

Name: _____
120 points
Dr. Jay H. Baltisberger

Test 2
Chemistry 121A
November 8, 1999

SHOW ALL CALCULATIONS FOR FULL CREDIT

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

- Which of the following has the greatest number of significant figures? (4 points):
A) 1.02 B) 0.0034 C) 1.003 D) 1.3001 E) 0.005001
- Which of the following has the greatest number of neutrons? (4 points)
A) ^{105}Rh B) ^{144}Nd C) ^{140}Ce D) ^{104}Rh E) ^{145}Nd
- How many grams of carbon are present in 44.0 g of CO_2 ? (4 points)
A) 12.0 g B) 24.0 g C) 44.0 g D) 16.0 g E) 56.0 g
- Which of the following is a strong base? (4 points)
A) RbOH B) $\text{HC}_2\text{H}_3\text{O}_2$ C) NH_3 D) HCl E) $\text{Fe}(\text{OH})_2$
- How much heat is required to heat a 10.0 g block of iron from 25.0°C to 500.0°C ? (4 points, the specific heat for iron is $C = 0.480 \text{ J / g }^\circ\text{C}$)
A) 120 J B) 2280 J C) 2400 J D) 2520 J E) 9900 J
- Which of the following orbitals is spherically symmetric? (4 points)
A) 2p B) 3d C) 4s D) 4f E) 6p
- Write the complete (no noble gas abbreviations) electron configurations for C, K^+ , and P^{3+} . (15 points)

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

BaCl₂ _____ soluble/insoluble

Pb₃(PO₄)₂ _____ soluble/insoluble

Na₂SO₃ _____ soluble/insoluble

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

aluminum nitrate _____ soluble/insoluble

ammonium bromide _____ soluble/insoluble

copper (II) hypochlorite _____ soluble/insoluble

10. Calculate the frequency of light emitted from a hydrogen atom when its electron falls from the $n = 5$ to the $n = 2$ state. (Potentially Useful Equations: $E_n = -R_H / n^2$, $E = h \nu$, $h = 6.626 \times 10^{-34}$ J s, $R_H = 2.18 \times 10^{-18}$ J) (10 points)

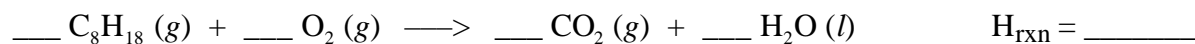
11. Draw pictorial representations of both an $n = 2, l = 1$ and an $n = 3, l = 0$ orbital. Indicate normal notation used to describe each orbital (i.e. 4f, 6s, ...) and the number of distinct m_l possible for each case. (15 points)

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12. How many mL of a 0.251 M HCl solution are required to titrate a 1.251 g sample of Ba(OH)₂ dissolved in 100.0 mL to a phenolphthalein endpoint? (10 points)

13. Calculate the H_{rxn} for combustion of octane and then determine the amount of energy released if 500.0 g of octane (C₈H₁₈, $H_f = -251$ kJ/mol) is burned completely in air to produce water (H₂O, $H_f = -285$ kJ/mol) and carbon dioxide (CO₂, $H_f = -393$ kJ/mol). (20 points)



14. What is the concentration of a solution of 5.21 g of CuSO₄ diluted to 500.0 mL with distilled water? What is the concentration of a second solution prepared by dilution of 25.0 mL of the original solution to 250.0 mL with distilled water? (6 points)