Name KEY D **(Print last name in CAPS)**

SECTION _____(same as your lab section)

1.	Read each question carefully before answering.
2.	Mark the choice that best answers the question or completes the statement.
3.	Use the scantron provided. Use a no. 2 pencil and clearly mark your choice. If you change an answer, completely erase your previous mark.
4.	Answer each question. There is no penalty for guessing. However, multiple answers are graded as incorrect, and blank answers are graded as incorrect.
5.	On the scantron, fill in your last name, first name and initial. Blacken the corresponding letters.
6.	Fill in your UIN, the department=CHEM, Course no. = 101, and Section= your lab section. Blacken the corresponding letters and numbers.
7.	Use the test for scratch paper.
8.	Mark your answers on the test so you can check them with the key when it is posted.
9.	***Turning in a blank scantron results in a grade of zero. ***
10.	You may be asked to turn in both the scantron and the exam, have your PHOTO ID and your calculator ready to be checked when you do so.
11.	Work at a steady pace and you will have ample time to finish.
12.	The keys will be posted on my class web page as soon as possible.

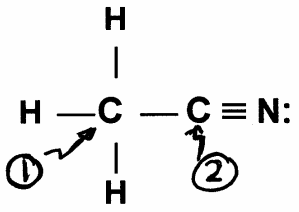
There are 22 questions for 150 points. Good Luck!

D

Possibly Useful Information

A periodic table is also provided on the last page of this exam.

Q.1 Which statement is correct for the structure shown?



a) The molecule contains a total of 6 σ bonds.
b) Carbon no. 1 is described by sp^2 hybridization.
c) The molecule contains 2 π bonds. ✓
d) The molecule contains 2 lone pairs.
e) Carbon no. 2 is described by sp^2 hybridization.

Q.2 Choose the Brønsted-Lowry acids and bases in the following reaction.

$$HCN + OH^- \rightarrow H_2O + CN^-$$

a) Acids: HCN, CN^- Bases: OH^-, H_2O
b) Acids: OH^-, CN^- Bases: HCN, H_2O
c) Acids: HCN, H_2O Bases: OH^-, CN^-
d) Acids: OH^-, H_2O Bases: HCN, CN^-
e) Acids: HCN, OH^- Bases: CN^-, H_2O

Q.3 What is the molecular geometry of the molecule IF_5?

a) Trigonal pyramidal
b) See-saw
c) Square pyramidal ←
d) Trigonal planar
e) T-shaped

N = 48
A = 42
S = 10 = 5 CB
L = 32 = 16 LP
→ AB_5M

Q.4 How many valence electrons are there in the molecule SF_6?

a) 32
b) 48
c) 56
d) 60
e) 70

$A = 6 + 6(7) = 48$

Q.5 How many of the following have a linear molecular geometry?

NH_3 H_2O N_2 CH_4 NO_2

a) 1 b) 2 c) 3 d) 4 e) 5

Q.6 A sigma bond...

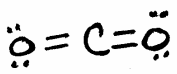
a) can only be formed by s orbitals.
b) is weaker than a pi bond.
c) has high electron probability between two atoms.
d) cannot be formed by two p orbitals.
e) None of the above are true.

Q.7 The octahedral hybrid configuration is composed of which orbital combination?

a) sp^3d^2
b) sp^2d^2
c) spd^2
d) sp^3d
e) sp^3

Q.8 Which of the following statements concerning the molecule carbon dioxide is correct?

a) The molecule contains two lone pairs of valence electrons.
b) The molecule contains two sigma bonds.
c) The molecule contains four pi bonds.
d) The carbon is described as sp^2 hybridized.
e) Each oxygen is described as sp^3 hybridized.



Q.9 Which of the following violates the rule of eight?

a) H_2S
b) PCl_3
c) SF_6
d) NH_3
e) CO_2

Q.10 The triple bond in acetylene, C_2H_2, consists of ...
a) Three pi bonds
b) Three sigma bonds
c) Two sigma and one pi bond
d) Two pi and one sigma bond ←
e) Three sigma and three pi bonds

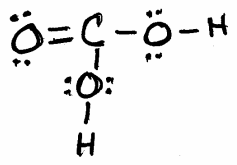
Q.11 When an sp^2 hybrid forms on a carbon atom ...

a) two pi bonds form
b) two sigma bonds form
c) one pi and one sigma bond form
d) one p orbital remains unhybridized ←
e) carbon has an incomplete octet in the molecule

Q.12 How many sigma and how many pi bonds are there in the molecule, H_2CO_3?
(The acidic hydrogens are each bonded to an oxygen.)

a) 2σ/4π
b) 3σ/3π
c) 4σ/2π
d) 5σ/1π
e) 6σ/0π

N = 36
A = 24
S = 12 ⇒ 6 CB
L = 12 ⇒ 6 LP



5σ, 1π

Q.13 Which response includes all the weak acids listed below and no strong acids?

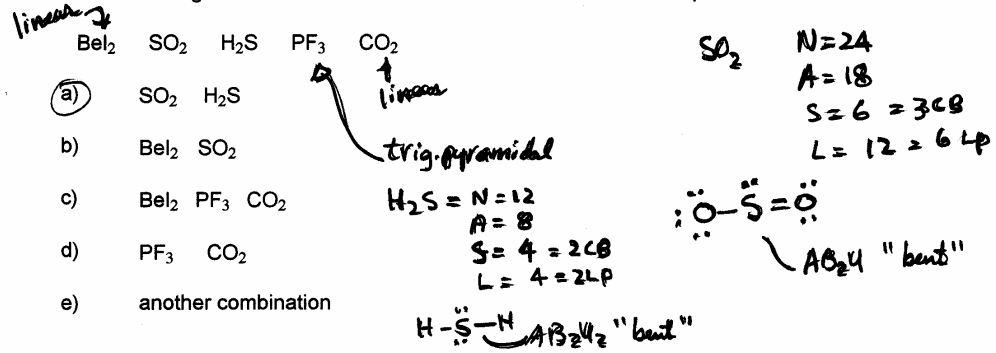
I. HF II. HI III. HNO_3 IV. HBrO V. $HC\ell O_4$

a) II and III
b) I, II, and IV
c) IV and V
d) II, III, and IV
e) I and IV

Q.14 Which response contains all of the following molecules that can be described as angular or bent molecules and none that have other shapes?

linear → BeI_2 SO_2 H_2S PF_3 CO_2

a) SO_2 H_2S
b) BeI_2 SO_2
c) BeI_2 PF_3 CO_2
d) PF_3 CO_2
e) another combination



Q.15 Which of the following is an amphoteric metal hydroxide?

a) KOH
b) $Ba(OH)_2$
c) $Be(OH)_2$
d) LiOH
e) $Mg(OH)_2$

Q.16 Which of the following could not act as a Brønsted-Lowry base?

a) H_2S
b) PH_3
c) NH_3
d) CH_4
e) H_2O

Q.17 Which of the following bonds is probably the most polar?

a) N-H in NH_3
b) O-H in H_2O ←
c) P-H in PH_3
d) Se-H in SeH_2
e) C-H in CH_4

Q.18 Balance the following redox reaction in acid. What is the balancing coefficient of water?

$MnO_4^- + H^+ + Br^- \rightarrow Mn^{2+} + Br_2 + H_2O$

a) 8
b) 9
c) 3
d) 4
e) 6

$$2(5e^- + 8H^+ + MnO_4^- \rightarrow Mn^{2+} + 4H_2O)$$

$$(2Br^- \rightarrow Br_2 + 2e^-)5$$

$$10e^- + 16H^+ + 2MnO_4^- + 10Br^- \rightarrow 2Mn^{2+} + 8H_2O + 5Br_2 + 10e^-$$

Q.19 How many valence electrons are there in the Lewis structure for NO_3^-?

a) 19 b) 20 c) 23 (d) 24 e) 18 $A = 5 + 3(6) + 1 = 24$

Q.20 Calculate the molarity of an H_2SO_4 solution of 40.0 mL if the H_2SO_4 solution neutralizes 0.212 g of Na_2CO_3. Molar mass Na_2CO_3 = 106.0 amu

a) 0.0250 M
(b) 0.0500 M
c) 0.0750 M
d) 0.100 M
e) 0.0900 M

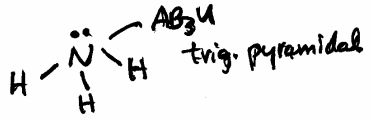
$H_2SO_4 + Na_2CO_3 \rightarrow Na_2SO_4 + CO_2 + H_2O$

$0.212\,g * \frac{mmol\ Na_2CO_3}{106.0\,g} * \frac{① H_2SO_4}{① Na_2CO_3} = 2.00 \times 10^{-3}\ mmol\ H_2SO_4$

$M = \frac{2.00 \times 10^{-3}}{0.0400\ L} = 0.0500\ M$

Q.21 The bonds in the ammonia molecule make angles of approximately ...

(a) 109° b) 120° c) 90° d) 45° e) 180°



Q.22 Which of the following compounds is the most polar?

a) ~~CO_2~~
b) H_2S
(c) H_2O ←
d) ~~CS_2~~
e) ~~CH_4~~

End of Test

Magnuson 101 exam 3 KEY D 12:40 class

There are 22 questions for 150 points

Each question is 6.82 points.

Q1	C
Q2	C
Q3	C
Q4	B
Q5	A
Q6	C
Q7	A
Q8	B
Q9	C
Q10	D
Q11	D
Q12	D

Q13	E
Q14	A
Q15	C
Q16	D
Q17	B
Q18	A
Q19	D
Q20	B
Q21	A
Q22	C