普通化學

1. For each of the following atoms or ions: first write the name in English, then write the electron configuration (in the ground state) (10%)

	Ca (z = 20)	Na^+ (z = 11)	Mn (z = 25)
Name	Calcium	b.	d.
Electron configuration	a.	c.	e.

2.(a) Calculate the total number of atoms contained in 25.6 g of sucrose ($C_{12}H_{22}O_{11}$) whose molar mass is 342.3 g. (5%)
(b) Calculate the molar concentration (mol/L) of pure water at 4 °C (d = 1.000 g/mL) (5%).

3. Define the following terms and give one example for each term (30%)
(a) ***isotopes***
(b) ***resonance***
(c) ***covalent bond***
(d) ***heat capacity***
(e) ***critical temperature***
(f) ***first-order reaction***

4. Although the molar mass of CO_2 is greater than that of water, CO_2 is a gas and water is a liquid at room temperature. Explain why the difference exists. (10%)

5. A commercially available concentrated H_2SO_4 has a concentration of 18.0 M. Explain in detailed steps how you may prepare 2.00 L of 4.00 M H_2SO_4? (10%)

6. Determine the pH of a solution that is 0.20 M in NH_3 and 0.30 M in NH_4Cl. K_b for NH_3 is 1.8×10^{-5}, K_a for NH_4^+ is 5.6×10^{-10} (15%)

7. What volume of hydrogen will be produced at 0.861 atm and 22 °C from the displacement reaction of 6.0 g of zinc with 25 mL of 6.0 M HCl? (gas constant R=0.0821 L atm/K mol, Zn = 65.38 g/mol) (15%)