

Chemguide – answers

PERIOD 3: REACTIONS OF THE ELEMENTS

1. The reactions of sodium.

| Reaction with water (if any) | |
|----------------------------------|---|
| Conditions | reacts vigorously in the cold |
| Product(s) | sodium hydroxide solution and hydrogen |
| Equation(s) | $2\text{Na} + 2\text{H}_2\text{O} \longrightarrow 2\text{NaOH} + \text{H}_2$ |
| Reactions with oxygen (if any) | |
| Conditions | burns on heating |
| Product(s) | sodium oxide, Na_2O and sodium peroxide, Na_2O_2 |
| Equation(s) | $4\text{Na} + \text{O}_2 \longrightarrow 2\text{Na}_2\text{O}$ $2\text{Na} + \text{O}_2 \longrightarrow \text{Na}_2\text{O}_2$ |
| Reactions with chlorine (if any) | |
| Conditions | burns on heating |
| Product(s) | sodium chloride |
| Equation(s) | $2\text{Na} + \text{Cl}_2 \longrightarrow 2\text{NaCl}$ |

2. The reactions of phosphorus.

| Reaction with water (if any) | |
|----------------------------------|--|
| Conditions | no reaction |
| Product(s) | none |
| Equation(s) | none |
| Reactions with oxygen (if any) | |
| Conditions | catches fire spontaneously at room temperature (assuming white phosphorus) |
| Product(s) | phosphorous (III) oxide, P_4O_6 and phosphorous (V) oxide, P_4O_{10} depending on whether there is excess oxygen |
| Equation(s) | $\text{P}_4 + 3\text{O}_2 \longrightarrow \text{P}_4\text{O}_6$ $\text{P}_4 + 5\text{O}_2 \longrightarrow \text{P}_4\text{O}_{10}$ |
| Reactions with chlorine (if any) | |
| Conditions | catches fire spontaneously at room temperature |
| Product(s) | phosphorous (III) chloride, PCl_3 , and phosphorous (V) chloride, PCl_5 , depending on whether there is excess chlorine |
| Equation(s) | $\text{P}_4 + 6\text{Cl}_2 \longrightarrow 4\text{PCl}_3$ (equations for white phosphorus) $\text{P}_4 + 10\text{Cl}_2 \longrightarrow 4\text{PCl}_5$ |