***Chemistry***

**18: Representative Metals, Metalloids, and Nonmetals**

**18.1: Periodicity**

1. How do alkali metals differ from alkaline earth metals in atomic structure and general properties?

Solution

The alkali metals all have a single *s* electron in their outermost shell. In contrast, the alkaline earth metals have a completed *s* subshell in their outermost shell. In general, the alkali metals react faster and are more reactive than the corresponding alkaline earth metals in the same period.

3. Predict the formulas for the nine compounds that may form when each species in column 1 of Table 18.3 reacts with each species in column 2.

|  |  |
| --- | --- |
| 1 | 2 |
| Na | I |
| Sr | Se |
| Al | O |

Table 18.3

Solution







5. Sodium chloride and strontium chloride are both white solids. How could you distinguish one from the other?

Solution

The possible ways of distinguishing between the two include infrared spectroscopy by comparison of known compounds, a flame test that gives the characteristic yellow color for sodium (strontium has a red flame), or comparison of their solubilities in water. At 20 °C, NaCl dissolves to the extent of  compared with  for SrCl2. Heating to 100 °C provides an easy test, since the solubility of NaCl is , but that of SrCl2 is. Density determination on a solid is sometimes difficult, but there is enough difference (2.165 g/mL NaCl and 3.052 g/mL SrCl2) that this method would be viable and perhaps the easiest and least expensive test to perform.

7. Write a balanced equation for the reaction of elemental strontium with each of the following: (a) oxygen

(b) hydrogen bromide

(c) hydrogen

(d) phosphorus

(e) water

Solution

(a) ; (b) ; (c) ; (d) ; (e)

9. What is the mass of fish, in kilograms, that one would have to consume to obtain a fatal dose of mercury, if the fish contains 30 parts per million of mercury by weight? (Assume that all the mercury from the fish ends up as mercury(II) chloride in the body and that a fatal dose is 0.20 g of HgCl2.) How many pounds of fish is this?

Solution

The mass of Hg in 0.20 g HgCl2 is .

Then. Mass of fish = 5.0 × 103 g. To convert to units of pounds, 

11. Does metallic tin react with HCl?

Solution

Yes, tin reacts with hydrochloric acid to produce hydrogen gas. This ability can be determined from the standard reduction potentials in Appendix L.

13. Compare the nature of the bonds in PbCl2 to that of the bonds in PbCl4.

Solution

In PbCl2, the bonding is ionic, as indicated by its melting point of 501 °C. In PbCl4, the bonding is covalent, as evidenced by it being an unstable liquid at room temperature.

This resource file is copyright 2015, Rice University. All Rights Reserved.