
 NUMERICAL ANSWERS TO ASSIGNED TUTORIAL PROBLEM SETS FOR CHEM205
 FROM KOTZ & TREICHEL'S CHEMISTRY & CHEMICAL REACTIVITY, 6th Ed.

NOTE: none of the answers from Ch.4 have been verified

Ch.	Q#	Answer	Units	SFs	Comments
4	6a				$\text{SF}_4(\text{g}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow \text{SO}_2(\text{g}) + 4\text{HF}(\text{l})$
4	6a				sulfur tetrafluoride, water, sulfur dioxide, hydrogen fluoride
4	6b				$4\text{NH}_3(\text{aq}) + 5\text{O}_2(\text{g}) \rightarrow 4\text{NO}(\text{g}) + 6\text{H}_2\text{O}(\text{l})$
4	6b				ammonia, oxygen, nitrogen monoxide, water
4	6c				$\text{BF}_3(\text{g}) + 3\text{H}_2\text{O}(\text{l}) \rightarrow 3\text{HF}(\text{aq}) + 3\text{H}_3\text{BO}_3(\text{l})$
4	6c				boron trifluoride, water, hydrogen fluoride, hydrogen borate (boric acid)
4	10a	318	g	3	Fe
4	10b	239	g	3	CO
4	12a				CO_2 carbon dioxide, H_2O water
4	12b				$\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$
4	12c	102	g	3	oxygen O_2
4	12d	128	g	3	products
4	14a				$\text{BaCl}_2(\text{aq}) + 2\text{AgNO}_3(\text{aq}) \rightarrow 2\text{AgCl}(\text{s}) + \text{Ba}(\text{NO}_3)_2(\text{aq})$
4	14b	0.255	g	3	AgNO_3
4	14b	0.215	g	3	AgCl
4	16				see Example 4.2
4	22				0.125mol S_8 ; 1.00mol Cl_2 ; $1\text{mol S}_8 : 4\text{mol Cl}_2 \rightarrow \text{S}_8$ is limiting reagent
4	24a				0.100mol Al ; 0.0573mol Cl_2 ; $2\text{mol Al} : 3\text{mol Cl}_2 \rightarrow \text{Cl}_2$ is limiting
4	24b	5.09	g	3	AlCl_3
4	24c	1.03	g	3	Al used; 1.67 g Al remains
4	26	1.30×10^2	g	3	maximum mass aspirin produced
4	30a	9.37	g	3	$\text{CH}_3\text{COSCH}_3$
4	30b	92.3	%	3	percent yield
4	32	91.4	%	3	percent $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$ in original mixture
4	36	8.79	%	3	0.0672g Al in 0.764g sample
4	40a				empirical formula C_5H_4
4	40b				molecular formula C_{10}H_8
4	44				empirical formula $\text{Fe}(\text{CO})_5$
4	46a				$\text{Ca}_3(\text{PO}_4)_2(\text{s}) + 2\text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{Ca}(\text{H}_2\text{PO}_4)_2(\text{aq}) + 2\text{CaSO}_4(\text{s})$
4	46b				$2\text{NaBH}_4(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{B}_2\text{H}_6(\text{g}) + 2\text{H}_2(\text{g}) + \text{Na}_2\text{SO}_4(\text{aq})$
4	46c				$\text{WO}_3(\text{s}) + 3\text{H}_2(\text{g}) \rightarrow \text{W}(\text{s}) + 3\text{H}_2\text{O}(\text{l})$
4	46d				$(\text{NH}_4)_2\text{Cr}_2\text{O}_7(\text{s}) \rightarrow \text{N}_2(\text{g}) + 4\text{H}_2\text{O}(\text{l}) + \text{Cr}_2\text{O}_3(\text{s})$
4	48	36.6	g	3	mass of product = mass of reactants
4	50	0.28	g	2	arginine
4	50	0.21	g	2	ornithine
4	52				Hint: did any substance enter or leave the system?
4	58	75.92	%	4	saccharin
4	62				empirical formula $\text{C}_3\text{H}_2\text{O}$
4	68				239 mg thioridazine; 19.9 mg thioridazine/tablet (3 SF due to mass data)
4	70	4.79×10^5	g	3	Cl_2
4	76				1.5×10^5 cm thick; volume 1.4 cm^3 ; mass 1.4 g $(\text{CH}_3)_2\text{SiCl}_2$
4	78				hint: find mass of $\text{CuS}/\text{Cu}_2\text{S}$ in mixture; & find mass of Cu produced. & devise set of 2 equations to solve for 2 unknowns (mass CuS & Cu_2S) Answer: in 100.0 g sample: 62.2 g Cu_2S (62.2%); 26.8 g CuS (26.8%)
4	82a				2.93 g Cl_2 , 4.47 g FeCl_3 because $2\text{Fe}(\text{s}) + 3\text{Cl}_2(\text{g}) \rightarrow 2\text{FeCl}_3(\text{s})$
4	82b				$1.32 \text{ g Fe}(\text{OH})_3$; $\text{FeCl}_3(\text{aq}) + 3\text{NaOH}(\text{aq}) \rightarrow \text{Fe}(\text{OH})_3(\text{s}) + 3\text{NaCl}(\text{aq})$