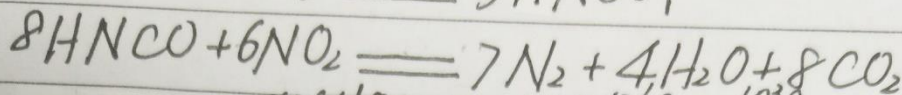
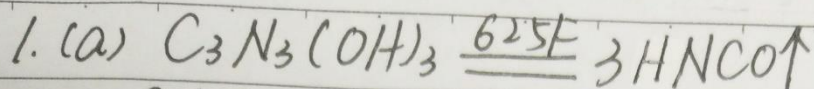


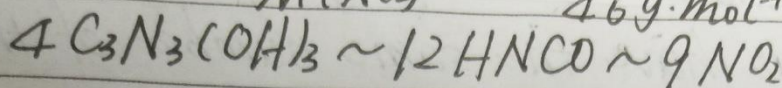
Homework 1

Date

No.

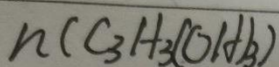


(b) $n(NO_2) = \frac{m(NO_2)}{M(NO_2)} = \frac{1.7 \times 10^{10} \text{ kg} \times \frac{10^3 \text{ g}}{1 \text{ kg}}}{46 \text{ g} \cdot \text{mol}^{-1}} = \frac{17}{46} \times 10^{12} \text{ mol}$



4

9



$$\frac{17}{46} \times 10^{12} \text{ mol}$$

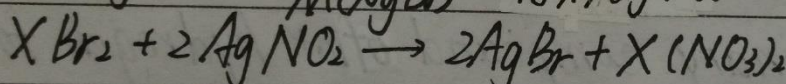
$$\frac{4}{n(C_3N_3(OH)_3)} = \frac{9}{\frac{17}{46} \times 10^{12} \text{ mol}} \Rightarrow n(C_3N_3(OH)_3) = \frac{17}{207} \times 10^{12} \text{ mol}$$

$$m(C_3N_3(OH)_3) = n(C_3N_3(OH)_3) M(C_3N_3(OH)_3)$$

$$= \frac{17}{207} \times 10^{12} \text{ mol} \times 129 \text{ g} \cdot \text{mol}^{-1}$$

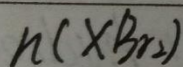
$$\approx 1.1 \times 10^{13} \text{ g} = 1.1 \times 10^{13} \text{ g} \times \frac{1 \text{ kg}}{10^3 \text{ g}} = \underline{1.1 \times 10^{10} \text{ kg}}$$

2. (a) $n(AgBr) = \frac{m(AgBr)}{M(AgBr)} = \frac{1.0128 \text{ g}}{187.76 \text{ g} \cdot \text{mol}^{-1}} \approx 0.0054314 \text{ mol}$



1

2



$$0.0054314 \text{ mol}$$

$$\frac{1}{n(XBr_2)} = \frac{2}{0.0054314 \text{ mol}} \Rightarrow n(XBr_2) = 0.0027157 \text{ mol}$$

$$M(XBr_2) = \frac{m(XBr_2)}{n(XBr_2)} = \frac{0.5000 \text{ g}}{0.0027157 \text{ mol}} \approx 184.1 \text{ g} \cdot \text{mol}^{-1}$$

Therefore, the molecular mass (formula mass) of XBr_2 is

184.1

(b) The relative mass of X is $184.1 - 2 \times 79.9 = \underline{24.3}$

Referring to the Period Table of the Elements, we discovered that Mg's relative mass is 24.3 and according to our common sense, the ion of Mg usually shows the valence of +2. Therefore, the name of X

is magnesium ("镁" in Chinese) and its symbol is Mg.
Date No.

3. In terms of elements in the main group, those in the same main group have the same number of the electron in the outermost layer, so they usually have similar property including valence.

Analogizing to the simplest binary compound that hydrogen forms with carbone, methane (CH_4), we predict the binary compound that hydrogen forms with germanium is GeH_4 .

Analogizing to the binary compound that hydrogen forms with chlorine, hydrochloric acid (HCl), we predict the binary compound that hydrogen forms with fluorine is HF .

Analogizing to the binary compounds that hydrogen forms with oxygen, water (H_2O), we predict the binary compound that hydrogen forms with tellurium is H_2Te .

Analogizing to the binary compound that hydrogen forms with nitrogen, ammonia (NH_3), we predict the binary compound that hydrogen forms with bismuth is BiH_3 .

$$4. (a) F = \frac{e^2}{4\pi\epsilon_0 r^2} = \frac{(1.602 \times 10^{-19} \text{C})^2}{4\pi \times 8.854 \times 10^{-12} \text{C}^2 \text{J}^{-1} \text{m}^{-1} \times 0.2 \text{\AA} \times \frac{1 \text{m}}{10^{10} \text{\AA}}} \approx 6 \times 10^{-33} \text{N}$$

$$(b) E = \frac{e^2}{4\pi\epsilon_0 r} = \frac{(1.602 \times 10^{-19} \text{C})^2}{4\pi \times 8.854 \times 10^{-12} \text{C}^2 \text{J}^{-1} \text{m}^{-1} \times 2 \text{\AA} \times \frac{1 \text{m}}{10^{10} \text{\AA}}} \approx 1 \times 10^{-42} \text{J}$$

$$5. (a) F_1 = \frac{e^2}{4\pi\epsilon_0 r_1^2} = \frac{(1.602 \times 10^{-19} \text{C})^2}{4\pi \times 8.854 \times 10^{-12} \text{C}^2 \text{J}^{-1} \text{m}^{-1} \times 1.2 \text{\AA} \times \frac{1 \text{m}}{10^{10} \text{\AA}}} \approx 5.13 \times 10^{-33} \text{N}$$

$$F_2 = \frac{e^2}{4\pi\epsilon_0 r_2^2} = \frac{(1.602 \times 10^{-19} \text{C})^2}{4\pi \times 8.854 \times 10^{-12} \text{C}^2 \text{J}^{-1} \text{m}^{-1} \times (0.529 \times \frac{1 \text{m}}{10^{10} \text{\AA}})^2} \approx 8.24 \times 10^{-32} \text{N}$$

$$\Delta F = F_2 - F_1 = (8.24 \times 10^{-32} - 5.13 \times 10^{-33}) \text{N} \approx 7.73 \times 10^{-32} \text{N}$$

$$(b) E_1 = -\frac{e^2}{4\pi\epsilon_0 r_1} = \frac{(1.602 \times 10^{-19} \text{C})^2}{4\pi \times 8.854 \times 10^{-12} \text{C}^2 \text{J}^{-1} \text{m}^{-1} \times 1.2 \text{\AA} \times \frac{1 \text{m}}{10^{10} \text{\AA}}} \approx -1.09 \times 10^{-42} \text{J}$$

$$E_2 = -\frac{e^2}{4\pi\epsilon_0 r_2} = \frac{(1.602 \times 10^{-19} \text{C})^2}{4\pi \times 8.854 \times 10^{-12} \text{C}^2 \text{J}^{-1} \text{m}^{-1} \times (0.529 \times \frac{1 \text{m}}{10^{10} \text{\AA}})} \approx -4.36 \times 10^{-42} \text{J}$$

$$\Delta E = E_2 - E_1 = (-4.36 \times 10^{-42} + 1.09 \times 10^{-42}) \text{J} = -3.27 \times 10^{-42} \text{J}$$

$$(c) \Delta E = -3.27 \times 10^{-42} \text{J} \times \frac{1 \text{eV}}{1.602 \times 10^{-19} \text{J}} \approx -2.04 \times 10^{-23} \text{eV}$$