FLINN SCIENTIFIC

Name_____

# All In the Family Worksheet

## Data Table A. Color and Appearance of the Halogens

| Bottles | Halogen | Color of Aqueous Solution | Appearance of Hexane/Water Mixture |
|---|---|---|---|
| 1, 2 | $Cl_2$ | | |
| 3, 4 | $Br_2$ | | |
| 5, 6 | $I_2$ | | |

## Data Table B. Reactions of Halogens and Sodium Halides

| Bottle | Halogen | Sodium Halide | Observations |
|---|---|---|---|
| 1 | $Cl_2$ | NaBr | |
| 2 | $Cl_2$ | NaI | |
| 3 | $Br_2$ | NaCl | |
| 4 | $Br_2$ | NaI | |
| 5 | $I_2$ | NaCl | |
| 6 | $I_2$ | NaBr | |

## Discussion Questions

1. Describe the hazards and safety precautions for working with halogens in the lab.

2. How can each halogen—$Cl_2$, $Br_2$, and $I_2$—be detected in the aqueous layer and in the organic (hexane) layer?

3. Did chlorine react with sodium bromide? With sodium iodide? Describe the evidence for any chemical reaction that occurred and the possible identity of the product(s).

4. Did bromine react with sodium chloride? With sodium iodide? Describe the evidence for any chemical reaction that occurred and the possible identity of the product(s).

5. Did iodine react with sodium chloride? With sodium bromide? Describe the evidence for any chemical reaction that occurred and the possible identity of the product(s).

6. Write a balanced chemical equation for each chemical reaction that occurred in bottles 1–6.

7. Explain, based on the results of this demonstration, which halogen was most reactive and least reactive, respectively. Write the activity series for the halogens, including fluorine, from highest to lowest.

8. (*a*) Write a general statement that describes the periodic trend in the reactivity of nonmetals within a group or family in the Periodic Table. (*b*) Predict which Group 16 element, oxygen or sulfur, should be more reactive.

9. The following table shows the boiling points of the halogens. Describe in words and give a possible explanation for the trend that is observed.

| **Halogen** | **$F_2$** | **$Cl_2$** | **$Br_2$** | **$I_2$** |
|---|---|---|---|---|
| **Boiling point** | –188 °C | –34 °C | 58 °C | 184 °C |

10. Chlorine is used in water treatment plants and in swimming pools. Why is chlorine added to drinking water and to swimming pool water? What is the chief disadvantage of using chlorine?