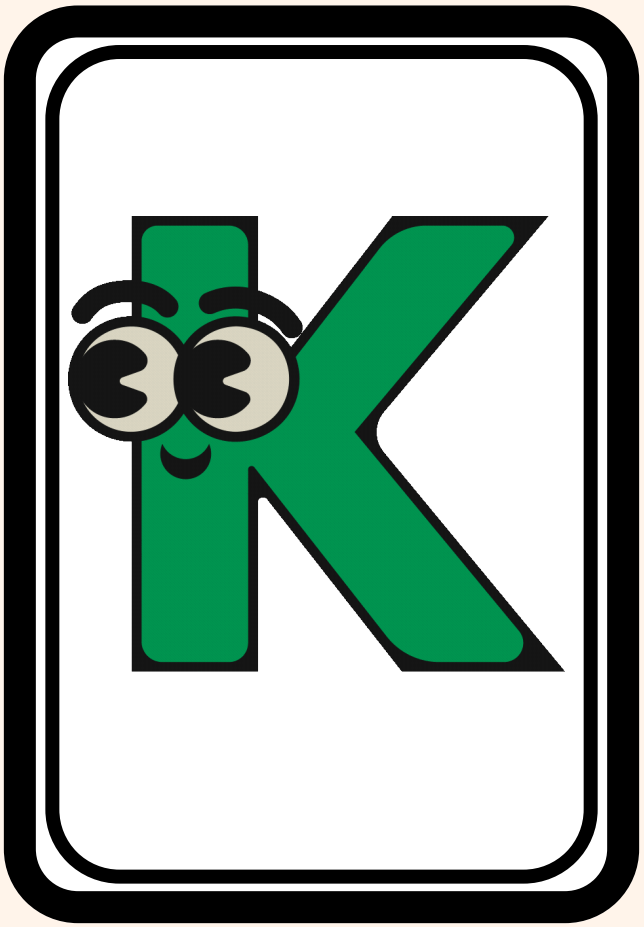
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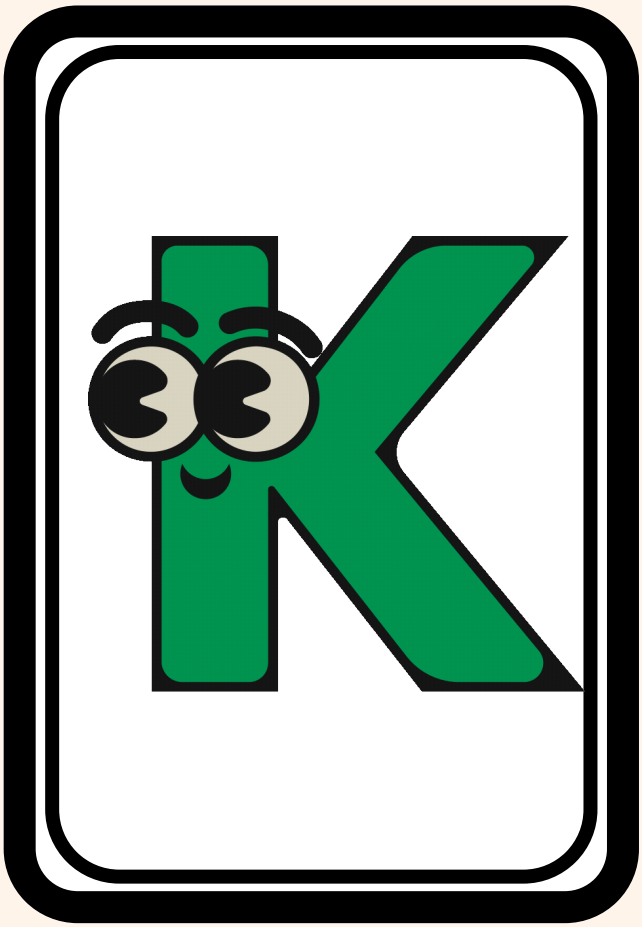
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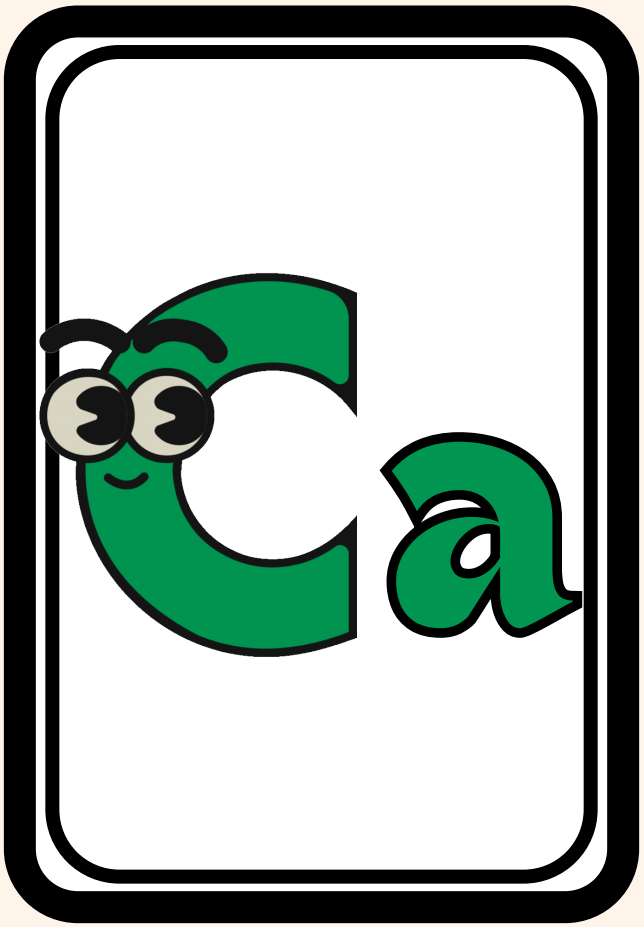
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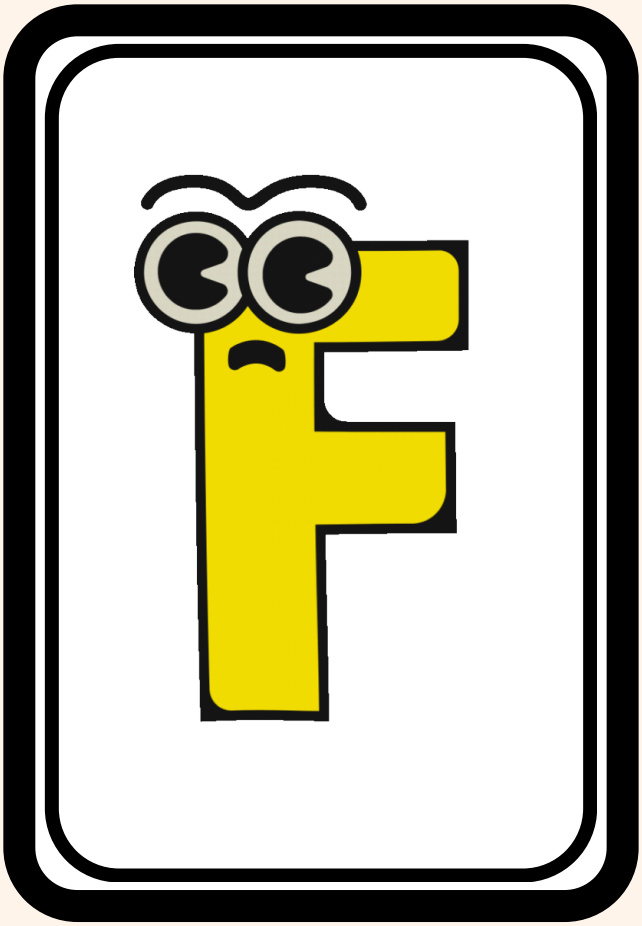
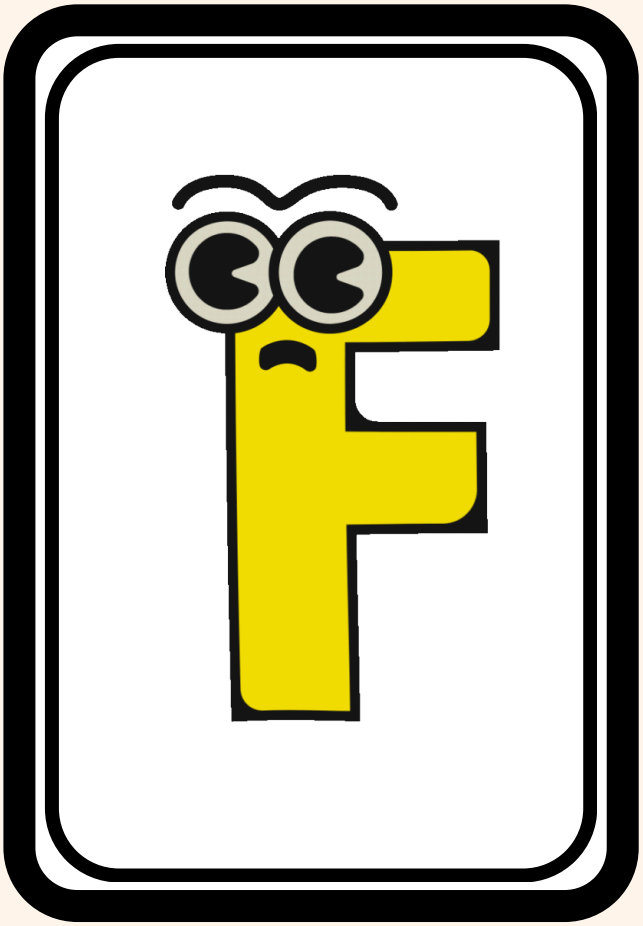
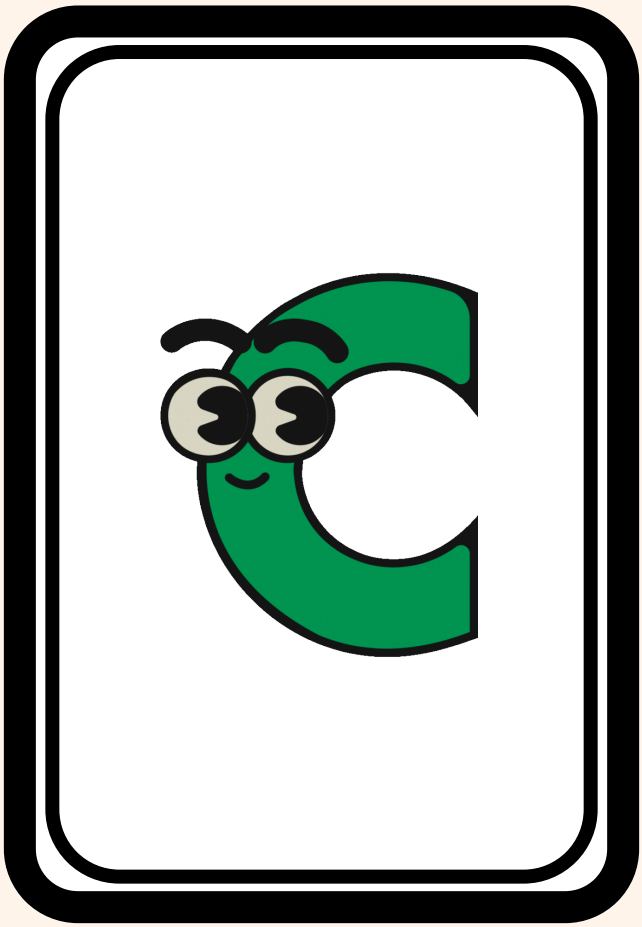
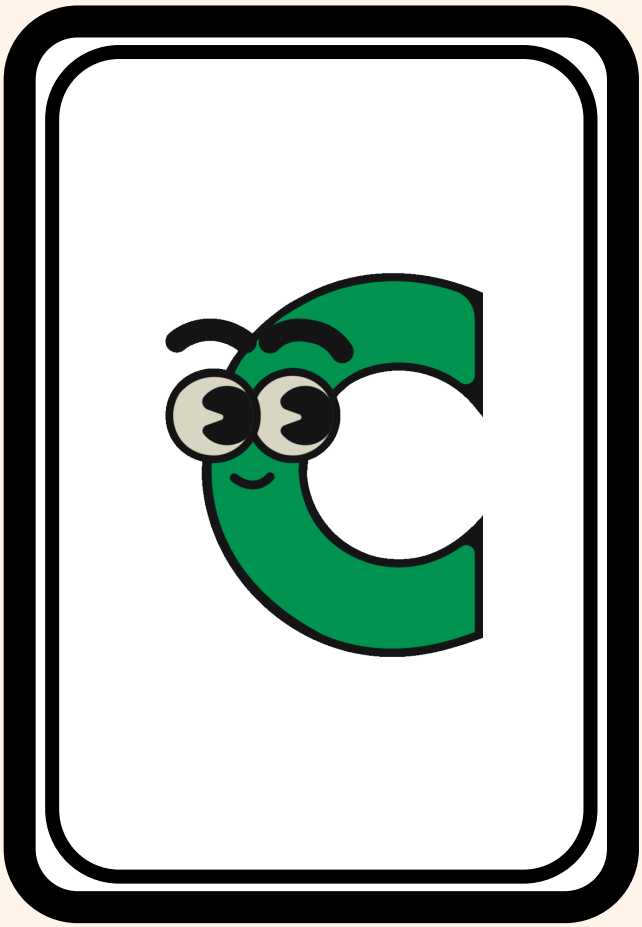







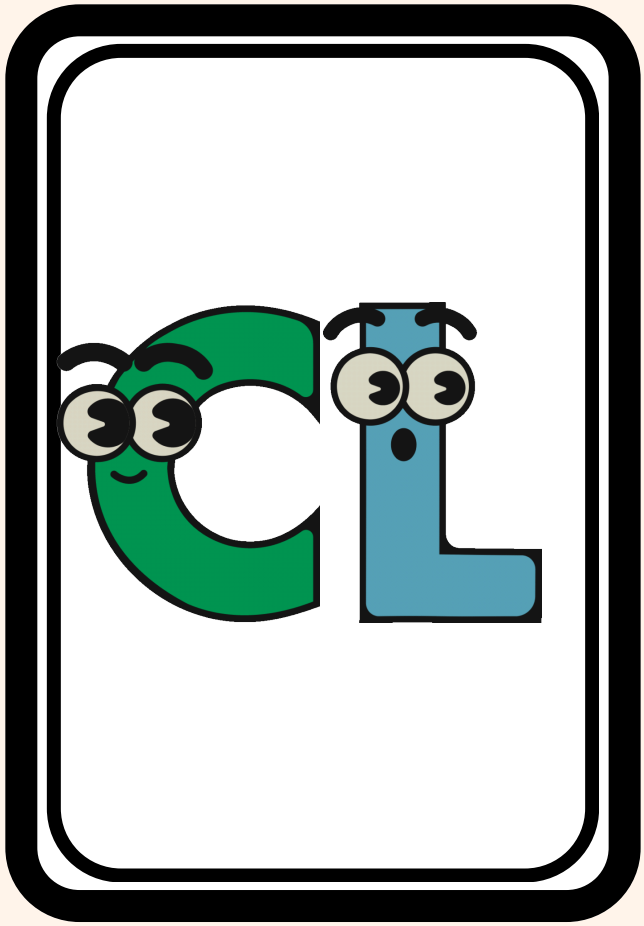
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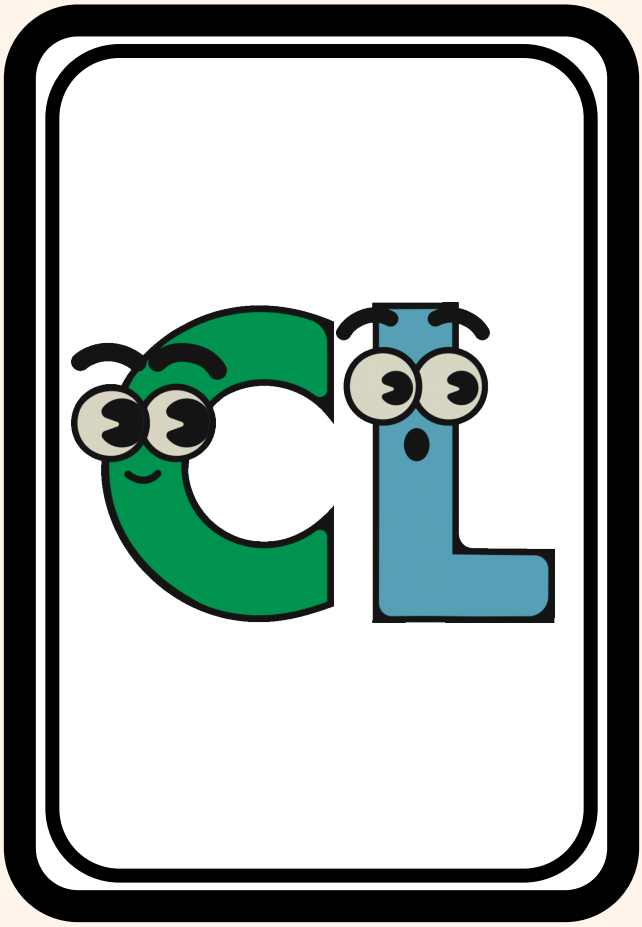
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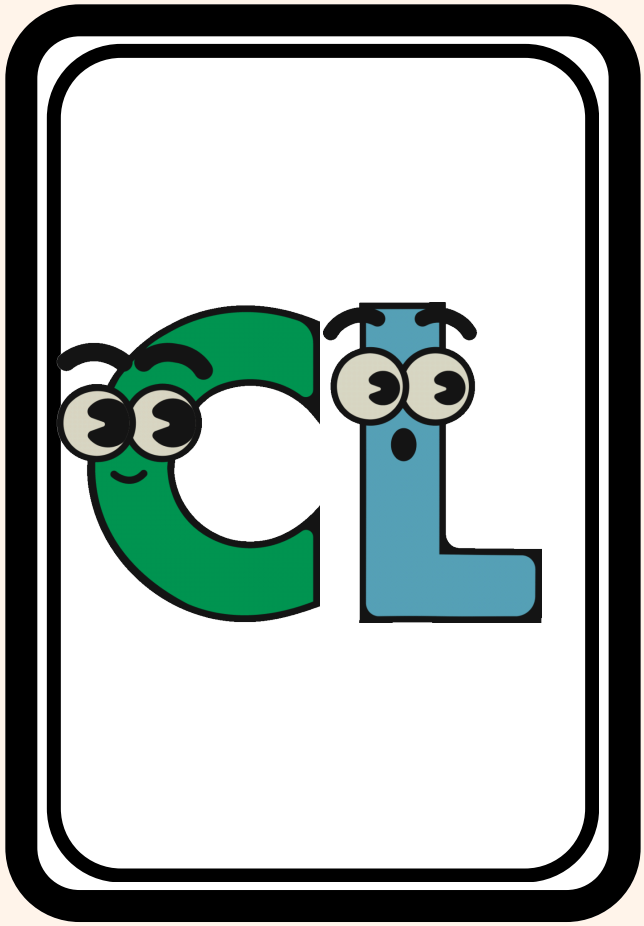
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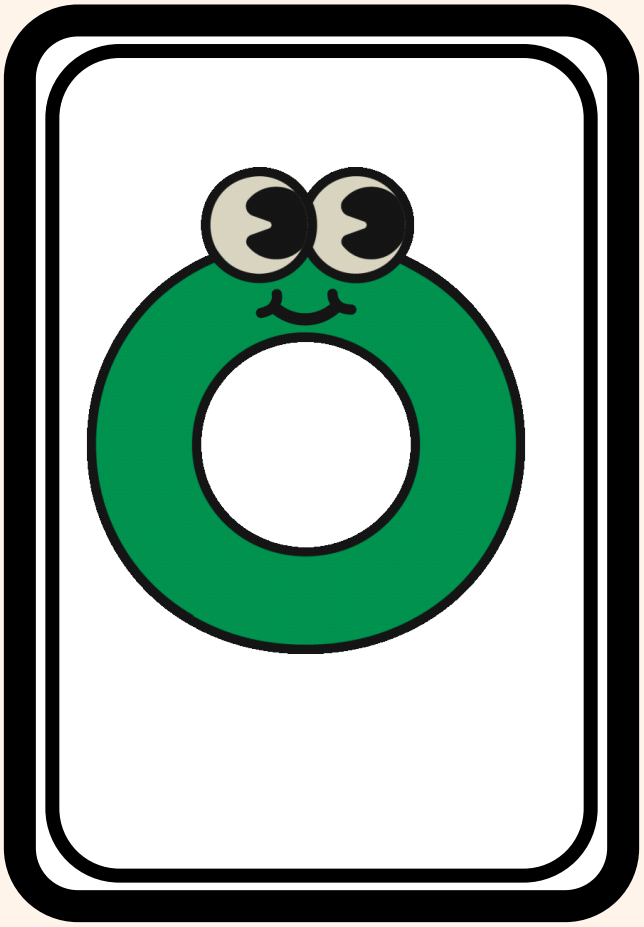
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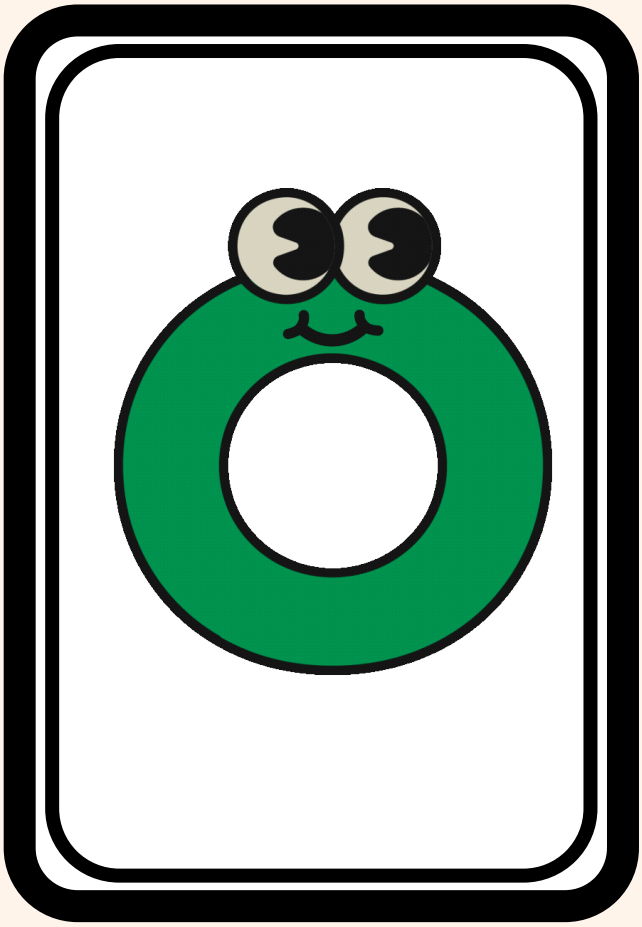
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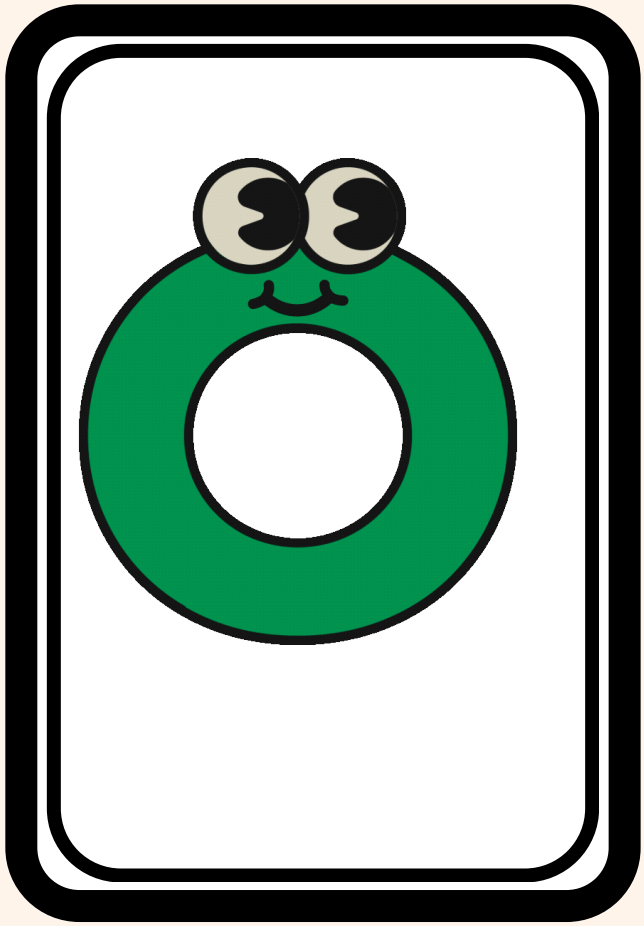
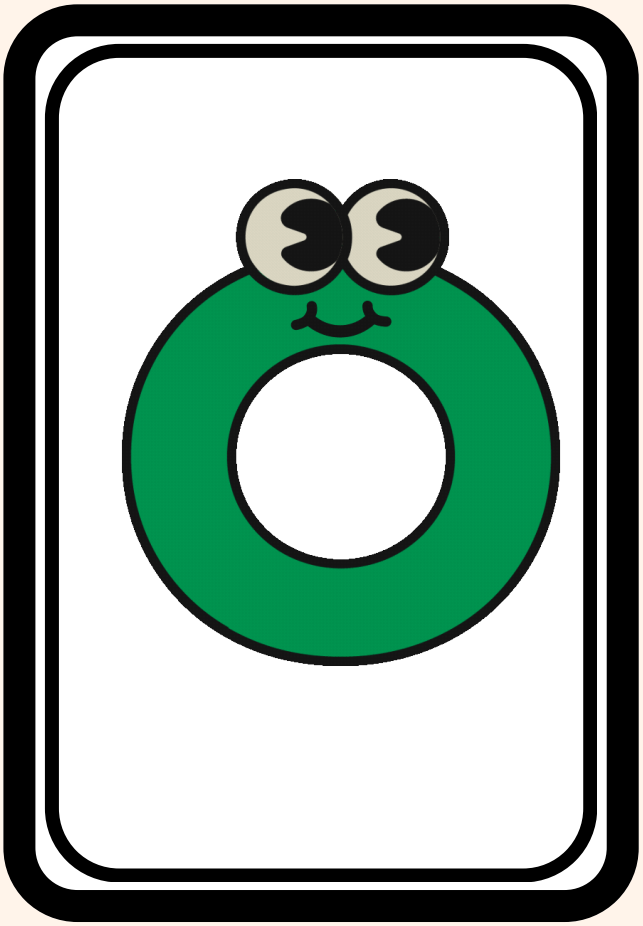
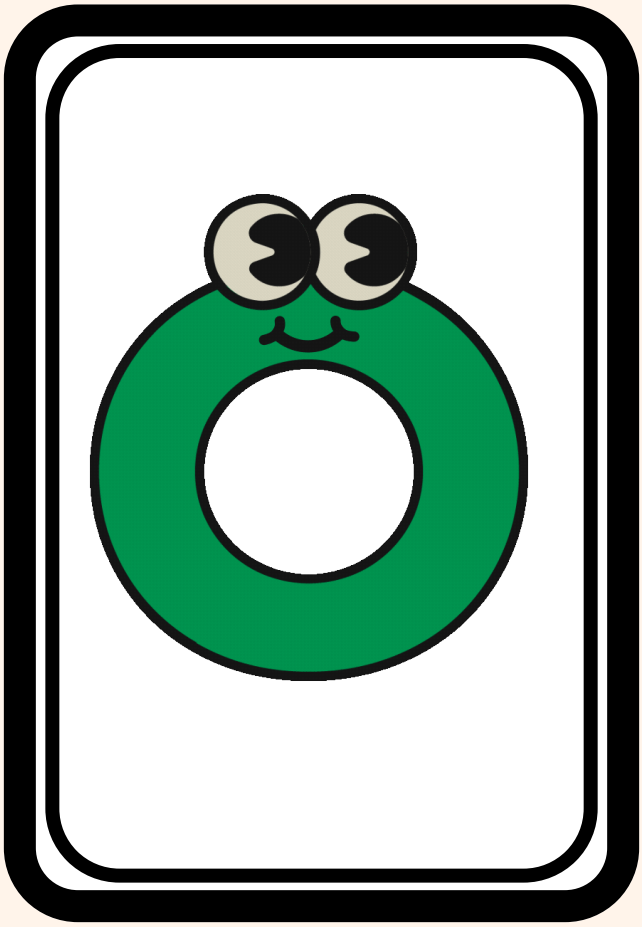
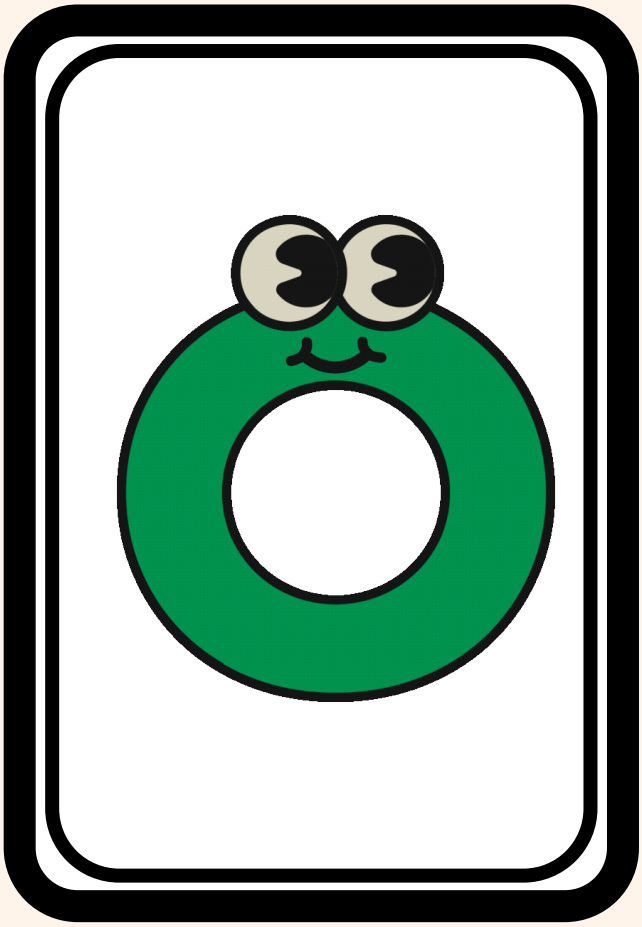

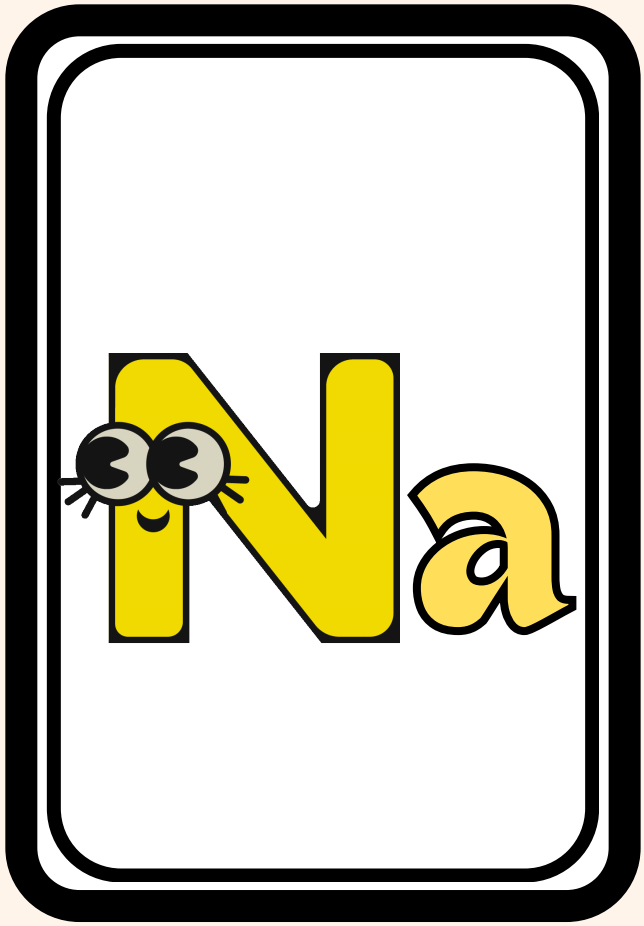
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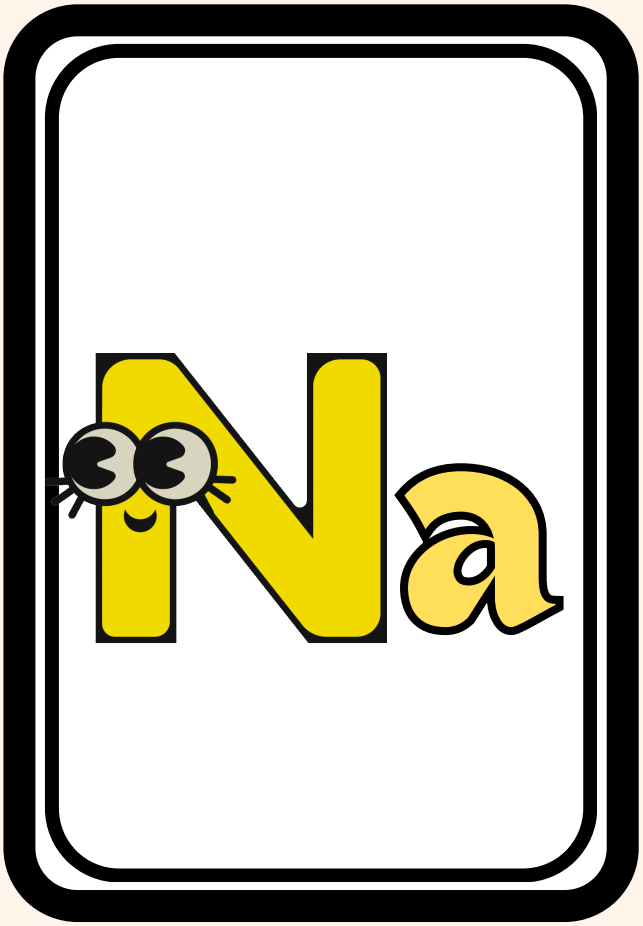
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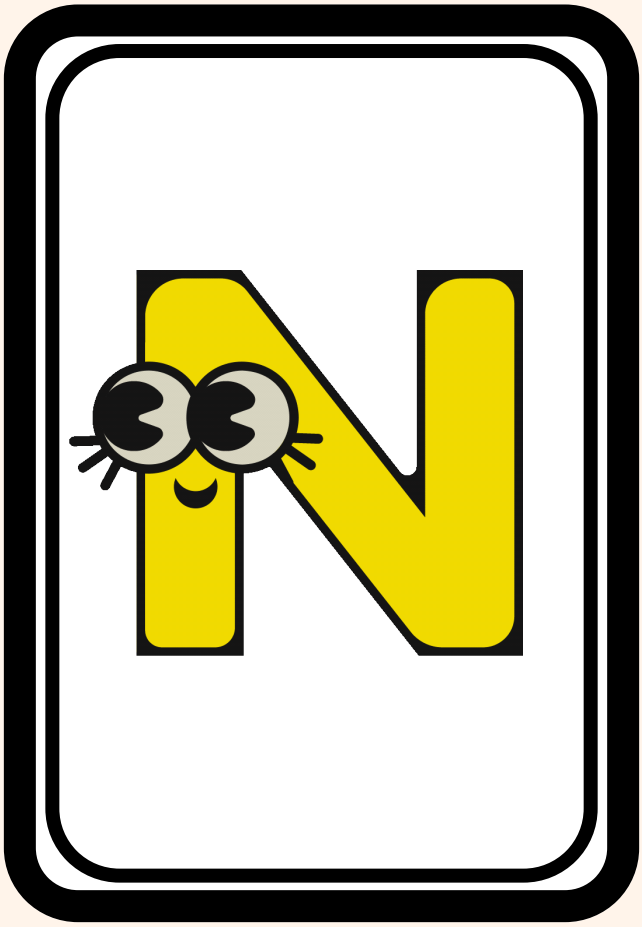
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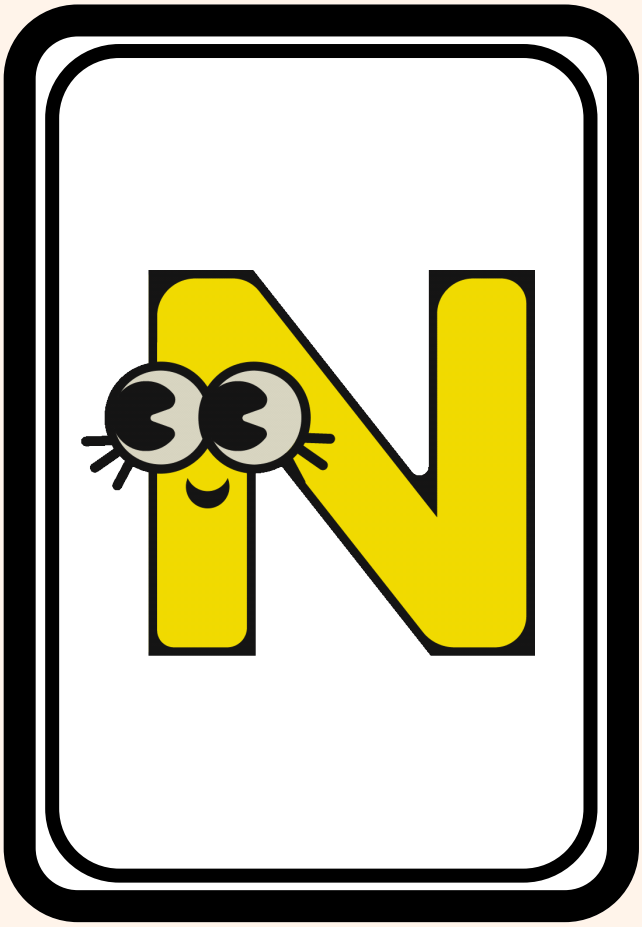
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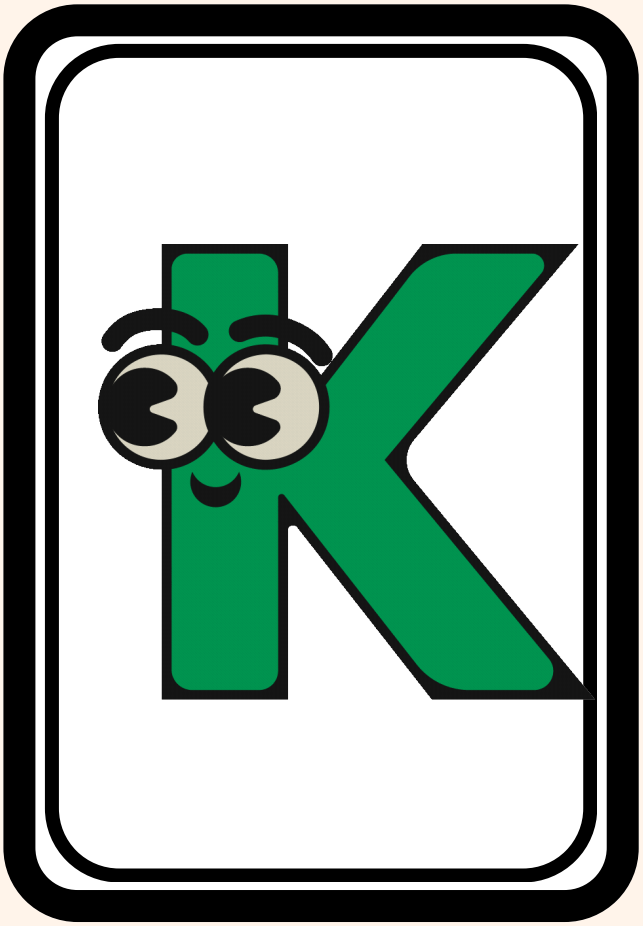
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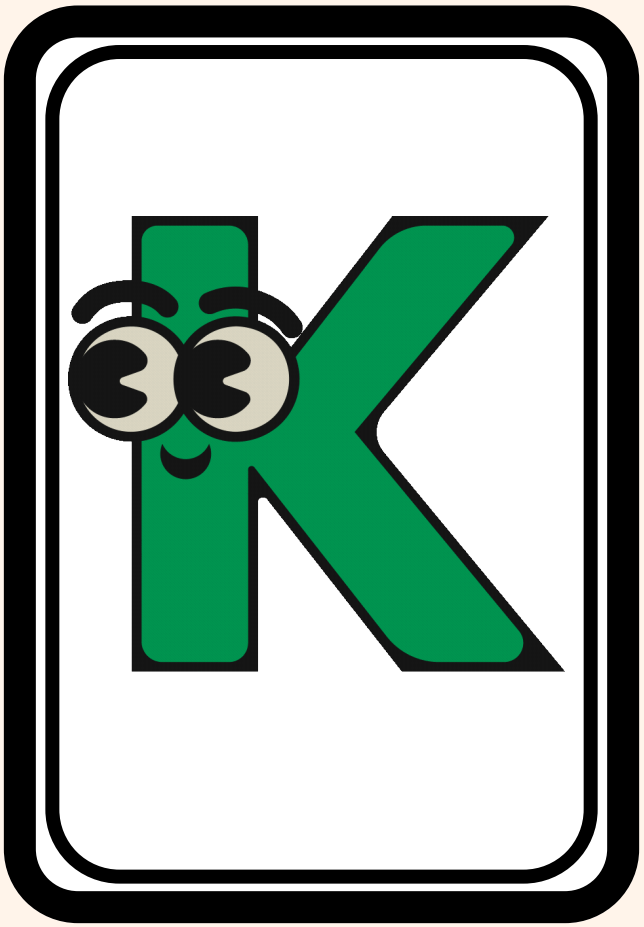
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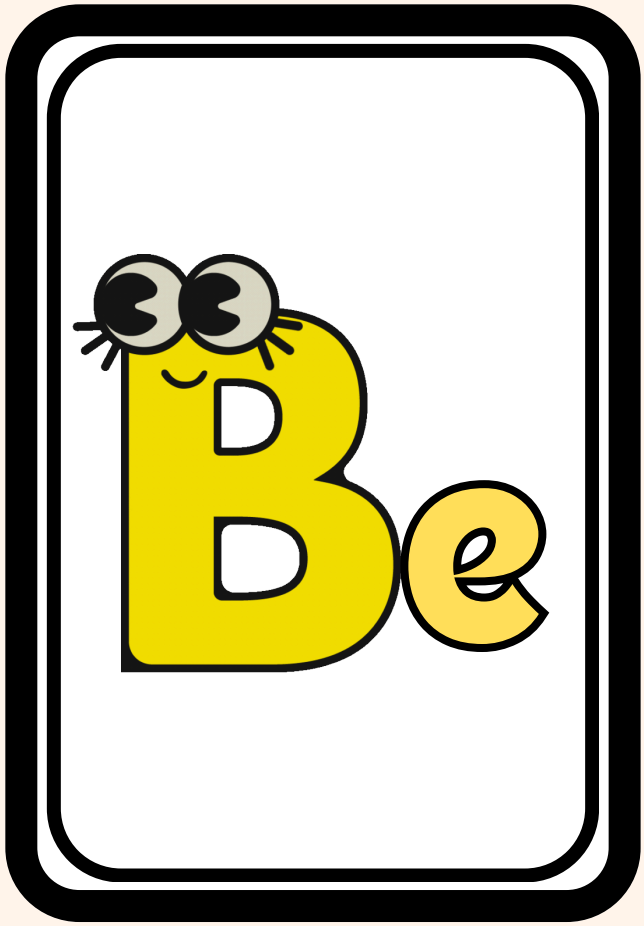
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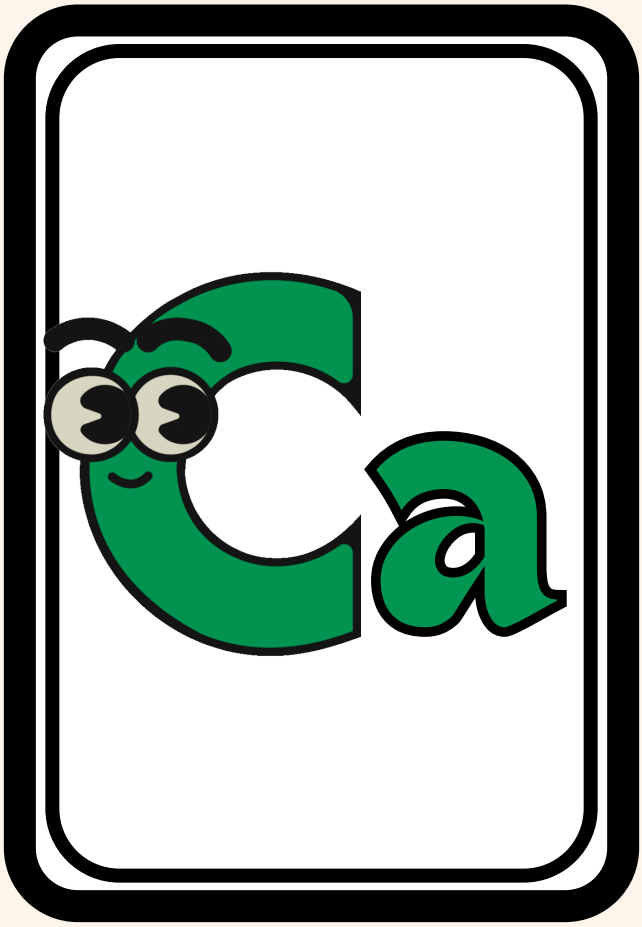
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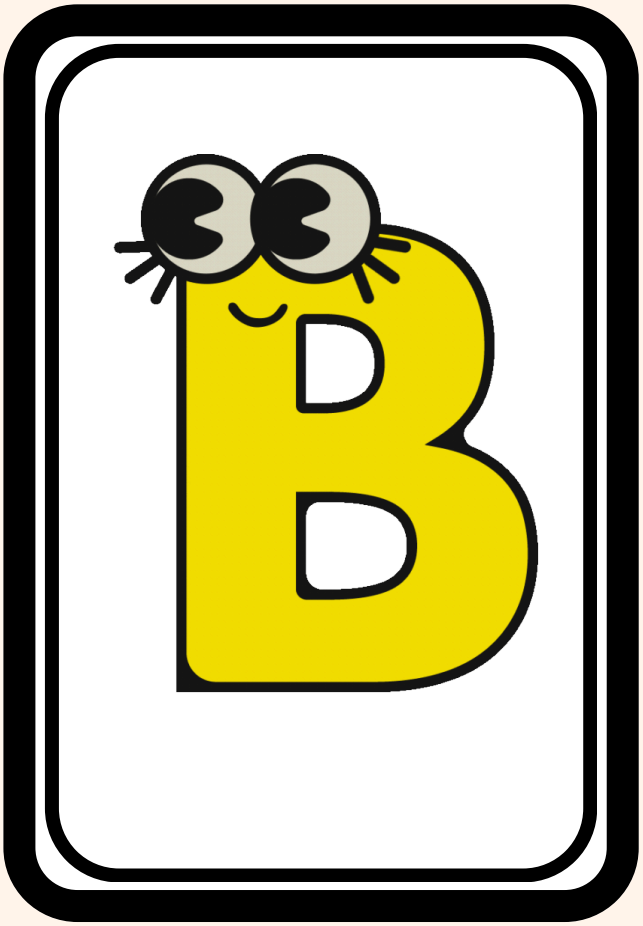
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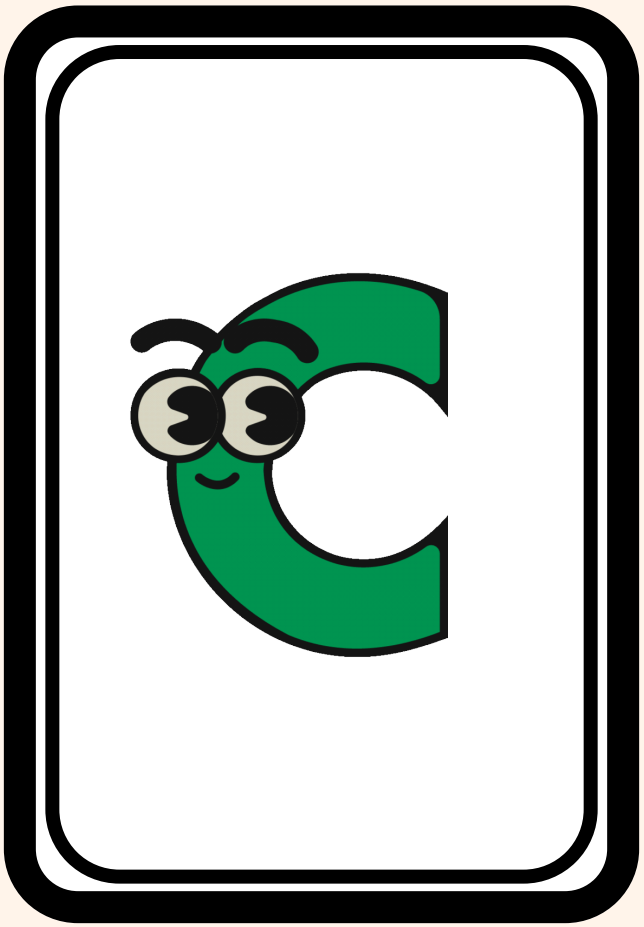
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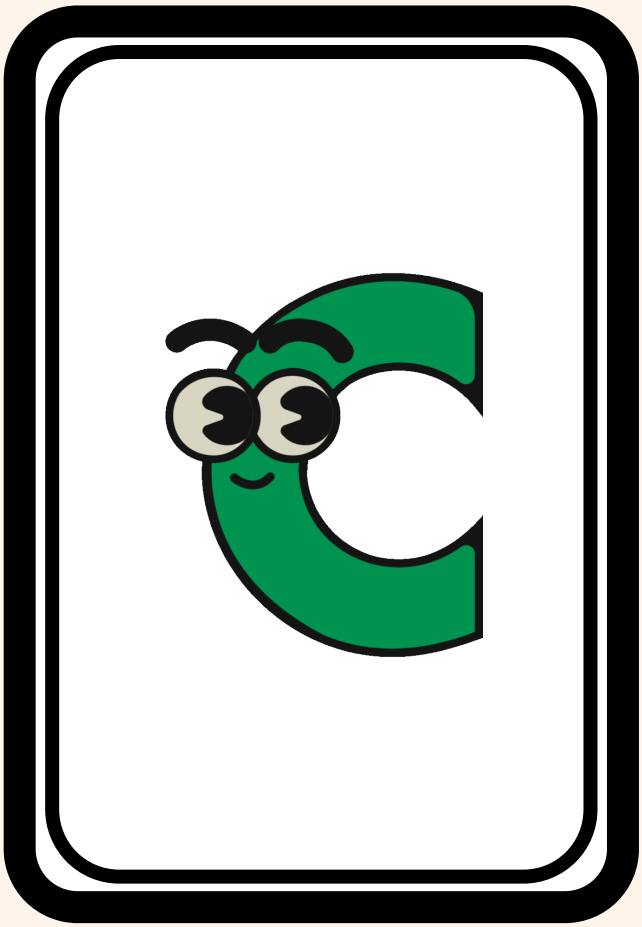
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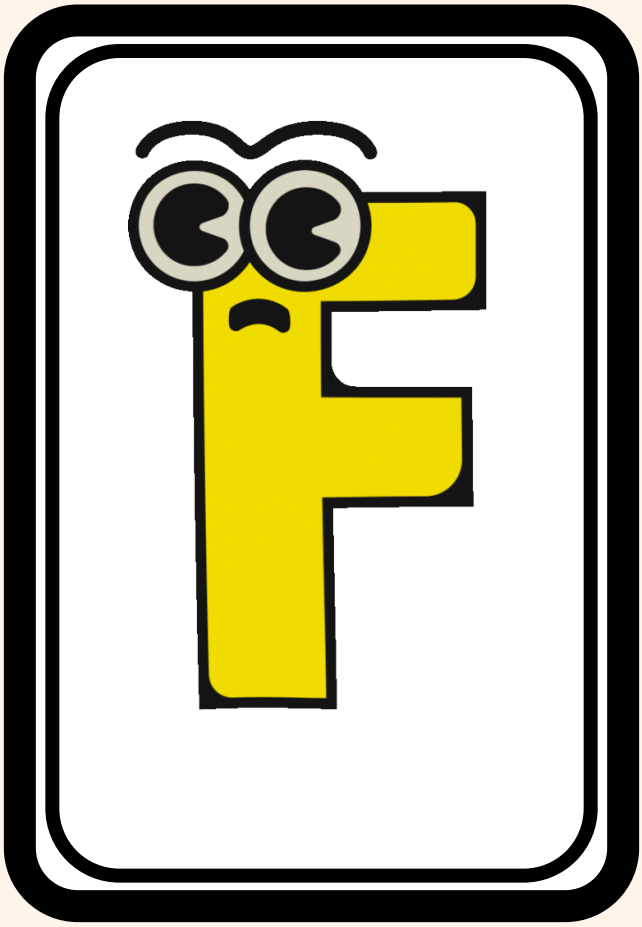


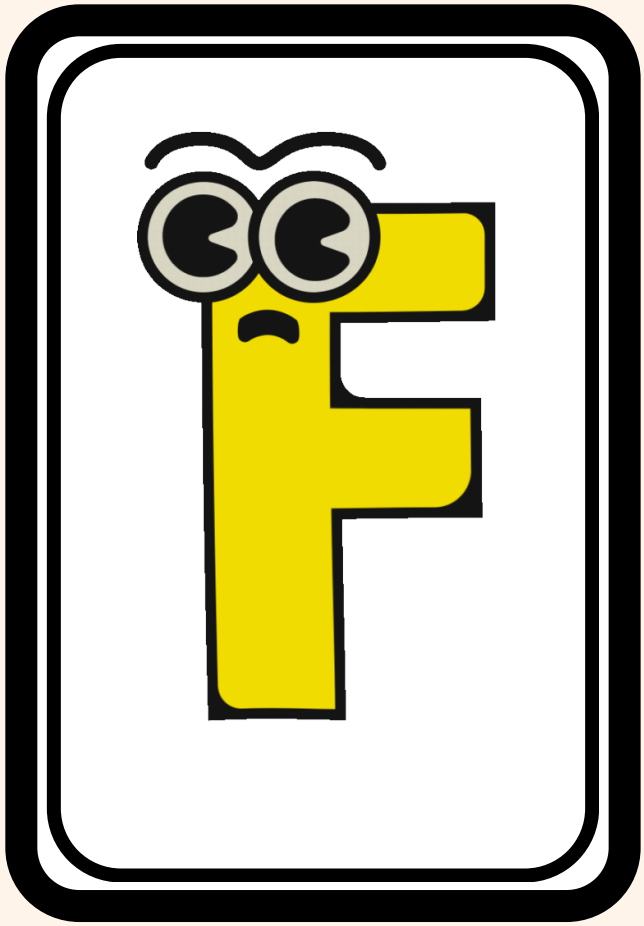
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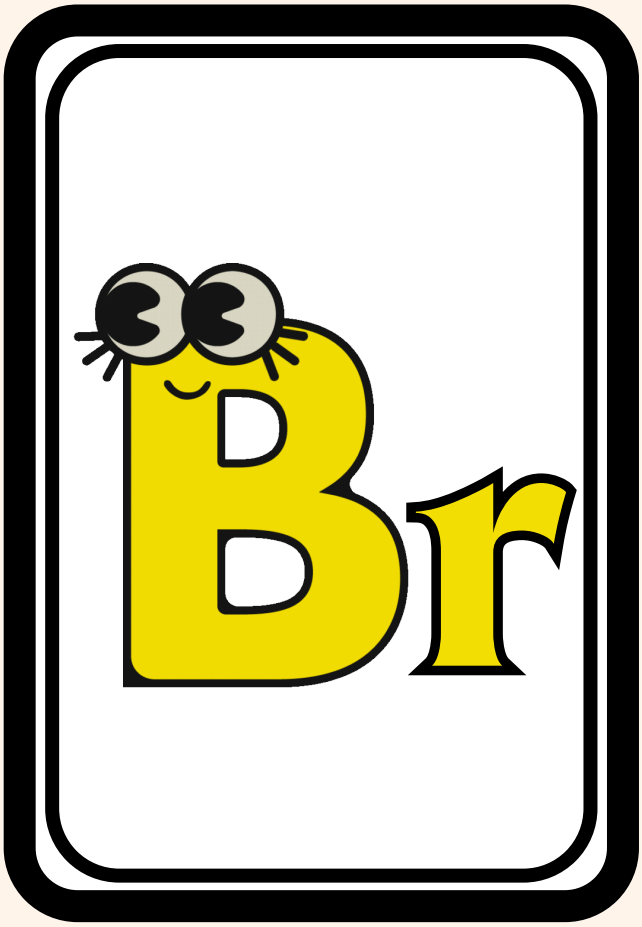
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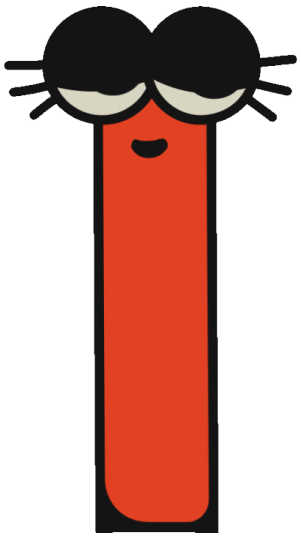

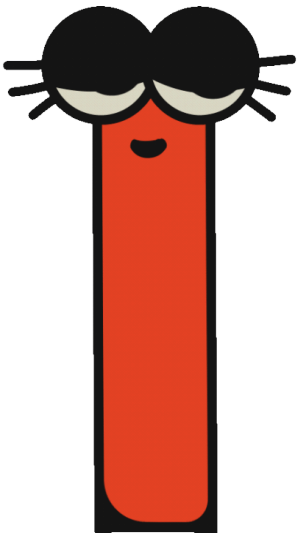

Na

ANSWER SHEET

Level 1: 1-Atom and 2-Atom Compounds (Valency 1 and 2)

These compounds involve simpler combinations based on valency 1 and 2 elements.

1. **Sodium Chloride (NaCl)**:
    - Na (Sodium, valency 1) + Cl (Chlorine, valency 1)
2. **Water (H_2O)**:
    - H (Hydrogen, valency 1) + O (Oxygen, valency 2)
3. **Magnesium Chloride ($MgCl_2$)**:
    - Mg (Magnesium, valency 2) + Cl (Chlorine, valency 1)
4. **Potassium Bromide (KBr)**:
    - K (Potassium, valency 1) + Br (Bromine, valency 1)
5. **Calcium Oxide (CaO)**:
    - Ca (Calcium, valency 2) + O (Oxygen, valency 2)
6. **Hydrogen Fluoride (HF)**:
    - H (Hydrogen, valency 1) + F (Fluorine, valency 1)
7. **Magnesium Oxide (MgO)**:
    - Mg (Magnesium, valency 2) + O (Oxygen, valency 2)
8. **Sodium Fluoride (NaF)**:
    - Na (Sodium, valency 1) + F (Fluorine, valency 1)
9. **Calcium Fluoride (CaF_2)**:
    - Ca (Calcium, valency 2) + F (Fluorine, valency 1)
10. **Beryllium Oxide (BeO)**:
    - Be (Beryllium, valency 2) + O (Oxygen, valency 2)
11. **Potassium Iodide (KI)**:
    - K (Potassium, valency 1) + I (Iodine, valency 1)
12. **Hydrogen Chloride (HCl)**:
    - H (Hydrogen, valency 1) + Cl (Chlorine, valency 1)
13. **Sodium Bromide (NaBr)**:

- Na (Sodium, valency 1) + Br (Bromine, valency 1)

14. **Magnesium Bromide ($MgBr_2$)**:
    - Mg (Magnesium, valency 2) + Br (Bromine, valency 1)
15. **Calcium Bromide ($CaBr_2$)**:
    - Ca (Calcium, valency 2) + Br (Bromine, valency 1)
16. **Beryllium Chloride ($BeCl_2$)**:
    - Be (Beryllium, valency 2) + Cl (Chlorine, valency 1)
17. **Hydrogen Sulfide (H_2S)**:
    - H (Hydrogen, valency 1) + S (Sulfur, valency 2)
18. **Calcium Iodide (CaI_2)**:
    - Ca (Calcium, valency 2) + I (Iodine, valency 1)
19. **Magnesium Iodide (MgI_2)**:
    - Mg (Magnesium, valency 2) + I (Iodine, valency 1)
20. **Potassium Fluoride (KF)**:
    - K (Potassium, valency 1) + F (Fluorine, valency 1)

Level 2: Complex Compounds Requiring Balancing (Valency 1, 2, and 3)

In Level 2, we are using higher valency elements and balancing compounds. Here are the complex compounds that can be formed:

1. **Ammonia (NH_3)**:
    - N (Nitrogen, valency 3) + H (Hydrogen, valency 1)
2. **Calcium Nitride (Ca_3N_2)**:
    - Ca (Calcium, valency 2) + N (Nitrogen, valency 3)
3. **Magnesium Nitride (Mg_3N_2)**:
    - Mg (Magnesium, valency 2) + N (Nitrogen, valency 3)
4. **Boron Trifluoride (BF_3)**:
    - B (Boron, valency 3) + F (Fluorine, valency 1)
5. **Magnesium Oxide (MgO)**:
    - Mg (Magnesium, valency 2) + O (Oxygen, valency 2)
6. **Calcium Fluoride (CaF_2)**:
    - Ca (Calcium, valency 2) + F (Fluorine, valency 1)
7. **Magnesium Chloride ($MgCl_2$)**:
    - Mg (Magnesium, valency 2) + Cl (Chlorine, valency 1)
8. **Calcium Bromide ($CaBr_2$)**:
    - Ca (Calcium, valency 2) + Br (Bromine, valency 1)
9. **Magnesium Iodide (MgI_2)**:
    - Mg (Magnesium, valency 2) + I (Iodine, valency 1)
10. **Calcium Sulfide (CaS)**:
    - Ca (Calcium, valency 2) + S (Sulfur, valency 2)
11. **Sodium Nitride (Na_3N)**:
    - Na (Sodium, valency 1) + N (Nitrogen, valency 3)
12. **Potassium Nitride (K_3N)**:
    - K (Potassium, valency 1) + N (Nitrogen, valency 3)
13. **Beryllium Nitride (Be_3N_2)**:
    - Be (Beryllium, valency 2) + N (Nitrogen, valency 3)

14. **Sodium Oxide (Na_2O)**:
    - Na (Sodium, valency 1) + O (Oxygen, valency 2)
15. **Potassium Oxide (K_2O)**:
    - K (Potassium, valency 1) + O (Oxygen, valency 2)
16. **Magnesium Sulfide (MgS)**:
    - Mg (Magnesium, valency 2) + S (Sulfur, valency 2)
17. **Calcium Iodide (CaI_2)**:
    - Ca (Calcium, valency 2) + I (Iodine, valency 1)
18. **Magnesium Fluoride (MgF_2)**:
    - Mg (Magnesium, valency 2) + F (Fluorine, valency 1)
19. **Calcium Oxide (CaO)**:
    - Ca (Calcium, valency 2) + O (Oxygen, valency 2)
20. **Hydrogen Nitride (NH_3)**:
    - H (Hydrogen, valency 1) + N (Nitrogen, valency 3)