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| D:\ShanghaiTech\Graphics\ShanghaiTech_logo.emf | General Chemistry I, Fall 2024  Problem Set 1 |

The set consists of 4 problems and the total points is 4. Pay attention to the significant figures.

**1.20**. (0.6 point) More than half of all the atoms in naturally occurring zirconium are 90Zr. The other four stable isotopes of zirconium have the following relative atomic masses and abundances. Compute the relative atomic mass of 90Zr to four significant digits, using the tabulated relative atomic mass 91.224 for natural zirconium.

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| Isotope | % Abundance | Atomic Mass |
| 91Zr | 11.27 | 90.9056 |
| 92Zr | 17.17 | 91.9050 |
| 94Zr | 17.33 | 93.9063 |
| 96Zr | 2.78 | 95.9083 |

**1.38**. (0.9 point) In a reproduction of the Millikan oil-drop experiment, a student obtains the following values for the charges on nine different oil droplets.

6.563 × 10−19 C 13.13 × 10−19 C 19.71 × 10−19 C 8.204 × 10−19 C

16.48 × 10−19 C 22.89 × 10−19 C 11.50 × 10−19 C 18.08 × 10−19 C

26.18 × 10−19 C

(a) Based on these data alone, what is your best estimate of the number of electrons on each of the above droplets?

(b) Based on these data alone, what is your best estimate of the charge on the electron?

(c) Is it conceivable that the actual charge is half the charge you calculated in (b)? What evidence would help you decide one way or the other?

**2.41**. (1.2 point) A dark brown binary compound contains oxygen and a metal. It is 13.38% oxygen by mass. Heating it moderately drives off some of the oxygen and gives a red binary compound that is 9.334% oxygen by mass. Strong heating drives off more oxygen and gives still another binary compound, which is only 7.168% oxygen by mass.

(a) Compute the mass of oxygen that is combined with 1.000 g of the metal in each of these three oxides.

(b) Assume that the empirical formula of the first compound is MO2 (where M represents the metal). Give the empirical formulas of the second and third compounds.

(c) Name the metal and give its element symbol.

**4**. (1.3 point) Give the systematic name of the following chemical formulas in English.

(1) (NH4)2CO3

(2) NH4HCO3

(3) Fe(NO3)3

(4) Mg(OH)2·5H2O