**Comparative Study: Chemical Properties of Metals and Non-Metals**

| **Property / Reaction** | **Metals** | **Non-Metals** |
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| **1. Reaction with Air (Oxygen)** | - Metals react with oxygen to form **basic metal oxides**.  - Some oxides are **amphoteric**.   **Examples:** 2Mg + O₂ → 2MgO (Magnesium oxide – basic) 4Al + 3O₂ → 2Al₂O₃ (Amphoteric oxide) | - Non-metals react with oxygen to form **acidic oxides**.  **Example:** C + O₂ → CO₂ (Carbon dioxide – acidic oxide) S + O₂ → SO₂ (Sulphur dioxide – acidic oxide) |
| **2. Reaction with Water** | - **Highly reactive metals** (like Na, K) react **vigorously** with cold water forming hydroxides and hydrogen gas. 2K + 2H₂O → 2KOH + H₂ ↑  - **Less reactive metals** (like Fe, Zn) react slowly or with steam. 3Fe + 4H₂O (steam) → Fe₃O₄ + 4H₂ ↑ | - Non-metals **generally do not react** with water.  - They are insoluble or unreactive in water.  **Example:** Sulphur and phosphorus do not react with water directly. |
| **3. Reaction with Acids** | - Metals react with **dilute acids** to produce **salt and hydrogen gas**. Zn + 2HCl → ZnCl₂ + H₂ ↑ Mg + 2HCl → MgCl₂ + H₂ ↑ | - Most non-metals **do not react with dilute acids** because they do not release electrons needed for the reaction. |
| **4. Displacement Reaction** | - A **more reactive metal** displaces a **less reactive metal** from its salt solution.  **Example:** Fe + CuSO₄ → FeSO₄ + Cu (Iron displaces copper) | - Non-metals do **not take part in metal displacement reactions**. However, in **halogens**, a more reactive halogen can displace a less reactive halogen. **Example:** Cl₂ + 2KI → 2KCl + I₂ |
| **5. Reaction with Chlorine** | - Metals react with chlorine to form **metal chlorides** (ionic compounds).  **Example:** 2Na + Cl₂ → 2NaCl | - Non-metals also react with chlorine to form **covalent chlorides**.  **Example:** C + 2Cl₂ → CCl₄ (Carbon tetrachloride) P + 3Cl₂ → PCl₃ |
| **6. Reaction with Hydrogen** | - Only a few reactive metals form **metal hydrides**.  **Example:** 2Na + H₂ → 2NaH These are **ionic** in nature. | - Non-metals form **covalent hydrides** with hydrogen.  **Examples:** H₂ + Cl₂ → 2HCl N₂ + 3H₂ → 2NH₃ (Ammonia) |

**Key Differences**

| **Aspect** | **Metals** | **Non-Metals** |
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| Nature of oxides | Basic or Amphoteric | Acidic |
| Reaction with water | React (depends on reactivity) | Generally no reaction |
| Reaction with acids | Produces salt and hydrogen gas | No reaction |
| Displacement reaction | Can displace less reactive metals | Limited to halogen displacement |
| Chloride formation | Forms **ionic** metal chlorides | Forms **covalent** chlorides |
| Hydride formation | Forms **ionic** metal hydrides | Forms **covalent** non-metal hydrides |