

Name: _____
105 points
Dr. Jay H. Baltsberger

Test 2
Chemistry 121A
November 3, 1995

SHOW ALL CALCULATIONS & USE PROPER SIGNIFICANT FIGURES AND UNITS

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

- How many μL are there in 0.0051 mL of fluid? (2 points)
A) $5.1 \times 10^{-6} \mu\text{L}$ B) $5.1 \times 10^{-3} \mu\text{L}$ C) $5.1 \mu\text{L}$ D) $5.1 \times 10^{+3} \mu\text{L}$ E) $5.1 \times 10^{+6} \mu\text{L}$
- Which of the following will form a compound with hydrogen that is most similar to the sulfur compound, H_2S ? (2 points)
A) ^{16}O B) ^{19}F C) ^{14}N D) ^{35}Br E) ^{21}Sc
- How many grams is 3.62 mole of methane, CH_4 ? (2 points)
A) 0.0173 g B) 0.226 g C) 3.62 g D) 4.43 g E) 58.1 g
- How many grams of sodium hydroxide are needed to make 250.0 ml of 0.235M NaOH (MW = 39.997)? (2 points)
A) 0.426 g B) 0.681 g C) 1.47 g D) 2.35 g E) 42.6 g
- How much heat (in kJ) is needed to raise the temperature of a 500.0 mL cup of water to 85°C from 25°C (heat capacity of water is $4.184 \text{ J g}^{-1} \text{ K}^{-1}$ and density of water is 1.00 g/mL)? (2 points)
A) 180 kJ B) 130 kJ C) 52 kJ D) 7.2 kJ E) 0.50 kJ
- Use Hess' Law to calculate the H_{rxn} for the following reaction:
$$\text{NH}_4\text{NO}_3 (s) \longrightarrow \text{N}_2\text{O} (g) + \text{H}_2\text{O} (g)$$

Given the following heats of formation: $\text{N}_2\text{O} (g) = +81.6 \text{ kJ/mol}$, $\text{H}_2\text{O} (g) = -241.8 \text{ kJ/mol}$, $\text{NH}_4\text{NO}_3 (s) = -365.6 \text{ kJ/mol}$. (10 points)

$H_{\text{rxn}} =$ _____

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7. Name the following ionic compounds and indicate the solubility. (6 points each)

$\text{Cr}_2(\text{Cr}_2\text{O}_7)_3$ _____

NH_4NO_2 _____

$\text{Sr}(\text{OH})_2$ _____

8. Write the empirical formula for the following compounds and indicate the solubility. (6 points each)

lithium acetate _____

lead (II) bromide _____

periodic acid _____

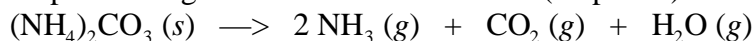
9. Calculate the frequency of light emitted from a hydrogen atom when its electron falls from the $n = 7$ to the $n = 3$ state. (Potentially Useful Equations: $E_n = -R_H / n^2$, $E = n h \nu$, $c = \lambda \nu$, $c = 3.0 \times 10^8$ m/s, $h = 6.626 \times 10^{-34}$ J s, $R_H = 2.18 \times 10^{-18}$ J) (6 points)

10. Sketch a rough picture showing the shape of $n = 2, l = 1$ and $n = 3, l = 2$ orbitals. Give the name and orientation description ($1s$, $3p_x$, $4d_{z^2}$, etc.) as well be sure to indicate the x , y and z axes in these pictures as well as any nodal planes. (8 points)

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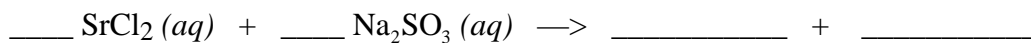
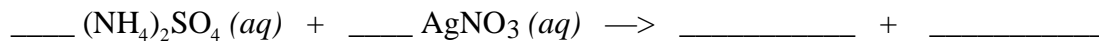
11. The ΔH for the following reaction is $+55.2 \text{ kJ mol}^{-1}$. Calculate the amount of heat required to completely decompose 6.87 g of ammonium carbonate. (15 points)



Minimum heat required = _____

12. What elements have the following electron configurations: $1s^2 2s^2 2p^4$, $[\text{Ne}] 3s^2 3p^5$, $[\text{Ar}] 4s^1 3d^5$. (6 points)

13. Balance the following two equations and write out the final net ionic equations for each. (10 points)



14. BONUS QUESTION: Describe an experiment which would show the wave character of an electron. (5 bonus points)