

Let's break this down into reactions between different classes of compounds and their typical products. Note that exceptions and specific cases might vary based on the compounds involved.

### ### 1. Acid + Acid

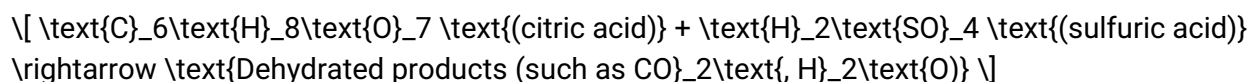
- **Typically:** No reaction occurs.

- **Exceptions:** Some acids might react under specific conditions (e.g., sulfuric acid can react with nitric acid).

When sulfuric acid ( $\text{H}_2\text{SO}_4$ ) and citric acid ( $\text{C}_6\text{H}_8\text{O}_7$ ) are mixed, they generally do not react significantly under normal conditions. Both are acids and do not typically engage in a reaction with each other.

However, if concentrated sulfuric acid is used, it can act as a dehydrating agent, potentially leading to the dehydration of citric acid to form various carbon-containing compounds, such as carbon dioxide ( $\text{CO}_2$ ) and water ( $\text{H}_2\text{O}$ ). In this case, sulfuric acid would effectively dehydrate citric acid, which could involve the removal of water molecules.

The main reaction under these conditions might be:

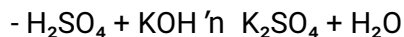
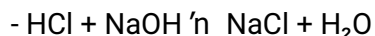


In summary, sulfuric acid can dehydrate citric acid, but under typical conditions with dilute solutions, no significant reaction between the two acids occurs.

### ### 2. Acid + Base

- **Product:** Salt + Water

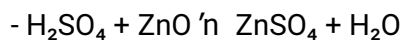
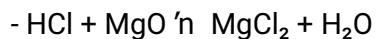
- **Example:**



### ### 3. Acid + Oxide

- \*\*Product:\*\* Salt + Water

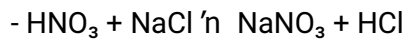
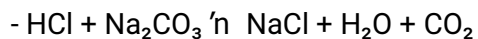
- \*\*Example:\*\*



### ### 4. Acid + Salt

- \*\*Product:\*\* New Salt + New Acid

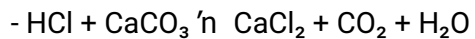
- \*\*Example:\*\*



### ### 5. Acid + Insoluble Salt

- \*\*Product:\*\* Soluble Salt + Other Products

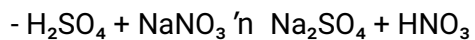
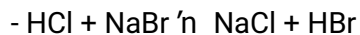
- \*\*Example:\*\*



### ### 6. Acid + Soluble Salt

- \*\*Product:\*\* New Salt + New Acid

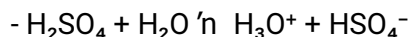
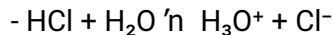
- \*\*Example:\*\*



### ### 7. Acid + Water

- **Product:** Acid Dissociation (Ionization)

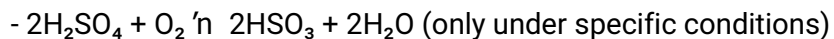
- **Example:**



### ### 8. Acid + Oxygen

- **Product:** Typically, oxidation or decomposition occurs.

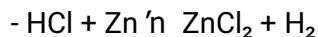
- **Example:**



### ### 9. Acid + Element

- **Product:** Generally, salt and hydrogen gas.

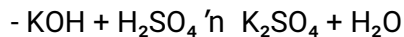
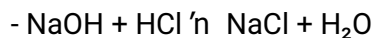
- **Example:**



### ### 10. Base + Acid

- **Product:** Salt + Water

- **Example:**



### ### 11. Base + Base

- **Product:** No reaction under normal conditions.

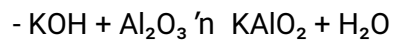
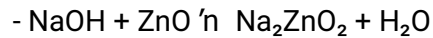


- **Exceptions:** Formation of a complex or precipitation if specific conditions apply.

### 12. Base + Oxide

- **Product:** Generally forms a salt and water (if the base is strong).

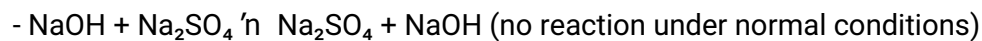
- **Example:**



### 13. Base + Salt

- **Product:** New Base + New Salt

- **Example:**



### 14. Base + Insoluble Salt

- **Product:** Soluble Salt + Other Products

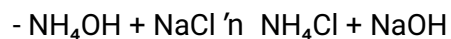
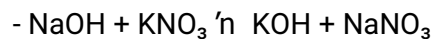
- **Example:**



### 15. Base + Soluble Salt

- **Product:** New Salt + New Base

- **Example:**

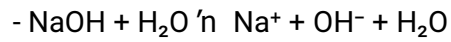


### 16. Base + Water



- **Product:** Base Dissociation (Ionization)

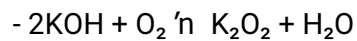
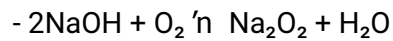
- **Example:**



### 17. Base + Oxygen

- **Product:** Generally forms a peroxide or superoxide.

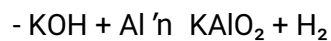
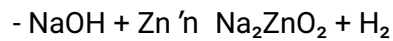
- **Example:**



### 18. Base + Element

- **Product:** Typically forms a salt and hydrogen gas.

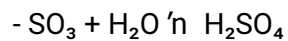
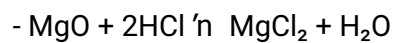
- **Example:**



### 19. Oxide + Acid

- **Product:** Salt + Water

- **Example:**

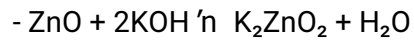
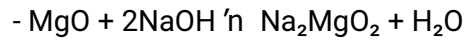


### 20. Oxide + Base

- **Product:** Salt + Water



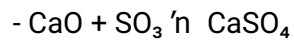
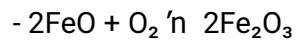
- **Example:**



### 21. Oxide + Oxide

- **Product:** Typically forms complex oxides or mixtures.

- **Example:**



### 22. Oxide + Salt

- **Product:** Generally no reaction unless specific conditions apply.

### 23. Oxide + Insoluble Salt

- **Product:** Usually no reaction under normal conditions.

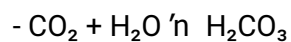
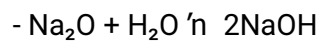
### 24. Oxide + Soluble Salt

- **Product:** Typically no reaction.

### 25. Oxide + Water

- **Product:** Hydroxide

- **Example:**



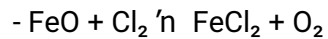
### ### 26. Oxide + Oxygen

- **Product:** Usually no reaction.

### ### 27. Oxide + Element

- **Product:** Generally forms a new oxide or complex.

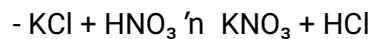
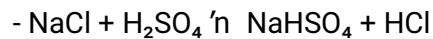
- **Example:**



### ### 28. Salt + Acid

- **Product:** New Salt + New Acid

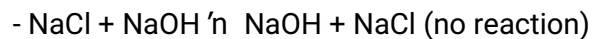
- **Example:**



### ### 29. Salt + Base

- **Product:** New Salt + New Base

- **Example:**



### ### 30. Salt + Oxide

- **Product:** Generally no reaction under normal conditions.

### ### 31. Salt + Salt

- **Product:** Usually no reaction.



### ### 32. Salt + Insoluble Salt

- **Product:** Often forms a precipitate if the resulting product is insoluble.

### ### 33. Salt + Soluble Salt

- **Product:** Generally no reaction unless specific conditions apply.

### ### 34. Salt + Water

- **Product:** Dissociation of the salt into ions.

### ### 35. Salt + Oxygen

- **Product:** Generally no reaction.

### ### 36. Salt + Element

- **Product:** Typically no reaction unless specific conditions apply.

### ### 37. Carbonate + Carbonate

- **Product:** Generally no reaction.

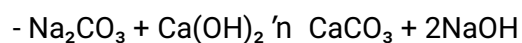
### ### 38. Carbonate + Sulfate

- **Product:** Typically no reaction.

### ### 39. Carbonate + Hydroxide

- **Product:** Usually forms a new carbonate and water.

- **Example:**

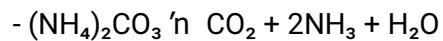




### ### 40. Carbonate + Ammonium

- **Product:** Carbon dioxide, water, and ammonia gas.

- **Example:**



### ### 41. Carbonate + Phosphate

- **Product:** Typically forms a new salt or complex.

### ### 42. Carbonate + Carbonate (Duplicate of 37)

### ### 43. Carbonate + Sulfate (Duplicate of 38)

### ### 44. Carbonate + Hydroxide (Duplicate of 39)

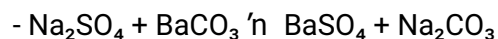
### ### 45. Carbonate + Ammonium (Duplicate of 40)

### ### 46. Carbonate + Phosphate (Duplicate of 41)

### ### 47. Sulfate + Carbonate

- **Product:** Typically forms a precipitate.

- **Example:**



### ### 48. Sulfate + Sulfate

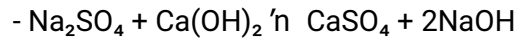


- \*\*Product:\*\* Generally no reaction.

### ### 49. Sulfate + Hydroxide

- \*\*Product:\*\* Typically forms a new salt and water.

- \*\*Example:\*\*



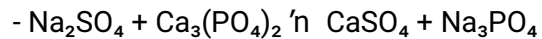
### ### 50. Sulfate + Ammonium

- \*\*Product:\*\* Generally forms a new salt.

### ### 51. Sulfate + Phosphate

- \*\*Product:\*\* Typically forms a precipitate.

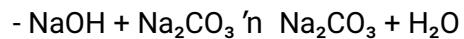
- \*\*Example:\*\*



### ### 52. Hydroxide + Carbonate

- \*\*Product:\*\* Typically forms a new carbonate and water.

- \*\*Example:\*\*

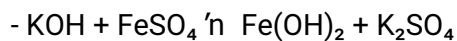


### ### 53. Hydroxide + Sulfate

- \*\*Product:\*\* Typically forms a new salt and water.

- \*\*Example:\*\*





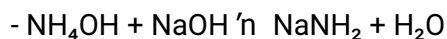
### ### 54. Hydroxide + Hydroxide

- **Product:** Generally no reaction, but mixing can form complex ions.

### ### 55. Hydroxide + Ammonium

- **Product:** Typically forms ammonia gas and water.

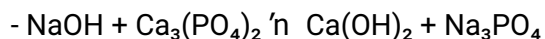
- **Example:**



### ### 56. Hydroxide + Phosphate

- **Product:** Typically forms a new phosphate and water.

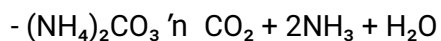
- **Example:**



### ### 57. Ammonium + Carbonate

- **Product:** Typically forms carbon dioxide, ammonia gas, and water.

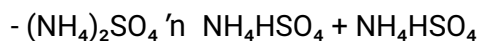
- **Example:**



### ### 58. Ammonium + Sulfate

- **Product:** Typically forms a new salt.

- **Example:**



### ### 59. Ammonium + Hydroxide

- **Product:** Typically forms ammonia gas and water.

- **Example:**



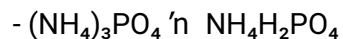
### ### 60. Ammonium + Ammonium

- **Product:** Generally no reaction under normal conditions.

### ### 61. Ammonium + Phosphate

- **Product:** Typically forms a new salt.

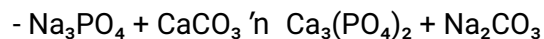
- **Example:**



### ### 62. Phosphate + Carbonate

- **Product:** Typically forms a new phosphate and carbonate.

- **Example:**



### ### 63. Phosphate + Sulfate

- **Product:** Typically forms a new phosphate and sulfate.

- **Example:**

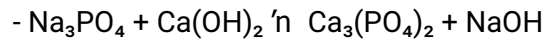


### ### 64. Phosphate + Hydroxide



- **Product:** Typically forms a new phosphate and water.

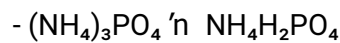
- **Example:**



### 65. Phosphate + Ammonium

- **Product:** Typically forms a new salt.

- **Example:**



### 66. Phosphate + Phosphate

- **Product:** Generally forms no new product under normal conditions.

### Key Points and Exceptions

- **Acid-Base Reactions:** Usually produce salt and water.

- **Acid + Metal Oxides:** Produces salt and water.

- **Acid + Metals:** Produces salt and hydrogen gas.

- **Base + Acid:** Forms salt and water.

- **Base + Oxides:** Typically forms salts and water.

- **Oxide + Water:** Forms hydroxides (or carbonic acid for  $\text{CO}_2$ ).

- **Salts + Water:** Dissociate into ions.

- **Complex Reactions:** Sometimes involve multiple steps or specific conditions.

These general rules and examples provide a broad overview, but actual reactions may depend on specific conditions and concentrations.

