

Name:

General Chemistry First Midterm 2014 First Semester

Questions from Chapter-2: Atoms and Atomic Theory

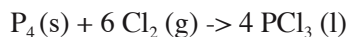
- 1) What is the correct symbol for the species that contains 12 neutrons, 11 protons, and 22 electrons?
- 2) Indicate the number of protons, neutrons, and electrons in
 - (a) an atom of barium-135 and
 - (b) the double negatively charged ion of selenium-80.
- 3) Which of the following have the same 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.
- 4) We found that when 0.455 g of magnesium reacted with 2.315 g of oxygen, 0.755 g of magnesium oxide was obtained. Determine the mass of magnesium contained in a 0.500 g sample of magnesium oxide?
- 5) Two naturally occurring isotopes of lithium, lithium-6 and lithium-7, have masses of 6.01512 u and 7.01600 u, respectively. Which of these two occurs in greater abundance?

Questions from Chapter-3: Compounds

- 6) Write the names of the following chemicals:
 - a. NaCl :
 - b. BCl₃ :
 - c. MgI₂ :
 - d. Al₂O₃ :
 - e. N₂O₅ :
- 7) Write the formulas for the following chemicals:
 - a. Iron (II) Sulfide :
 - b. Hydrochloric acid :
 - c. Calcium Fluoride :
 - d. Copper (II) Chloride :
 - e. Dinitrogen pentoxide :
- 8) Determine the mass in grams of
 - a. 6.25×10^{-2} mol P₄
 - b. 4.03×10^{24} molecules of stearic acid, C₁₈H₃₆O₂
 - c. A quantity of the amino acid lysine, C₆H₁₄N₂O₂, containing 3.03 mol N atoms

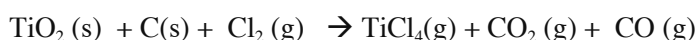
Questions from Chapter-4: Chemical Reactions

- 9) Phosphorus trichloride, PCl_3 , is commercially important compound in the manufacture of pesticides, gasoline additives and a number of other products. Liquid PCl_3 is made by the direct combination of phosphorous and chlorine.



What is the maximum mass of PCl_3 that can be obtained from 125 g P_4 and 323 g Cl_2 ?

- 10) Titaniumtetrachloride, 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?

- 11) Billions of kilograms of urea, $\text{CO}(\text{NH}_2)_2$, are produced annually for use as a fertilizer.



If 47.7 g urea forms per mole of CO_2 that reacts, what is the a) Theoretical yield, b) Actual Yield, c) Percent Yield?

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 hydrazinodioxides of Ca^{2+} , Sr^{2+} , Ba^{2+} slightly soluble).
 - VI. Sulfates are soluble except for those of calcium, strontium, and barium.
- 12) Indicate whether a precipitate forms by the following equations. If no reaction occurs, so state. (Indicate the precipitation rules)
- (a) $\text{NH}_4\text{Cl} (\text{aq}) + \text{KNO}_3 (\text{aq}) \rightarrow$
 - (b) $\text{PbCl}_2 (\text{aq}) + \text{KI} (\text{aq}) \rightarrow$
 - (c) $\text{Na}_2\text{SO}_4 (\text{aq}) + \text{Pb}(\text{NO}_3)_2 (\text{aq}) \rightarrow$

Periodic Table of the Elements

| | | | | | | | | | | | | | | | | | |
|---------------------|---------------------|-------------------------------------|--------------------|---------------------|---------------------|---------------------|--------------------|---------------------|--------------------|---------------------|---------------------|---------------------|---------------------|---------------------|--------------------|---------------------|---------------------|
| 1 1A | 2 2A | | | | | | | | | | | 3 3A | 4 4A | 5 5A | 6 6A | 7 7A | 8 8A |
| 1 H 1.008 | 2 He 4.003 | 3 Li 6.941 | 4 Be 9.012 | 5 B 10.811 | 6 C 12.011 | 7 N 14.007 | 8 O 15.999 | 9 F 18.998 | 10 Ne 20.180 | 11 Na 22.990 | 12 Mg 24.305 | 13 Al 26.982 | 14 Si 28.086 | 15 P 30.974 | 16 S 32.065 | 17 Cl 35.453 | 18 Ar 39.948 |
| 19 K 39.098 | 20 Ca 40.078 | 21 Sc 44.956 | 22 Ti 47.88 | 23 V 50.942 | 24 Cr 51.996 | 25 Mn 54.938 | 26 Fe 55.845 | 27 Co 58.933 | 28 Ni 58.693 | 29 Cu 63.546 | 30 Zn 65.39 | 31 Ga 69.723 | 32 Ge 72.63 | 33 As 74.922 | 34 Se 78.96 | 35 Br 79.904 | 36 Kr 83.80 |
| 37 Rb 85.468 | 38 Sr 87.62 | 39 Y 88.906 | 40 Zr 91.224 | 41 Nb 92.906 | 42 Mo 95.94 | 43 Tc 98.906 | 44 Ru 101.07 | 45 Rh 101.07 | 46 Pd 106.42 | 47 Ag 107.868 | 48 Cd 112.411 | 49 In 114.818 | 50 Sn 118.71 | 51 Sb 121.757 | 52 Te 127.6 | 53 I 126.905 | 54 Xe 131.29 |
| 55 Cs 132.905 | 56 Ba 137.327 | 57-71 La-Lu Lanthanide Series | 72 Hf 178.49 | 73 Ta 180.948 | 74 W 183.85 | 75 Re 186.207 | 76 Os 190.23 | 77 Ir 192.22 | 78 Pt 195.08 | 79 Au 196.967 | 80 Hg 200.59 | 81 Tl 204.383 | 82 Pb 207.2 | 83 Bi 208.980 | 84 Po [209] | 85 At [210] | 86 Rn [222] |
| 87 Fr [223] | 88 Ra [226] | 89-103 Ac-Lr Actinide Series | 104 Rf [261] | 105 Db [262] | 106 Sg [266] | 107 Bh [264] | 108 Hs [265] | 109 Mt [268] | 110 Ds [271] | 111 Rg [272] | 112 Cn [285] | 113 Nh [284] | 114 Fl [289] | 115 Uup [288] | 116 Lv [293] | 117 Uus [294] | 118 Uuo [294] |
| 57 La 138.905 | 58 Ce 140.115 | 59 Pr 140.908 | 60 Nd 144.24 | 61 Pm [145] | 62 Sm 150.36 | 63 Eu 151.965 | 64 Gd 157.25 | 65 Tb 158.925 | 66 Dy 162.50 | 67 Ho 164.930 | 68 Er 167.26 | 69 Tm 168.934 | 70 Yb 173.054 | 71 Lu 174.967 | | | |
| 89 Ac [227] | 90 Th 232.038 | 91 Pa [231] | 92 U 238.029 | 93 Np [237] | 94 Pu 244.064 | 95 Am [243] | 96 Cm [247] | 97 Bk [247] | 98 Cf [251] | 99 Es [252] | 100 Fm [257] | 101 Md [258] | 102 No [259] | 103 Lr [262] | | | |