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**CHEMICAL ENGINEERING REFRESHER REVIEW**  
**GENERAL INORGANIC CHEMISTRY PART 1**

1. Which among the following are true?
  - I. Protons are heavier than neutrons
  - II. Protons dictate the chemical reactivities of the elements.
  - III. Protons and Electrons have equal masses and charges.
  - a. I only
  - b. II only
  - c. II and III
  - d. None of these
2. Balance the following oxidation, reduction reactions equations:  
$$\text{KMnO}_4 + \text{FeSO}_4 + \text{H}_2\text{SO}_4 \rightarrow \text{Fe}_2(\text{SO}_4)_3 + \text{K}_2\text{SO}_4 + \text{MnSO}_4 + \text{H}_2\text{O}$$
  - a. 2, 10, 8, 5, 1, 2, 8
  - b. 3, 5, 8, 1, 1, 2, 5
  - c. 5, 2, 10, 1, 5, 2, 10
  - d. 4, 1, 8, 2, 8, 1, 10
3. In alkaline chlorination, the indicative reactions are shown below. Balance the equations:  
$$\text{NaCN} + \text{NaOH} \leftrightarrow \text{Cl}_2\text{NaCNO} + \text{NaCl} + \text{H}_2\text{O}$$
$$\text{NaCNO} + \text{NaOH} \leftrightarrow \text{Cl}_2\text{NaCl} + \text{CO}_2 + \text{N}_2 + \text{NaHCO}_3 + \text{H}_2\text{O}$$
  - a. 1, 2, 1, 1, 2, 1 and 2, 5, 3, 6, 1, 1, 1, 2
  - b. 1, 1, 1, 1, 1, 1 and 1, 2, 3, 3, 1, 1, 1, 2
  - c. 2, 1, 1, 1, 1, 2 and 3, 5, 2, 1, 6, 1, 1, 4
  - d. 1, 1, 2, 2, 2, 1 and 3, 2, 5, 5, 6, 1, 1, 1
4. Which among the following has the largest atomic / ionic size?
  - a.  $\text{Na}^+$
  - b.  $\text{Mg}^{2+}$
  - c. Ne
  - d.  $\text{F}^-$
5. The element neon was discovered in 1898 by:
  - a. Marks and Howell
  - b. Davy and Russel
  - c. Travers and Ramsay
  - d. Pontin and Berzelius
6.  $\text{C}_9\text{H}_8\text{O}_4$  is known as
  - a. Penicillin
  - b. Caffeine
  - c. Aspirin
  - d. Vitamin C
7. Sodium Hypobromite
  - a.  $\text{NaBrO}$
  - b.  $\text{NaBrO}_2$
  - c.  $\text{NaBrO}_3$
  - d.  $\text{NaBrO}_4$

8. What is the common name of the following compound,  $\text{Be}_3\text{Al}_2(\text{SiO}_3)_6$ ?
- Rochelle's Salt
  - Paris green
  - Aquamarine
  - Turnbull's blue
9. Classify each of the following as an element, a compound, or a mixture. Diamond, sea water, gasoline, wine, a pebble, bronze
- element, mixture, mixture, mixture, mixture, mixture
  - compound, mixture, compound, mixture, mixture, element
  - element, compound, compound, element, compound, compound
  - compound, compound, mixture, compound, compound, mixture
10. Tetrahedral electronic geometry on the central atom can be observed among the following, except:
- Phosphate ion
  - Water
  - Xenon Tetrafluoride
  - Sulfur Tetrafluoride
- I and II
  - III and IV
  - II only
  - I only
11. Which solvents are polar protic?
- Ethanol
  - Hexane
  - DMSO
  - Water
- III, IV
  - II, III
  - I, IV
  - I, III
12. Which of the following carbonates is most soluble in water?
- $\text{MgCO}_3$  ( $K_{\text{sp}} = 3.5 \times 10^{-8}$ )
  - $\text{BaCO}_3$  ( $K_{\text{sp}} = 2.0 \times 10^{-9}$ )
  - $\text{CdCO}_3$  ( $K_{\text{sp}} = 1.8 \times 10^{-14}$ )
  - $\text{Hg}_2\text{CO}_3$  ( $K_{\text{sp}} = 8.9 \times 10^{-17}$ )
13. Consider the following reaction. What combination of changed conditions would cause it to proceed more to the right as written?
- $$\text{CS}_2(\text{g}) + 3\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{SO}_2(\text{g}) \quad \Delta H = -1110 \text{ kJ/mol}$$
- raising the temperature and increasing the pressure
  - raising the temperature and decreasing the pressure
  - lowering the temperature and increasing the pressure
  - lowering the temperature and decreasing the pressure
14. A curie corresponds to \_\_\_\_\_ disintegrations of radioactive nuclei per second
- $3.70 \times 10^7$
  - $3.70 \times 10^8$
  - $3.70 \times 10^9$
  - $3.70 \times 10^{10}$
15. Determine the oxidation number of Chromium in  $\text{CrF}_6^{3+}$ .
- 2
  - 3
  - 5
  - 6
16. Which among the following statements are true about nitric acid?
- Correct Lewis structure of nitric acid shows a (-1) formal charge on nitrogen
  - Correct Lewis structure of nitric acid shows 1 lone pair on Nitrogen
  - Nitric acid is a strong acid
- I and III only
  - II and III only
  - III only
  - All of the above
17. What determines the degree of completeness of a reaction?
- catalyst
  - intimacy of contact
  - rate of reaction
  - equilibrium constant
18. If a nitrogen-14 nuclide captures an alpha particle, a proton is produced along with \_\_\_\_\_
- B – 10
  - O – 17
  - F – 18
  - C – 17

19. Bombardment of uranium-235 with a neutron generates tellurium-135, 3 neutrons, and
- |                 |                 |
|-----------------|-----------------|
| a. zirconium-98 | c. krypton-103  |
| b. krypton-101  | d. strontium-99 |
20. Do isotopes of the heavy elements (for example, those from atomic number 37 to 53) contain more, the same, or fewer neutrons than protons?
- |         |                  |
|---------|------------------|
| a. more | c. fewer         |
| b. same | d. none of these |

- E N D -

