CHEM 131 **Name** _____

Quiz 4 – Due in class September 27, 2019

Complete the following problems. Write your final answers in the blanks provided. You must show your work to receive full credit. Show your answers to the correct number of significant figures with the correct units.

Rules for this take-home quiz.

DO NOT OPEN THE QUIZ UNTIL YOU ARE READY TO TAKE IT!

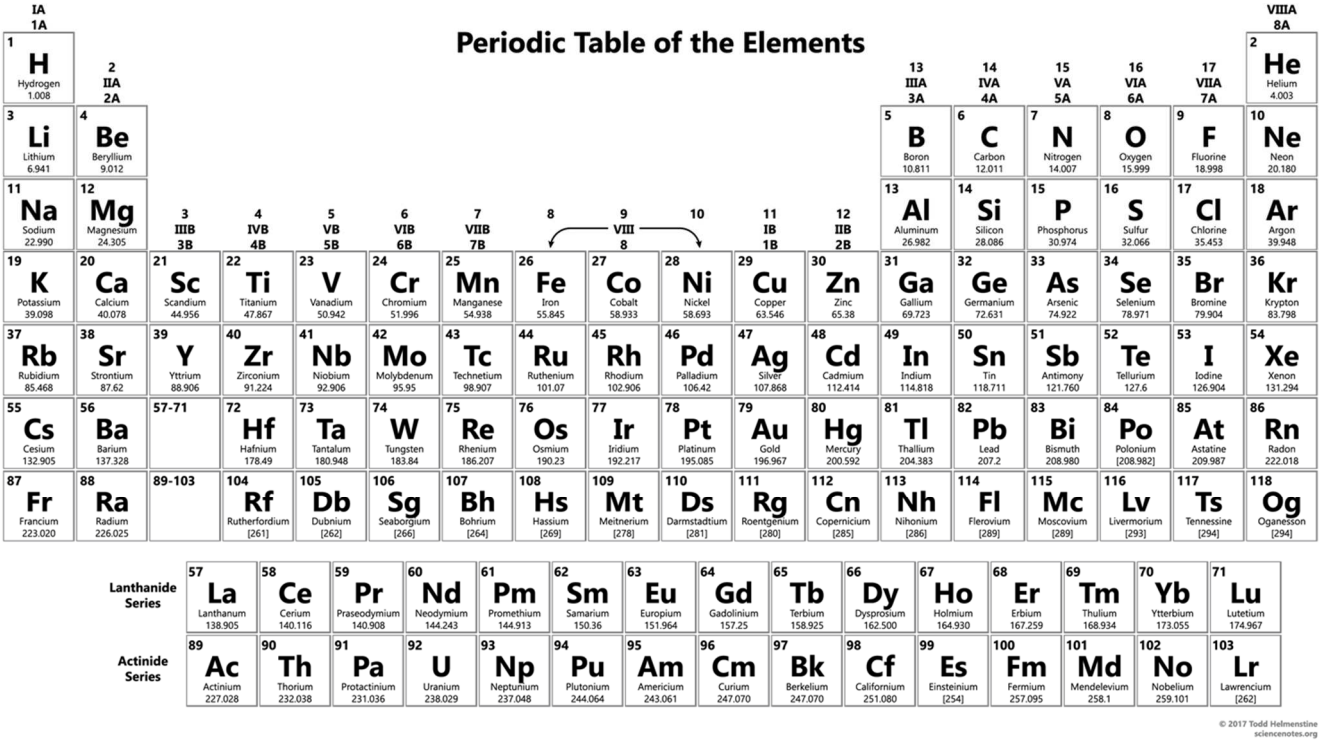
- You may allocate a maximum of **50 continuous minutes** for this quiz, split in to two 25-minute segments.
- For the first 25-minute segment, you will take the quiz using only the materials on these pages, a calculator and a **pencil**. Treat this time as though you were taking the quiz in the classroom. You may not use your book, notes, electronic sources or anyone else to help. Record the start and end of the first 25 minutes below.
- For the second 25 minutes, you may use your book, notes or electronic resources to make any corrections to your work. **Make these corrections in blue or red pen.** You **MAY NOT** ask anyone else for help. Record the end of the second 25 minute block below.
- Once you have completed the quiz, sign below to affirm that the quiz was taken following the rules above. This signature is your pledge that the quiz was completed in an ethical manner!

Start time: _____ End of 1st 25 minutes: _____ End of 2nd 25 minutes: _____

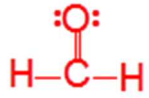
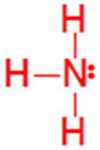
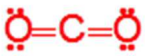
Signature_____Date_____

Possibly Useful Information

$\Delta H^o = \Sigma$(Bond Energy for bonds broken) – Σ(Bond energy for bonds formed)



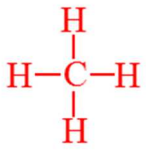
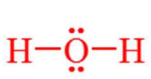
1. Choose **<u>two (2)</u>** of the compounds below and draw Lewis Structures for the compound, indicate the hybridization of the central atom and estimate all bond angles. (8 points each)

Compound	Lewis Structure ***Include estimated bond angles***	# of sigma bonds in the structure	# of pi bonds in the structure	Hybridization on central atom	Is the molecule polar?
CH_2O	all bond angles should be ~120° 	3	1	sp^2	Yes
NH_3	all bond angles should be <109.5° 	3	0	sp^3	Yes
CO_2	the O-C-O bond angle should be 180° 	2	2	sp	no

2. Using the information below, determine the ΔH^o for the reaction: (9 points)

$$CO(g) + 3\ H_2(g) \rightarrow CH_4(g) + H_2O(g)$$

Bond	C-O	C=O	C≡O	C-H	H-H	O-H	O-O	O=O
Bond Energy (kJ/mol)	360	736	1072	414	436	464	142	498

	CO	+	$3H_2$	→	CH_4	+	H_2O
Structure							
Bonds Broken	1 C≡O		3(H-H)				
Bonds Made					4(C-H)		2(O-H)
Energy Cost	1(1072 kJ)		3(436 kJ)				
Energy Return					4(414 kJ)		2(464 kJ)

Net change = = [1072 + 4(436)]kJ – [4(414) + 2(464)]kJ = 2380kJ – 2584kJ = **-204 kJ**