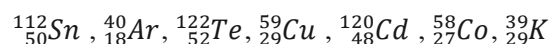


Name:

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 $\text{C}_6\text{H}_{12}\text{O}_6$.

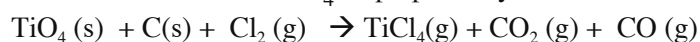
Questions from Chapter-4: Chemical Reactions

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

Periodic Table of the Elements

																		1																			18		
																		1A																			VIIA		
																		1 H Hydrogen 1.008																			2 He Helium 4.003		
																		2 IIA 2A																				8A	
																		3 III 3B																				10 VIIA 7A	
																		4 IV 4B																				9 VIA 6A	
																		5 VB 5B																				8 V 5A	
																		6 VIB 6B																				7 IVA 4A	
																		7 VII 7B																				6 III 3A	
																		8																				5 II 2B	
																		9 VIII																				4 II 2B	
																		10																				3 I 1B	
																		11																				2 I 1B	
																		12																				1 I 1B	
																		13																				13 III 3A	
																		14																				14 IVA 4A	
																		15																				15 VA 5A	
																		16																				16 VIA 6A	
																		17																				17 VIIA 7A	
																		18																				18 VIIIA 8A	
																		19 Na Sodium 22.990																				19 K Potassium 39.098	
																		20 Mg Magnesium 24.305																				20 Ca Calcium 40.078	
																		21																				21 Sc Scandium 44.956	
																		22																				22 Ti Titanium 47.88	
																		23																				23 V Vanadium 50.942	
																		24																				24 Cr Chromium 51.996	
																		25																				25 Mn Manganese 54.938	
																		26																				26 Fe Iron 55.833	
																		27																				27 Co Cobalt 58.933	
																		28																				28 Ni Nickel 58.693	
																		29																				29 Cu Copper 63.546	
																		30																				30 Zn Zinc 65.39	
																		31																				31 Ga Gallium 69.722	
																		32																				32 Ge Germanium 72.61	
																		33																				33 As Arsenic 74.922	
																		34																				34 Se Selenium 78.09	
																		35																				35 Br Bromine 79.904	
																		36																				36 Kr Krypton 84.80	
																		37																				37 Rb Rubidium 84.468	
																		38																				38 Sr Strontium 87.62	
																		39																				39 Y Yttrium 88.906	
																		40																				40 Zr Zirconium 91.224	
																		41																				41 Nb Niobium 92.906	
																		42																				42 Mo Molybdenum 95.94	
																		43																				43 Tc Technetium 98.907	
																		44																				44 Ru Ruthenium 101.07	
																		45																				45 Rh Rhodium 102.906	
																		46																				46 Pd Palladium 106.42	
																		47																				47 Ag Silver 107.868	
																		48																				48 Cd Cadmium 112.411	
																		49																				49 In Indium 114.818	
																		50																				50 Sn Tin 118.71	
																		51																				51 Sb Antimony 121.760	
																		52																				52 Te Tellurium 127.6	
																		53																				53 I Iodine 126.904	
																		54																				54 Xe Xenon 131.29	
																		55																				55 Cs Cesium 132.905	
																		56																				56 Ba Barium 137.327	
																		57-71																				57-103 Lanthanide Series	
																		58																				58 Ce Cerium 140.115	
																		59																				59 Pr Praseodymium 140.908	
																		60																				60 Nd Neodymium 144.24	
																		61																				61 Pm Promethium 144.913	
																		62																				62 Sm Samarium 150.36	
																		63																				63 Eu Europium 151.966	
																		64																				64 Gd Gadolinium 157.25	
																		65																				65 Tb Terbium 158.925	
																		66																				66 Dy Dysprosium 162.50	
																		67																				67 Ho Holmium 164.930	
																		68																				68 Er Erbium 167.26	
																		69																				69 Tm Thulium 168.934	
																		70																				70 Yb Ytterbium 173.04	
																		71																				71 Lu Lutetium 174.967	
																		72																				72 Hf Hafnium 178.49	
																		73																				73 Ta Tantalum 180.948	
																		74																				74 W Tungsten 183.85	
																		75																				75 Re Rhenium 186.207	
																		76																				76 Os Osmium 190.23	
																		77																				77 Ir Iridium 192.22	
																		78																				78 Pt Platinum 195.08	
																		79																				79 Au Gold 196.967	
																		80																				80 Hg Mercury 200.59	
																		81																				81 Tl Thallium 204.383	
																		82																				82 Pb Lead 207.2	
																		83																				83 Bi Bismuth 208.980	
																		84																				84 Po Polonium [208.982]	
																		85																				85 At Astatine 209.987	
																		86																				86 Rn Radon 222.018	
																		87																				87 Fr Francium [223.020]	
																		88																				88 Ra Radium [226.025]	
																		89-103																				89-103 Actinide Series	
																		89																				89 Ac Actinium 227.028	
																		90																				90 Th Thorium 232.038	
																		91																				91 Pa Protactinium 231.036	
																		92																				92 U Uranium 238.029	
																		93																				93 Np Neptunium 237.048	
																		94																				94 Pu Plutonium 244.064	
																		95																				95 Am Americium 243.061	
																		96																				96 Cm Curium 247.070	
																		97																				97 Bk Berkelium 247.070	
																		98																				98 Cf Californium 251.080	
																		99																				99 Es Einsteinium [254]	
																		100																				100 Fm Fermium 257.095	
																		101																				101 Md Mendelevium 258.1	
																		102																				102 No Nobelium 259.101	
																		103																				103 Lr Lawrencium [262]	