

Chapter 22 Study Questions

1. What is the most abundant element in the universe?
2. Where is most of the hydrogen on Earth?
3. What is steam reforming hydrocarbon? Synthesis Gas? Water gas?
4. What is the gas shift reaction?
5. What is the reaction for the electrolysis of water?
6. What is the structure of a photoelectrochemical cell?
7. What is the semiconductor used in a photochemical cell?
8. Why is hydrogen under such study as an energy source?
9. Compare hydrogen and gasoline, which has a higher specific enthalpy – which has more energy stored in molecules per gram?
10. What are some of the problems with the storage of liquid hydrogen?
11. Describe one of the solutions for storage of hydrogen.
12. How is hydrogen purified?
13. What are the formulas of the ionic hydrides from the alkali metals?
14. What kinds of chemical reactions can water be used for?
15. What can methanol be used for? What is the chemical formula for methanol?
16. What is the valence electron configuration for the alkali metals?
17. Are the alkali metals good reducing agents? Oxidizing agents? Easily oxidized? Easily reduced?
18. What is the trend of the alkali metal melting points as you move down a group? Why is this the case?
19. Alkali metals form compounds with group 7 non-metals. What is the generic chemical formula for these compounds?
20. Are the reactions described in question 20 enthalpy driven or entropy driven? Why?
21. What is the generic reaction for alkali metals with water? What is the resulting general formula?
22. What is the generic reaction for alkali metals with oxygen? TRICK QUESTION!?
23. Define corrosion.
24. What is the formula and oxidation state for oxide, peroxide, superoxide? What are the size trends for these atoms/molecules? Why?
25. What do you use potassium compounds for? What specific compound is used in SCBA gear?
26. What are sodium compounds used for?

REVIEW CHAPTER 8 SECTION 6:

1. Nuclear charge and electron configuration
2. Lithium was used in what soda drink?
3. What psychological disease is lithium used for? What is the chemical formula of the lithium compound used as a drug?
4. What is the electronic configuration of the alkali earth metals?
5. Are the reactions of the alkali earth metals more or less vigorous than the alkali metals?
6. What is the general reaction of the alkali earth metals and water?
7. What is the trend of reactivity of the alkali earth metals and water as you move down the column?
8. The ability to form Nitrides N^{3-} distinguishes what two groups on the periodic table?
9. What is calcium used for in the cement industry?
10. How is calcium oxide prepared?
11. Calcium is found where in the body? What are the chemical formulas of these compounds?
12. Why does fluorinated water improve dental health?
13. What is the central intracellular messenger in the body?
14. Group 3A elements are...
15. What is the electronic structure for Boron and Aluminum?
16. Boron and Aluminum form compounds with only six electrons in the valence shell. These compounds are called...
17. What is the orbital hybridization in BF_3 ?
18. What is the Lewis structure for BF_3 ?
19. What is a Lewis acid?
20. What is the structure of boric acid?
21. What is the reaction of boric acid and water?
22. Name two uses for boric acid.
23. BH_3 exists as a dimer. What is the structure of diborane?
24. Aluminum is used in airplanes, but has what characteristics that would appear to make this dangerous? What is done to counter these characteristics?
25. What is an active metal?
26. Aluminum is amphoteric. What does this mean? What are the reactions?
27. Aluminum appears as what chemical formula naturally? What is the common name for this compound?
28. What is the reaction for the electrolysis of Al_2O_3 ?
29. What is the Hall process? What occurs at the cathode? The anode?
30. In the demonstration with Aluminum and Bromine...why did it take so long for the reaction to start? Was the reaction exothermic or endothermic? Was it spontaneous or non-spontaneous?
31. Carbon forms ionic or covalent bonds? Why?
32. What is the electronic structure of Carbon and Silicon?
33. What are allotropes?

34. What are the three allotropes of carbon?
35. Give some general characteristics of the allotropes of carbon.
36. The elemental form of silicon is similar to what allotrope of carbon?
37. Carbon bonds form long chains and rings. Why?
38. Compare and contrast the strength of bonds between carbon-carbon, carbon-hydrogen, carbon-oxygen, silicon-silicon, silicon-hydrogen, silicon-oxygen. How are these bonds characterized? (what units do you use to compare?)