

Last Name ANSWER	First Name KEY	MI
Student ID Number:		Total Score 36 / 30
Circle the name of your TA: RYAN / KAUSHIK / CARI / HEATHER		
Discussion Section – Day:	Time:	

Chem 30A Fall 2005

QUIZ #1A
(15 Min)

Weds October 12th

***INTERPRETATION OF THE QUESTIONS IS PART
OF THE EXAM – DO NOT ASK FOR THE
QUESTIONS TO BE EXPLAINED TO YOU***

***ONLY ANSWERS WRITTEN IN THE BOXES
PROVIDED WILL BE GRADED***

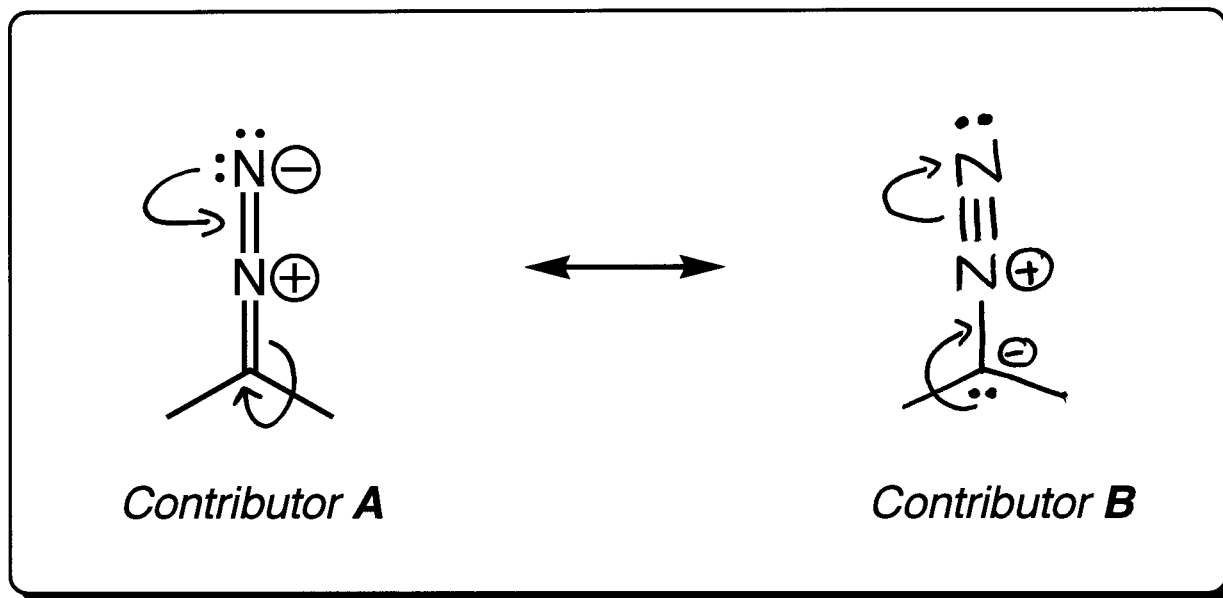
******DO NOT OPEN THIS EXAM UNTIL INSTRUCTED TO DO SO******

Q	1	2	Total
X			

"America believes in education: the average professor earns more money in a year than a professional athlete earns in a whole week."

- Evan Esar

Q1. (a) One of the resonance contributors (A) of 2-diazopropane is drawn below. Draw another resonance contributor (B) that does NOT have any open octets (i.e., all octets are filled) – include all electron pairs and non-zero formal charges (if appropriate). For both resonance contributors (A and B), add curly arrows to them, showing how they interconvert. (8 pt)

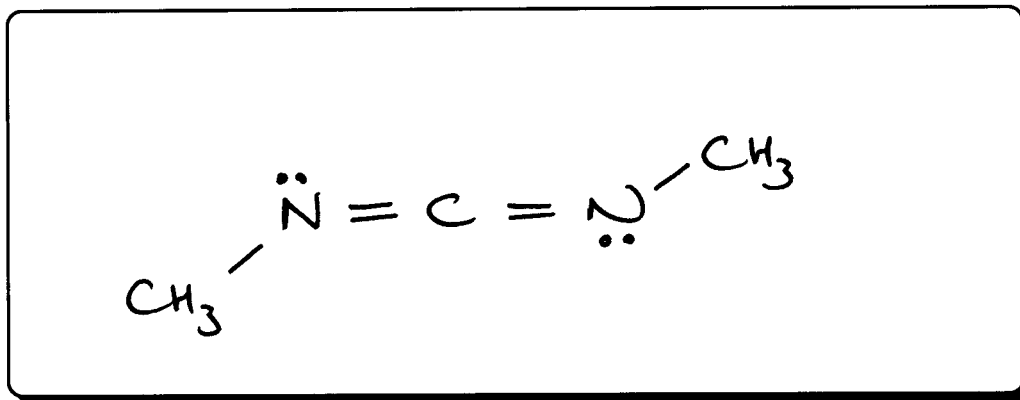


(b) In the box below, comment on the relative stabilities of the two resonance contributors, i.e., are they of equal stability or is one a more significant contributor than the other, and if so, which one? Briefly explain your answer. (4 pt)

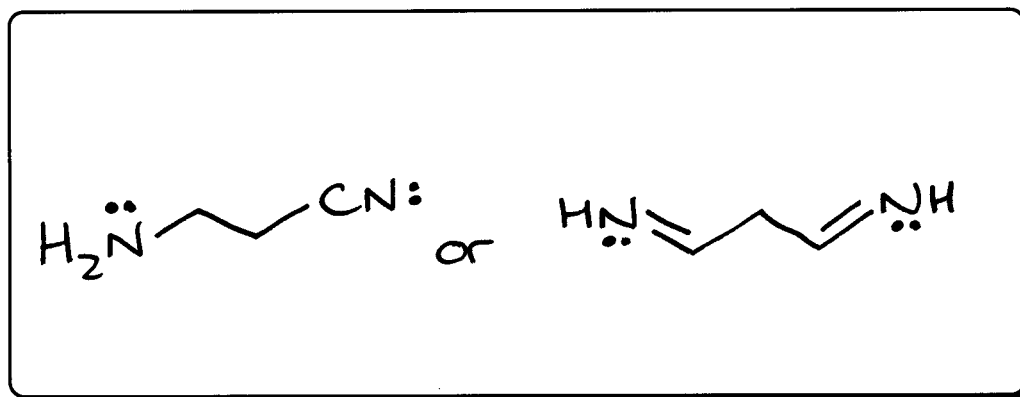
A is the more significant contributor because the negative charge is on the more electronegative element (i.e., N vs C)

(c) 2-Diazopropane has the molecular formula $C_3H_6N_2$. There are many other compounds that also have this molecular formula, i.e., constitutional isomers. Using your knowledge of chemical bonding and structure, provide drawings of the molecules (you may draw Cs, Hs and Ns if it makes your drawings clearer) that satisfy the following criteria:

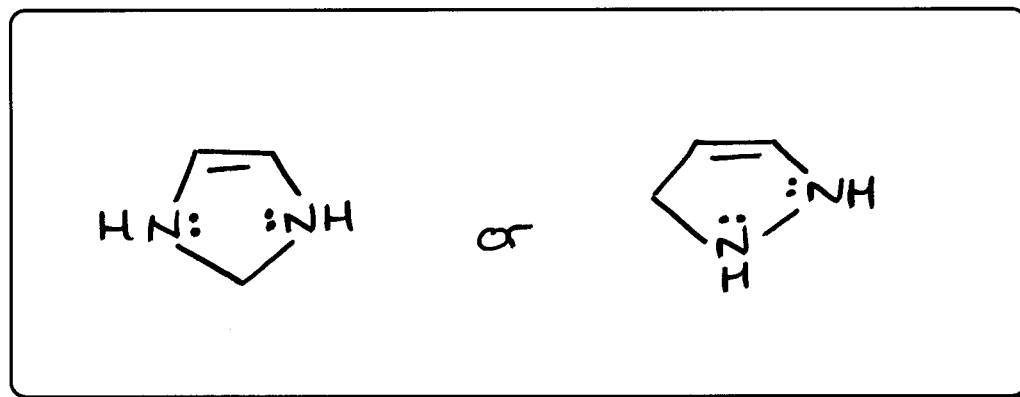
(i) Draw a non-cyclic isomer of $C_3H_6N_2$ in which the atomic connectivity is C-N-C-N-C and the middle N-C-N unit has a bond angle of 180° . (4 pt)



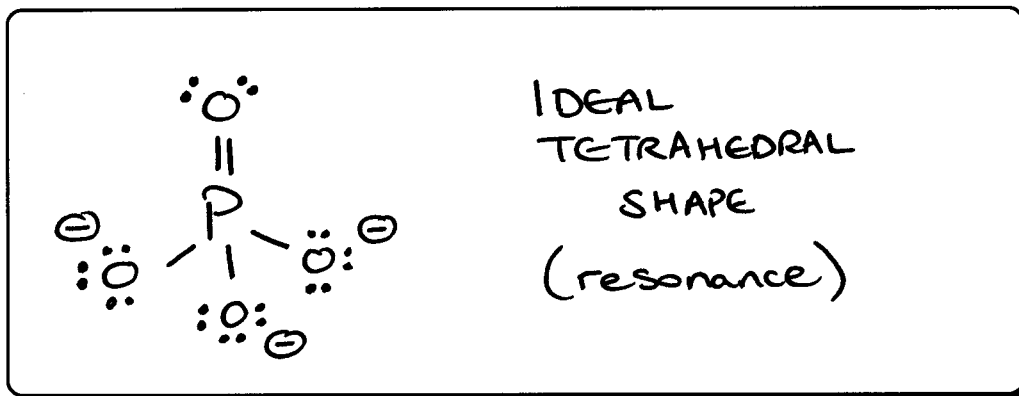
(ii) Draw a non-cyclic isomer of $C_3H_6N_2$ in which the atomic connectivity is N-C-C-C-N and the middle C-C-C unit has a bond angle of $\sim 109.5^\circ$. (4 pt)



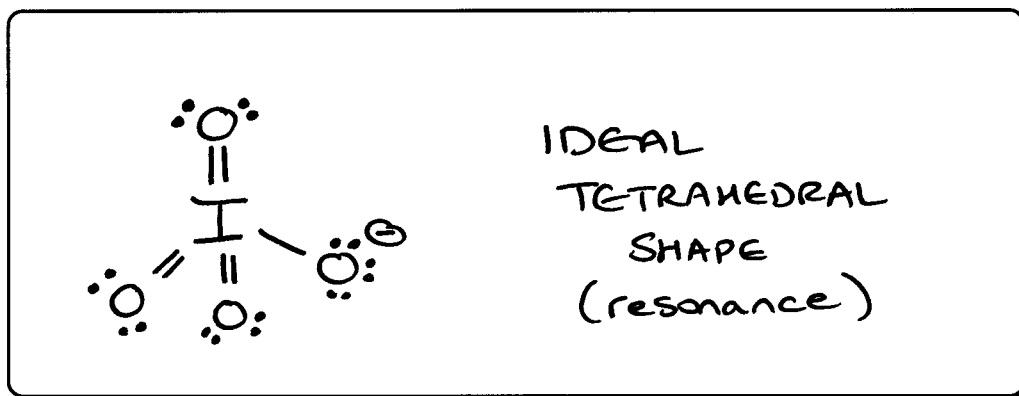
(iii) Draw an isomer of $C_3H_6N_2$ that has a five-membered ring structure in which there are TWO sp^2 hybridised carbon atoms. (4 pt)



Q2. (a) In the box below, draw a reasonable structure for the phosphate (PO_4^{3-}) anion, including all non-bonded electron pairs and non-zero formal charges (if appropriate), and comment upon its shape and any deviations from an idealised geometry. (6 pt)



(b) In the box below, draw a reasonable structure for the periodate (IO_4^-) anion, including all non-bonded electron pairs and non-zero formal charges (if appropriate), and comment upon its shape and any deviations from an idealised geometry. (6 pt)



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QUIZ #1B
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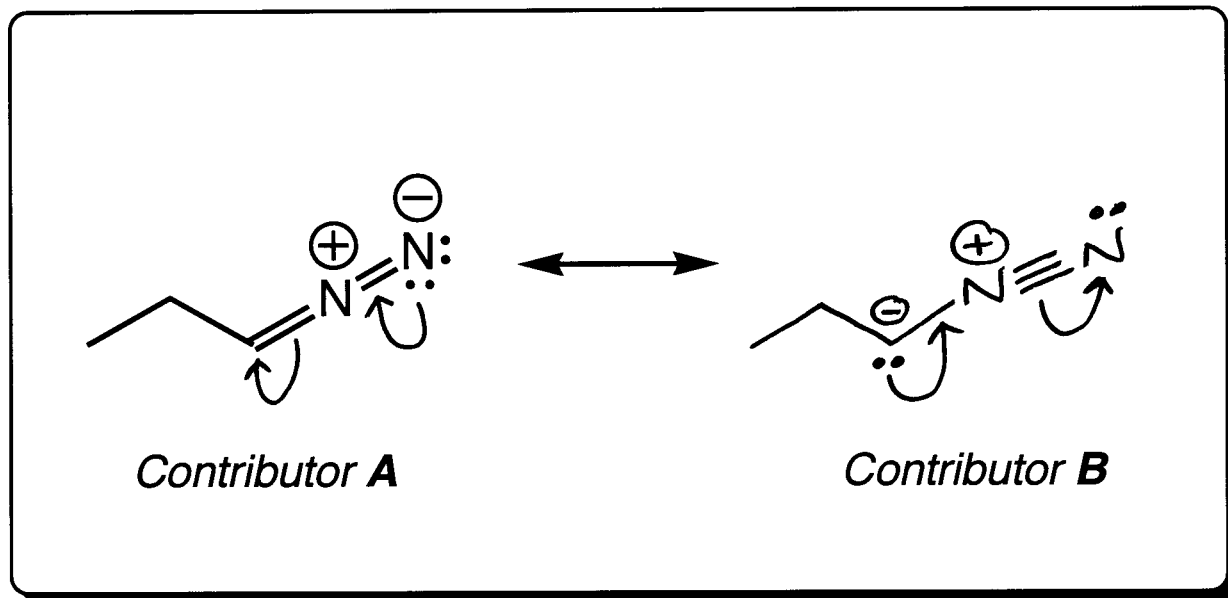
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Q	1	2	Total
X			

"America believes in education: the average professor earns more money in a year than a professional athlete earns in a whole week."

- Evan Esar

Q1. (a) One of the resonance contributors (A) of 1-diazopropane is drawn below. Draw another resonance contributor (B) that does NOT have any open octets (i.e., all octets are filled) – include all electron pairs and non-zero formal charges (if appropriate). For both resonance contributors (A and B), add curly arrows to them, showing how they interconvert. (8 pt)

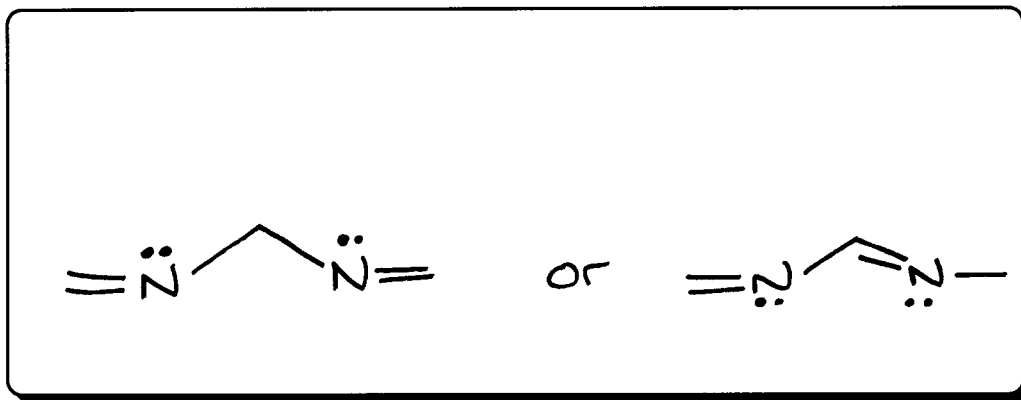


(b) In the box below, comment on the relative stabilities of the two resonance contributors, i.e., are they of equal stability or is one a more significant contributor than the other, and if so, which one? Briefly explain your answer. (4 pt)

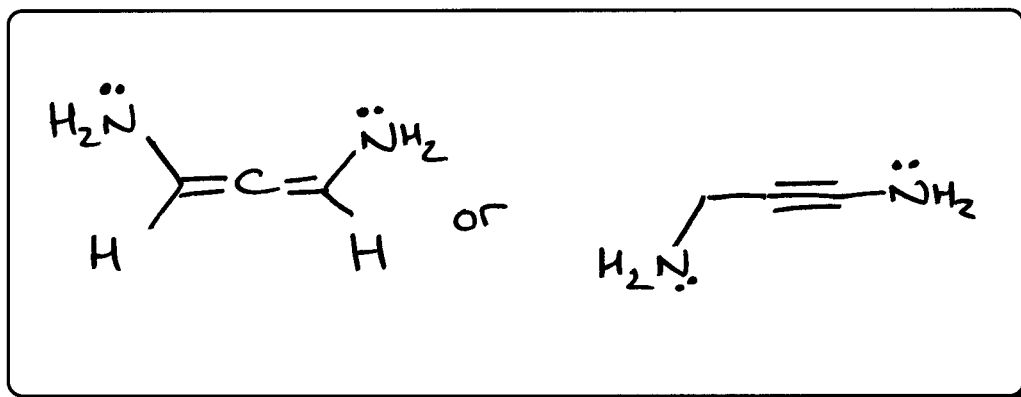
A is the more significant contributor because the negative charge is on the more electronegative element (i.e., N vs C)

(c) 1-Diazopropane has the molecular formula $C_3H_6N_2$. There are many other compounds that also have this molecular formula, i.e., constitutional isomers. Using your knowledge of chemical bonding and structure, provide drawings of the molecules (you may draw Cs, Hs and Ns if it makes your drawings clearer) that satisfy the following criteria:

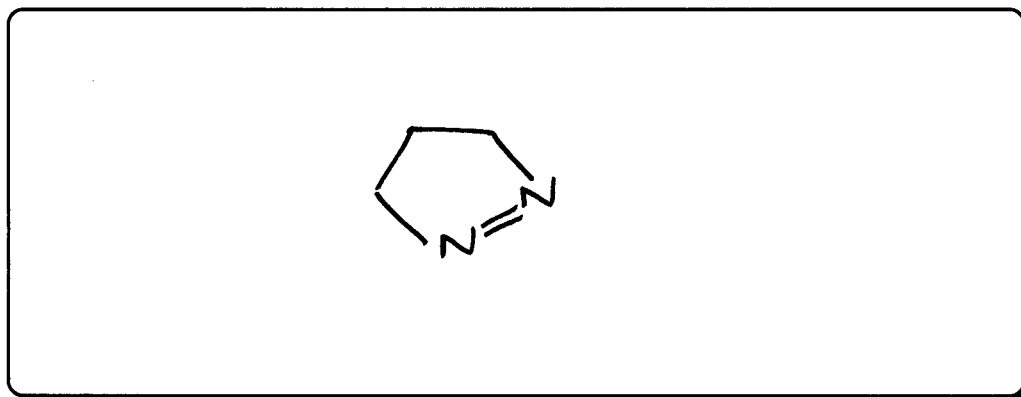
(i) Draw a non-cyclic isomer of $C_3H_6N_2$ in which the atomic connectivity is C-N-C-N-C and the middle N-C-N unit DOES NOT have a bond angle of 180° . (4 pt)



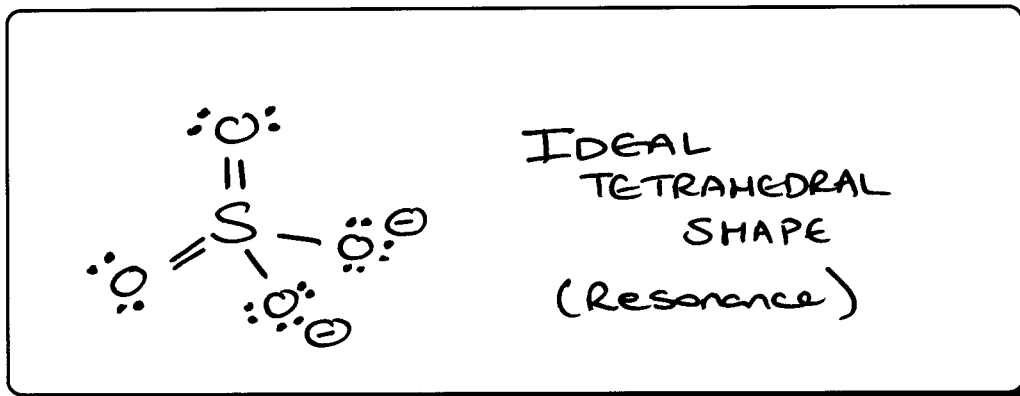
(ii) Draw a non-cyclic isomer of $C_3H_6N_2$ in which the atomic connectivity is N-C-C-C-N and the middle C-C-C unit has a bond angle of 180° . (4 pt)



(iii) Draw an isomer of $C_3H_6N_2$ that has a five-membered ring structure in which there are NO sp^2 hybridised carbon atoms. (4 pt)



Q2. (a) In the box below, draw a reasonable structure for the sulfate (SO_4^{2-}) anion, including all non-bonded electron pairs and non-zero formal charges (if appropriate), and comment upon its shape and any deviations from an idealised geometry. (6 pt)



(b) In the box below, draw a reasonable structure for the perchlorate (ClO_4^-) anion, including all non-bonded electron pairs and non-zero formal charges (if appropriate), and comment upon its shape and any deviations from an idealised geometry. (6 pt)

