

Name: _____
100 points
Dr. Jay H. Baltsberger

Test 3
Chemistry 121A
November 30, 1994

SHOW ALL CALCULATIONS & USE PROPER SIGNIFICANT FIGURES AND UNITS

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

1. Consider the atomic symbol $^{35}\text{Cl}^-$, which of the following are the correct numbers for this element (p., e. and n. represent protons, electrons and neutrons respectively)? (2 points)
A) 17p. 18e. 18n. B) 18p. 18e. 17n. C) 17p. 17e. 18n. D) 17p. 18e. 17n. E) 35p. 18e. 0n.
2. Convert 531.52 cm^3 into m^3 . (2 points)
A) 53.152 m^3 B) 5315.2 m^3 C) 0.53152 m^3 D) $5.3152 \times 10^5 \text{ m}^3$ E) $5.3152 \times 10^{-4} \text{ m}^3$
3. Suppose an element had two isotopes with masses 89.0 amu and 93.0 amu with relative abundances of 0.250 and 0.750, calculate the average atomic weight of this element. (2 points)
A) 90.0 amu B) 91.0 amu C) 92.0 amu D) 93.0 amu E) 182 amu
4. How is the first law of thermodynamics defined mathematically? (2 points)
A) $\Delta E = q - w$ B) $\Delta E = q + w$ C) $\Delta H = q - w$ D) $\Delta E = w - \Delta H$ E) $\Delta E = -q - w$
5. For an electron in an $n = 4$ energy level, which of the following values for the other quantum numbers (l and m_l) would be allowed? (2 points)
A) $l = 4, m_l = 4$ B) $l = 0, m_l = -2$ C) $l = -3, m_l = 1$ D) $l = 2, m_l = -2$ E) $l = 4, m_l = 1$
6. Which of the following atoms or ions has the smallest radius? (2 points)
A) Fe^{3+} B) Al^{3+} C) F^- D) Na^+ E) Rh^+
7. Draw the Lewis dot structure for BrF_3 . (10 points)

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8. Write the formula or name of the following ionic compounds and indicate the solubility. (4 points each)

ZnNO ₃	_____	_____
AgI	_____	_____
_____	Barium hydroxide	_____
_____	Cesium carbonate	_____

9. Explain which of the following ionic lattices would have the greatest lattice energy (most energetically favorable): MgO SrO CsF NaI (6 points)
10. Draw the Lewis dot structures for SO₃ and SO₃²⁻ (including resonance structures for each, if any exist). Indicate the molecular and electron pair geometries for each as well as formal charges. (16 points)
11. Describe in words and pictures how an *s* and *p* orbit may mix to form an *sp* orbit in BeH₂. (10 points)

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12. Show using pictures and words how p orbitals on adjacent atoms can form either a π molecular orbital or a σ molecular orbital, depending on the orientation of the p orbitals. (15 points)
13. Calculate the enthalpy of combustion (reaction with O_2 to make CO_2 and H_2O) for CH_4 , given the following bond dissociation energies: C–H 413; C=O 799; O–H 463 kJ/mol. (10 points, remember to write a balanced equation first.)
14. Balance the following equation and write out a final net ionic equation. (5 points)
- $$\underline{\hspace{1cm}} Na_2CrO_4 (aq) + \underline{\hspace{1cm}} AgNO_3 (aq) \longrightarrow \underline{\hspace{2cm}} + \underline{\hspace{2cm}}$$
15. BONUS QUESTION: Calculate the wavelength of light emitted when an electron falls from the $n = 5$ to $n = 3$ level in atomic hydrogen. $E_n = -R_H/n^2$, $E = h\nu$, $\lambda\nu = c$, $h = 6.626 \times 10^{-34}$ J s, $c = 3.0 \times 10^8$ m/s, $R_H = 2.18 \times 10^{-18}$ J. (5 bonus points)