Skills to Develop

- Explain some facts about alkali metals, alkali earth metals, and noble gases.
- Apply the theories you have learned regarding the periodic table of chemical elements to explain the trends in properties of these elements.

Alkali, Alkali Earth, and noble gases

Here is one of the nonsensical ways of remembering the Group I and Group II elements.

- **Group 1:** H Li Na K Rb Cs Fr
- **Group 2:** Be Mg Ca Sr Ba Ra

Reading Material

For the moment, please read your text on these elements. This page is still under construction, but some questions have been made up to test your skills.

- To **Quizzes**

Confidence Building Questions

1. **What is the most abundant element in the universe?**
   Hint: 92% of the mass of the sun is hydrogen.

2. **What is the most abundant element in the Earth's crust?**
   Hint: More than 90% of the Earth's crust is silica. Silica is $\text{SiO}_2$. Quartz and sand are typical silica, and silicon oxide is an important ingredient of many other minerals.

3. **By what industrial process is hydrogen produced?**
   Hint: Using a nickel catalyst to convert light hydrocarbons to $\text{H}$ and $\text{CO}$.

4. **What industrial application consumes the most amount of hydrogen?**
   Hint: The production of ammonia using the Haber process.

5. **What is the name for the compound $\text{KH}$?**
   Hint: potassium hydride

6. **What is the oxidation state of hydrogen in the compounds $\text{NaH}$ and $\text{LiAlH}_4$?**
7. What is the oxidation state of hydrogen in \(\text{H}_2\text{O}\)?

Hint: +1

8. Arrange the alkali metals in increasing order of their melting point.

Hint: Melting points increase in the order: \(\text{Cs} < \text{Rb} < \text{K} < \text{Na} < \text{Li}\)

9. Arrange the alkali earth metals in decreasing order of their first ionization potential.

Hint: First ionization potential decreases in the order: \(\text{Be} > \text{Mg} > \text{Ca} > \text{Sr} > \text{Ba}\)

10. Which metal has the highest density in the list: \(\text{Li}, \text{K}, \text{Cs}, \text{Ca}, \text{Mg}, \text{Ba}\)?

Hint: \(\text{Ba}\) has the highest density. Check their values up.

11. Arrange the noble gases in order of their atomic radii?

Hint: Atomic radii of the noble gases increase with atomic number: \(\text{He} < \text{Ne} < \text{Ar} < \text{Kr} < \text{Xe}\)

12. Which alkali metal reacts with air to from a nitride?

Hint: \(\text{Li}\) is the only metal that reacts with air to form \(\text{Li}_3\text{N}\). \(\text{Li}_3\text{N}\) is called lithium nitride. Nitrogen has an oxidation state of -3.

13. Sodium hydroxide is the seventh most manufactured chemical in the United States. How is the sodium hydroxide produced?

Hint: By electrolysis of concentrated aqueous sodium chloride (brine).

14. What is most of the sodium carbonate mined or produced in the United States used for?

Hint: For the production of glass; things may change in the future.

15. You have two solutions, a sodium nitrate and a barium nitrate. What chemical test will be able to tell you which is which?

Hint: Barium ions form a precipitate with sulfate ion.

\[\text{Ba}^{2+} + \text{SO}_4^{2-} \rightarrow \text{BaSO}_4\ (\text{insoluble})\]

16. How is sodium produced?

Hint: By electrolysis of molten salt \(\text{NaCl}\). Describe the chemical reaction in this process.

17. Which of the alkaline earth metals does not react with water (even hot water)?

Hint: Beryllium, \(\text{Be}\), is stable towards it, but \(\text{Mg}\) reacts with hot water.

18. When calcium nitride \(\text{Ca}_2\text{N}_3\) reacts with water, what are the products?

Hint: Calcium hydroxide and ammonia.
19. **What is the major chemical found in most calcium containing minerals?**
   
   Hint: Most calcium on Earth is calcium carbonate.

20. **Do you know the chemical identity of calcium supplements from your pharmacy?**
   
   Hint: Calcium carbonate (the ingredient of sea and egg shells)

21. **What is the chemical called quick lime?**
   
   Hint: Quick lime is \( \text{CaO} \), calcium oxide

22. **Which has a higher atomic weight, \( \text{K} \) or \( \text{Ar} \)?**
   
   Hint: Check them out from your periodic table.

23. **How can you produce noble gases neon, argon, krypton, and xenon?**
   
   Hint: By fractional distillation of air.

24. **Do you know what nobel gas compounds have been made? Give one as an example.**
   
   Hint: Xenon fluoride has been made.
   
   Xenon fluoride has the formula: \( \text{XeF}_4 \).

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