CHEM 100 Chapter 2 Homework Key

Items boxed in purple were graded out of two points each, with two points earned for a correct answer and one point earned for a reasonable, but incorrect, attempt. Four points were awarded for submission of a completed assignment.

11, 15, 22, 27, 31, 34, 37, 41, 42, 45, 48, 51

11. Rectangle C cannot represent the mixture after reaction. Rectangle C contains 15 oxygen atoms; there are 14 oxygen atoms in the initial mixture. The law of conservation of mass has been violated.

15. (a) The container would weigh the same regardless of how much time passed. (b) No. The mouse would exchange gases with the surroundings.

22. Mass before the reaction = 2.796 g of zinc + 2.414 g of sulfur = 5.210 g
Mass after the reaction = 4.169 g of zinc sulfide + 1.041 g of sulfur = 5.210 g
Yes, the experiment obeys the law of conservation of mass.

27. $\frac{3.0 \text{ parts carbon}}{3.0 + 8.0 \text{ parts carbon dioxide}} \text{ x } 14 \text{ kg carbon dioxide} = 3.8 \text{ kg carbon}$

31. The atoms are neither being created nor destroyed; they are being rearranged.

34. a; $\frac{57 \text{ unit F}}{14 \text{ units N}} \text{x} \frac{1 \text{ atom N}}{3 \text{ atoms F}} = \frac{19}{14} \text{ by mass}$

37. Calculate the mass ratio of Sn to O in SnO. 0.742 g Sn / 0.100 g O = 7.4:1.
Calculate the mass ratio of Sn to O in the unknown. 0.555 g Sn / 0.150 g O = 3.7:1
or 7.4:2. Compare the oxygen mass ratios of the two oxides. 1:2; thus the second oxide has 2 oxygen atoms for every oxygen atom in the first oxide. The formula of the second oxide is SnO_2.

41. $1.000 \text{ g C} \text{ x} \frac{1 \text{ mol C}}{12.01 \text{ g C}} = 0.08326 \text{ mol C} \text{ x} \frac{6.02\text{x}10^{23} \text{ atoms C}}{1 \text{ mol C}} = 5.01\text{x}10^{22} \text{ atoms C}$

42. 16.00 g/mol O + 2(1.01g/mol H) = 18.02 g/mol H_2O
$6.02 \text{ x } 10^{23}$ atoms of O and $2(6.02 \text{ x } 10^{23}$ atoms of H) = $1.20 \text{ x } 10^{24}$ atoms of H

45. Sample 1: $\frac{0.937 \text{ g C}}{1.000 \text{ g}} \times 100\% = 93.7\% \text{ C}; \frac{0.0629 \text{ g H}}{1.000 \text{ g}} \times 100\% = 6.29\% \text{ H}$

Sample 2: $\frac{0.229 \text{ g C}}{0.244 \text{ g}} \times 100\% = 93.8\% \text{ C}; \frac{0.0153 \text{ g H}}{0.244 \text{ g}} \times 100\% = 6.27\% \text{ H}$

Sample 3: $\frac{0.094 \text{ g C}}{0.100 \text{ g}} \times 100\% = 94\% \text{ C}; \frac{0.0063 \text{ g H}}{0.100 \text{ g}} \times 100\% = 6.3\% \text{ H}$

All ratios are constant to two significant figures. The solid is a pure compound!

48. From the first experiment we note that 3.06 g of hydrogen produced 27.35 g of water when allowed to react with oxygen. By applying the law of conservation of mass, 24.29 g of oxygen is required. Next, calculate the ratio by mass of hydrogen to oxygen in water. 3.06 g hydrogen / 24.29 g oxygen = 1 part hydrogen to 8 parts oxygen. Next, compare the ratio (1:8) with the masses of hydrogen and oxygen produced in the electrolysis experiment: 1.45 g hydrogen / 11.51 g oxygen = 1 part hydrogen to 8 parts oxygen. The results are consistent with the law of definite proportions.

51. Table 2.1 indicates 1 ratio of 1.000 g oxygen:0.4375 g nitrogen. The nitrogen ratio is 0.4375:0.5836 or 1.000:1.334 or in whole numbers 3:4.