Last Name ANSWER	First Name KEY	MI
Student ID Number:		Total Score
Circle the name of your TA: MIKE ROB		
Discussion Section – Day:	Time:	/ 30

Chem 30A Winter 2005

QUIZ #1

(15 Min)

Weds January 19th

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

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

Q1 ☐ Q2 ☐

ONLY Question 1 or Question 2 will be graded

Put an 'X' in the box of the question you want graded

If you put an 'X' in BOTH boxes, we will grade Question 1

If you put an 'X' in NEITHER box, we will grade Question 1

If your choice is ambiguous, we will grade Question 1

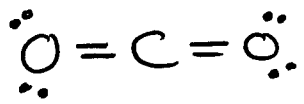
Question 3 WILL be graded and added to your total no matter which other question you choose to answer

Truth is incontrovertible, ignorance can deride it, panic may resent it, malice may destroy it, but there it is.
- Winston Churchill

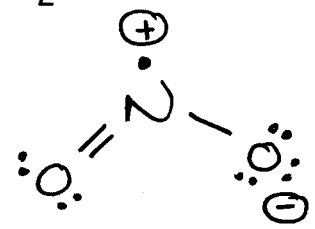
Q	1	2	3	Total
X				

1. (a) In the boxes below, draw the structural formulae for the dioxides of carbon, nitrogen, and sulfur; in each case, the atom connectivity is O—X—O. Include all necessary bonds, lone pairs of electrons (or single unshared electrons if appropriate), and non-zero formal charges. (4 pts each)

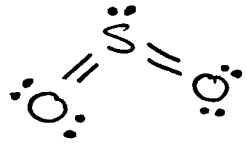
CO_2



NO_2



SO_2



(b) Which of these molecules has an O—X—O bond angle of 180°? Briefly explain your answer. (2 pts)

CO_2 => central C atom has two atoms attached to it, and no lone pairs, hence is linear with an angle of 180°

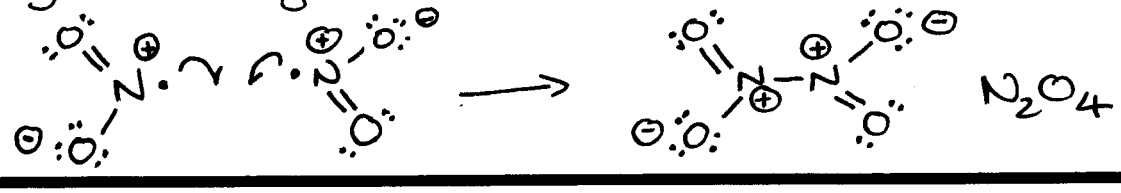
(c) Which of these molecules has the smallest O—X—O bond angle? Briefly explain your answer. (8 pts)

SO_2 => both NO_2 and SO_2 are based on a trigonal planar geometry, but in NO_2 (134°) the single unshared electron on N requires less room than the lone pair on S in SO_2 (119°)

(d) One of these molecules is very reactive, and is observed to dimerize (two molecules join together) to form a new species with the formula X_2O_4. Which of the molecules above does this, what is the structural formula of the new species, and more importantly, why does this happen? (8 pts)

NO_2 => it is a radical, has an unshared electron on N, and the N atom does not have a full octet ($7e^-$)

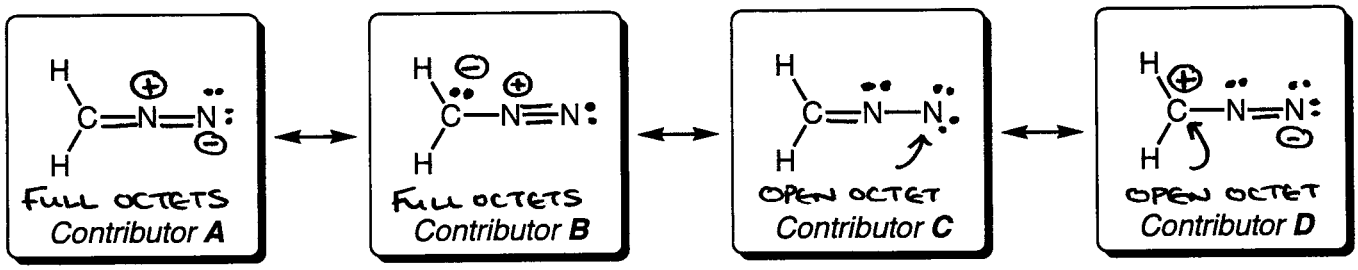
By dimerizing, the octets can all be satisfied, hence:



N_2O_4

2. Diazomethane is a yellow gas at room temperature that may explode violently if heated: its molecular formula is CH_2N_2.

(a) It is possible to draw many different resonance structures for diazomethane in which no atom bears a charge greater than plus or minus one (i.e., no doubly charged atoms). By drawing in extra bonds (i.e., turning single bonds into multiple bonds), lone pairs of electrons, and non-zero formal charges where necessary, complete the structures of four of these contributors, such that in two of your structures, all of the octets are filled, and in the other two, some octets are not completely filled. (5 pts each)



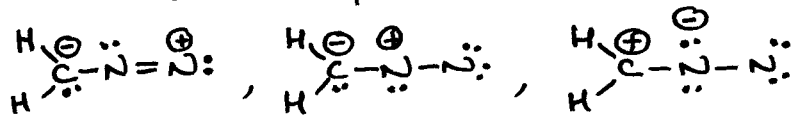
(b) The different resonance structures for diazomethane do not contribute equally to the overall resonance hybrid. By writing the appropriate letters in the boxes below, rank the contributors that you have drawn above (**A**, **B**, **C**, and **D**), from the most significant to the least significant. *To receive any credit for this part of the question, your structures in part (a) must be correct, so make sure you have them right.* (2 pts)

A *is more significant than* B *which, in turn, is more significant than* C *which, in turn, is more significant than* D

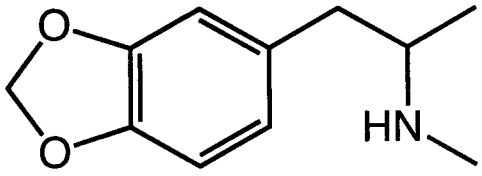
(c) Briefly justify your choices for part (b) in the box below. *Same deal here, to get any credit here, your answers to parts (a) and (b) must be correct.* (8 pts)

A has full octets, and -ve charge is on more EN atom (N)
B has full octets, and -ve charge is on least EN atom (C)
C has no charge separation, but has an open octet
D has charge separation AND an open octet

OTHER BAD RESONANCE CONTRIBUTORS ⇒



3. The chemical structure of the drug 'Ecstasy' is shown below – what is its molecular formula? (5 pts)



3,4-methylene-dioxymethamphetamine (MDMA)

$C_{11}H_{15}NO_2$