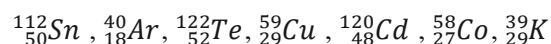


Name:

Exam Chemistry 101 for Chemical Engineers

Questions from Chapter-2: Atoms and Atomic Theory

- 1) What is the correct symbol for the species that contains 18 neutrons, 17 protons, and 16 electrons?
- 2) Which of the following have the same charge and approximately the same mass?
 - a. an electron and a proton;
 - b. a proton and a neutron;
 - c. a hydrogen atom and a proton;
 - d. a neutron and a hydrogen atom;
 - e. an electron and ion.
- 3) Arrange the following species in order of increasing
 - (a) number of electrons;
 - (b) number of neutrons;
 - (c) mass.



Questions from Chapter-3: Compounds

- 4) Write the names of the following chemicals:
 - a. SiF_4 :
 - b. BCl_3 :
 - c. MgI_2 :
 - d. Al_2O_3 :
 - e. N_2O_5 :
- 5) Write the formulas for the following chemicals:
 - a. Carbon tetrachloride :
 - b. Hydrochloric acid :
 - c. Ammonium Bromide :
 - d. Copper (II) Chloride :
 - e. Sodium Sulfate :
- 6) Determine the number of Moles and number of molecules or atoms of
 - a. N_2O_4 in a 115 g sample
 - b. N atoms in 43.5 of $\text{Mg}(\text{NO}_3)_2$
 - c. N atoms in a sample of $\text{C}_7\text{H}_5(\text{NO}_2)_3$ that has the same number of O atoms as 12.4 g $\text{C}_6\text{H}_{12}\text{O}_6$.

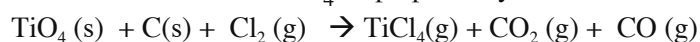
Questions from Chapter-4: Chemical Reactions

- 7) Sodium nitrite (NaNO_2) is used in the production of dyes for coloring fabrics,

as a preservative in meat processing (to prevent botulism), as a bleach for fibers, and in photography. It can be prepared by passing nitrogen monoxide and oxygen gases into an aqueous solution of sodium carbonate. Carbon dioxide gas is another product of the reaction.

In one experimental method, which gives a 95.0% yield, 225 mL of 1.50 M aqueous solution of sodium carbonate, 22.1 g of nitrogen monoxide, and a large excess of oxygen gas are allowed to react. What mass of sodium nitrite is obtained?

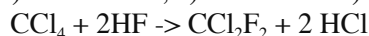
- 8) Titanium tetrachloride, TiCl_4 , is prepared by the reaction below.



First balance the equation. And find the maximum mass of TiCl_4 that can be obtained from 35 g TiO_2 , 45 g Cl_2 and 11 g C?

- 9) In the reaction of 227 g CCl_4 with an excess of HF, 187 g CCl_2F_2 is obtained.

What are the a) Theoretical, b) Actual and c) Percent Yields of this reaction?



Questions from Chapter-5: Reactions in Water

Solubility Rules:

- I. Salts of group 1 cations (with some exceptions of Li) and NH_4 are soluble.
- II. Nitrates, acetates, and perchlorates are soluble.
- III. Salts of silver, lead, and mercury(I) are insoluble.
- IV. Chlorides, bromides, and iodides are soluble.
- V. Carbonates, phosphates, sulfides, oxides, and hydroxides are insoluble (sulfides of group 2 cations and hydroxides of Ca^{2+} , Sr^{2+} , Ba^{2+} slightly soluble).
- VI. Sulfates are soluble except for those of calcium, strontium, and barium.

- 10) Indicate whether a precipitate forms when the following compounds in aqueous solution are mixed. If no reaction occurs, so state. (Indicate the precipitation rules)

(a) sodium phosphate + aluminum chloride -->

(b) aluminum sulfate + barium chloride -->

- 11) 11) Indicate whether a precipitate forms by the following equations. If no reaction occurs, so state. (Indicate the precipitation rules)

(a) $\text{AlCl}_3(\text{aq}) + \text{KOH}(\text{aq}) \rightarrow$

(b) $\text{KSO}_4(\text{aq}) + \text{FeBr}_3(\text{aq}) \rightarrow$

