

1. Consider the balanced reaction below:
 $2X (s) + 2H_2O (l) \rightarrow 2XOH (aq) + H_2 (g)$

The species 'X' would be which of the following?

1. a halogen
2. an alkaline earth metal
3. an alkali metal **Correct**
4. a chalcogen

Explanation: The stoichiometry and (implied) charges on the species in the generic reaction above would all suggest an alkali metal such as potassium for X.

Example: $2K (s) + 2H_2O (l) \rightarrow 2KOH (aq) + H_2 (g)$

2. Which of the following **is not** true of alkaline earth metals?

1. React with halogens to form salts
2. Tend to form a +2 charge
3. Somewhat reactive toward water
4. Gain electrons to achieve noble gas configuration **Correct**
5. Have 2 electrons in their highest energy shell

Explanation: Having 2 electrons in their highest energy level makes the alkaline earth metals' shortest path to noble gas configuration the loss of two electrons.

3. Which member of the Boron family is a deadly poison

1. Aluminum (Al)
2. Boron (B)
3. Gallium (Ga)
4. Indium (In)
5. Thallium (Tl) **Correct**

Explanation: Thallium is highly toxic and has been used historically in rat poisons and insecticides. Its use for murder has earned it the nicknames "The Poisoner's Poison" and "Inheritance Powder."

4. The Nitrogen group contains (1/2) non-metal(s), (1/2) metalloid(s) and (1/2) metal(s). Do not consider the synthetic superheavy element Ununpentium (Uup) in arriving at your answer.

1. 2, 1, 2
2. 1, 2, 2
3. 2, 2, 1 **Correct**
4. 1, 1, 1
5. 2, 2, 2

Explanation: N and P are non-metals, As and Sb are metalloids and Bi is a metal.

5. Which member of the carbon family is most abundant in Earth's crust?

1. Silicon (Si) **Correct**
2. Carbon (C)
3. Germanium (Ge)
4. Tin (Sn)
5. Lead (Pb)

Explanation: Measured by mass, silicon is roughly 25% of the Earth's crust.

6. Which of the following statements **is not** true of the oxygen family?

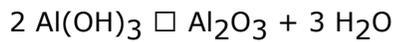
1. Are good reducing agents **Correct**
2. They often have an oxidation number of -2
3. Contains elements crucial to life
4. Are also called chalcogens

Explanation: Oxygen (and other members) tend to be good oxidizing agents.

7. Alumina (Al_2O_3) is produced in which of the following processes?

1. Hall process
2. *Contact* process
3. Bayer process **Correct**
4. Klaus process

Explanation: The Bayer process amounts to the following overall reaction:



8. Which of the following gemstones is/are derived from aluminum oxides?

- I. Diamond
 - II. Sapphire
 - III. Ruby
1. I
 2. II
 3. III
 4. I and II
 5. I and III
 6. II and III **Correct**
 7. none

Explanation: Diamond is a covalent network of carbon (one of its allotropes). Sapphire and Ruby are aluminates with trace impurities.