

Name: _____
130 points
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Test 2
Chemistry 121A
November 14, 1997

SHOW ALL CALCULATIONS FOR FULL CREDIT

Multiple Choice Questions: Circle the single best answer. No penalty for guessing.

- How many significant figures does the number 0.003510 have? (4 points)
A) 3 B) 4 C) 5 D) 6 E) 7
- How many neutrons does $^{55}\text{Mn}^{7+}$ have? (4 points)
A) 55 B) 37 C) 32 D) 30 E) 25
- If 0.65 moles of a compound has a mass of 11.709 g, what is the molecular weight of this compound? (4 points)
A) 0.65 g/mol B) 7.6 g/mol C) 12 g/mol D) 18 g/mol E) 65 g/mol
- Which of the following is strong electrolyte? (4 points)
A) AgCl B) $\text{HC}_2\text{H}_3\text{O}_2$ C) NH_3 D) HF E) HNO_3
- Calculate the temperature change of 321 g of H_2O if 82.1 kJ of heat is added. (4 points, the specific heat for water is $C = 4.184 \text{ J / g } ^\circ\text{C}$)
A) $+61.1^\circ \text{C}$ B) $+10.7^\circ \text{C}$ C) $+3.43^\circ \text{C}$ D) -0.611°C E) -82.1°C
- Which of the following orbitals has the highest energy? (4 points)
A) 2s B) 2p C) 3d D) 4f E) 6p
- Arrange the following in order of atomic radius (smallest to largest): Be, N, Sr, Xe. (4 points)
A) Be, N, Sr, Xe B) Be, N, Xe, Sr C) N, Be, Sr, Xe
D) N, Be, Xe, Sr E) Xe, Be, Sr, N
- Write the complete electron configuration for Al^+ , Rb, and S^{2-} . (12 points)

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9. Name the following ionic compounds and indicate the solubility. (10 points)

HClO₄ _____ _____

FePO₄ _____ _____

10. Write the empirical formula for the following compounds and indicate the solubility. (10 points)

strontium hydroxide _____ _____

copper (I) sulfite _____ _____

11. Calculate the wavelength of light emitted from a hydrogen atom when its electron falls from the $n = 9$ to the $n = 6$ state. (Potentially Useful Equations: $E_n = -R_H / n^2$, $E = h \nu$, $c = \lambda \nu$, $c = 3.0 \times 10^8$ m/s, $h = 6.626 \times 10^{-34}$ J s, $R_H = 2.18 \times 10^{-18}$ J) (10 points)

12. Describe the difference between radial and angular nodes in orbitals. Draw a picture of one example of each. (15 points)

13. Describe the concept of effective nuclear charge and how this effect impacts ionization energies of atoms. (10 points)

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14. 0.247 moles of a pure gaseous hydrocarbon (a molecule made of only C and H) was burned in excess oxygen to generate 21.81 g of CO_2 and 4.47 g of H_2O and 311 kJ of heat.
A) Calculate the molecular formula of the hydrocarbon. (10 points)

B) Calculate H_f for this compound. (15 points, $H_f = -393$ kJ/mol and -242 kJ/mol for CO_2 and H_2O respectively.)

15. **Balance** the following chemical equation and **quantitatively** describe the resulting reaction mixture formed when 1.00 mole of solid copper (II) chloride is added to 1.00 L of a 0.500 M ammonium phosphate solution. (10 points)

