

Name: \_\_\_\_\_ **CIRCLE YOUR SECTION:**

Section:	016	017	018	019	020
LA:	Julia	John	Rhiannon	Julia	Alex
recitation time:	6:30 pm	8:00 am	11:30 am	12:40 pm	4:10 pm

***LB 171***  
***Chemistry***  
Dr. S. Cass  
**Mock EXAM #2**

In the spirit of fairness, do not open your booklets until all students have received their exams.

There are 5 pages in this exam booklet, including this cover page. Before beginning work, check to see if all pages are present. An equation sheet and a periodic table are provided up front. Please put them in the recycle pile after the exam.

You have 55 minutes to complete this exam. It is worth one hundred (100) points. READ all questions carefully before attempting to answer. BE SURE to answer ALL parts to the multi-part questions. Show all your work. I can only grant partial credit if I can see your reasoning.

If you are running short on time, I will give partial credit for problems where you have correctly set up any necessary multiplication/division even if you do not complete the calculation. Concept maps of how to solve problems will also be awarded partial credit.

You can also get the formula for any named compound at a 2 pt penalty (except for naming specific problems)

	<b>PAGE</b>	<b>SCORE</b>
LBC Honor Code:		
As a member of the Lyman Briggs College Community, I vow to hold myself and my peers to the highest measures of honesty and integrity. I understand that this benchmark is set forth to advance the credibility and pride associated with our college. I will neither give nor receive any unauthorized assistance in completing my work, which includes, but is not limited to : papers, reports, exams, group-work and classroom conduct.	2	_____/24
	3	_____/26
	4	_____/26
	5	_____/24
Please initial if you will uphold the code: _____	<b>TOTAL</b>	_____/100

Write the shorthand electronic configuration for  $\text{Co}^{2+}$ . ( $Z = 27$ ) (4 pts)

The ionization energy (in kJ/mol) for a few elements or ions is listed below. Use your knowledge behind periodic trends to explain WHY they have the order they do. (10 pts)

\*NOTE: if you just cite the general trend, that will be worth 0 points, I'm looking for the reason behind the trend.)

**Ge** 762;      **As** 947;      **Se** 941;      **S** 1000;      **Ca<sup>+</sup>** 1145;      **K<sup>+</sup>** 3052

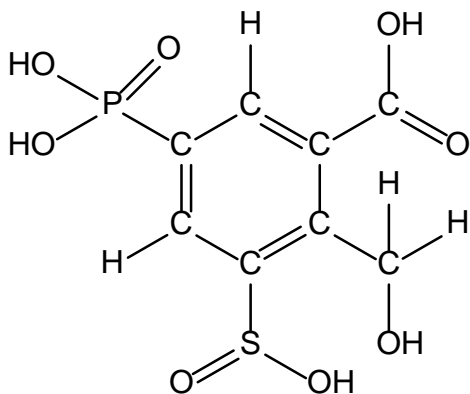
Suppose you were trying to find a substitute for  $\text{Na}^+$  in nerve signal transmission. Identify two ions that would be most like  $\text{Na}^+$ . (2 pts) For each ion you propose, explain the ways in which it would be similar to  $\text{Na}^+$  and the ways it would be different. Use periodic trends in your discussion. (4 pts)

Why do we use prefixes (di, tri, tetra, etc.) to indicate the number of atoms for covalent compounds but do not need to use prefixes for ionic compounds? Be specific here. (4 pts)

Using concepts from class briefly EXPLAIN why Cl can break the octet rule but F never can. (2 pts)

**\*\*The next two problems go together\*\***

The acid shown below is a derivative from benzoic acid and has a MW = 296.21 g/mol. In the structure below, circle the **ALL** the acidic hydrogens and then EXPLAIN using **both words** and **relevant structure/s** why those hydrogens are acidic. (9 pts)



If 42.0 g of the acid shown above (MW = 296.21 g/mol) was added to 348 mL of a 0.695 M solution of  $\text{Ba}(\text{OH})_2$ , what is the molarity of the excess reactant once the reaction has gone to completion? Assume no change in volume. Be sure to write a balanced equation. (15 pts)

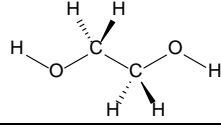
**If you cannot come up with the acid/base molar ratio, you may assume an incorrect 1:1 ratio for a 5 point penalty.**

The average bond energy for a C–O bond is 360 kJ/mol and the average bond energy for a C=O bond is 736 kJ/mol. Donna the chemist wrote down in her lab notebook that one of the compounds (listed below) that she analyzed had a C–O bond energy of 410 kJ/mol but she didn't write down which compound it was. If the compound had to be one of the four listed, suggest which of the compounds it could be using Lewis Dot (for the covalent part of the compounds only), ALL resonance structures, formal charge/s and Bond Order of EACH molecule in addition to words to explain your reasoning. (14 pts)

CO, NaHCO<sub>3</sub>, CO<sub>2</sub>, CH<sub>3</sub>CO<sub>2</sub>Na

Possible compound/s that could have a C–O bond energy of 410 kJ/mol:

The boiling points for five compounds are listed below. Explain the trend. Be specific. No, there are no incorrect boiling points listed here (12 pts)

CH <sub>3</sub> CH <sub>2</sub> CH <sub>3</sub>	CF <sub>2</sub> Cl <sub>2</sub>	CFCl <sub>3</sub>		CaO
-43.0 °C	34.6 °C	65.0 °C	197 °C	3812 °C

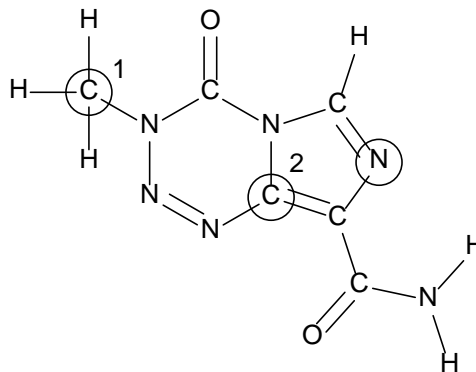
**\*Over-arching problem\* (All problems on this page are related)**

Temozolamide (Tradename: Temodar) shown below, is a pharmaceutical used in the treatment of some forms of cancer. Identify (using the provided lines) the **molecular geometries** marked of the circled atoms within the molecule. (3 pts) Draw three water molecules around Temozolamide and for each water molecule illustrate a **different** type of intermolecular forces present between Temozolamide and water using dashed lines and  $\delta^+/\delta^-$ . Then next to each of the IMFs that you have drawn, name the specific type of IMFs that you illustrated. (10 pts)  
**\*NOTE:** all atoms will have enough lone pair electrons (not shown in drawing) to have a 0 formal charge.

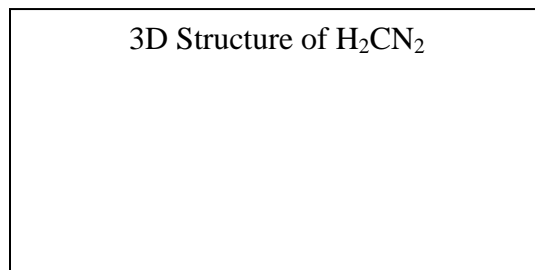
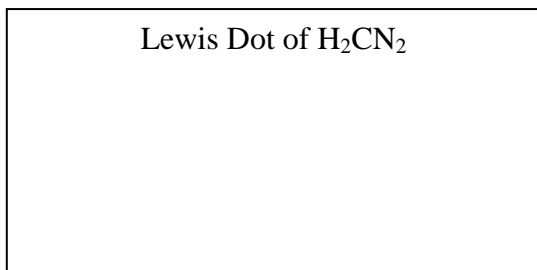
C1: \_\_\_\_\_

C2: \_\_\_\_\_

N: \_\_\_\_\_



Temozolamide breaks down in water to form the very reactive diazomethane,  $\text{H}_2\text{CN}_2$ , (more on how it reacts soon). Draw the Lewis Dot and the 3D structure and give one reason why this chemical is reactive. (7 pts) \*Tip: there is more than one center atom in diazomethane



In class we discussed that diazomethane donates a methyl ( $\text{CH}_3$ ) to the oxygen on guanine. Why is adding a methyl group to the oxygen so detrimental to the DNA? (2 pts) Would the methyl group have the same impact if the oxygen on guanine had been a sulfur atom instead? EXPLAIN why or why not. (2 pts) Feel free to use the structure guanine to aid in your explanation.

