Name _____ Test 1 (10/14)
CHEM 0201 (Organic) Fall 2022

1. The two most common isotopes of carbon are ^{12}C and ^{13}C.
   a. (4 pts.) Subatomic particle wise, how are atoms of ^{12}C and ^{13}C similar? 1. _____

2. _____

   b. (4 pts.) Subatomic particle wise, how are atoms of ^{12}C and ^{13}C different?

3. _____

   c. (4 pts.) Would the atoms have similar or different chemical reactivity?

4. _____

   d. (2 pts.) Which isotope would react more slowly?

5. _____

2. Fluorine is more electronegative than carbon. 6. _____
   a. (6 pts.) How does this affect the distribution of electrons in a C to F bond?

7. _____

   b. (6 pts.) Explain why is fluorine more electronegative than carbon. Remember to base the explanation on the makeup of the atom and not simply its position on the periodic table. 8. _____

9. _____

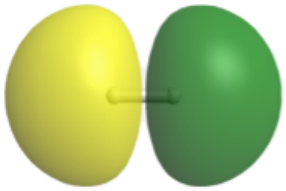
10. _____

11. _____

3. a. (6 pts.) What is the ground state electron configuration for an oxygen atom (using the noble gas shorthand is acceptable).

   b. (2 pts.) In its ground state, how many unpaired electrons does an oxygen atom have?

4. (8 pts.) The diagram below is a graphical representation of an antibonding molecular orbital. What feature (or features) of the orbital accounts for the high energy of the electrons placed in this orbital and why does this make the electrons higher in energy.

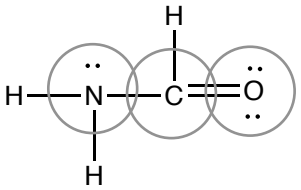


5. (16 pts.) Draw Lewis structures for the following condensed structures.

$CH_3C(O)OH$ | CH_2ClCH_2SH

6. (8 pts) Determine the hybridization of the circled atoms in the structures drawn below. Lewis Kekulé, and condensed structures have been provided.

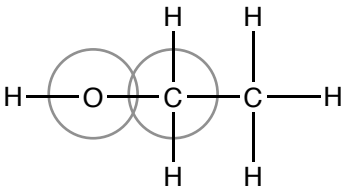
a.



N _____ C _____

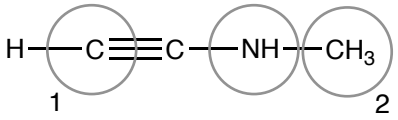
O _____

b.



O _____ C _____

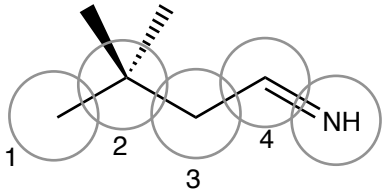
c.



C(1) _____ N _____

C(2) _____

7. a. (5 pts.) Determine the hybridization of the circled atoms in the following skeletal structure.



C(1) _____ C(2) _____ N _____

C(3) _____ C(4) _____

8. (8 pts.) Use valence bond theory to briefly describe what types of bonds are involved (σ or π) in single and double bonds and briefly explain why rotation around a carbon–carbon double bond is not possible at room temperature.

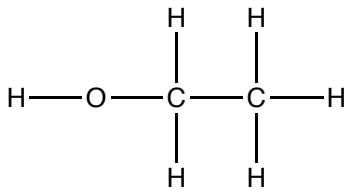
9. a. (6 pts.) Brønsted-Lowry acids are proton donors or acceptors?

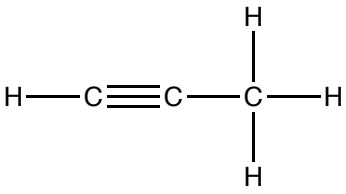
b. (6 pts.) Lewis acids are lone-pair electron donors or acceptors?

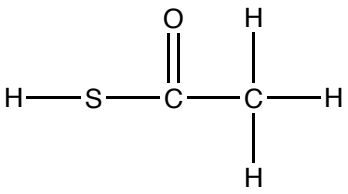
10. Rank (assign first place to the most acidic and fourth place to the least acidic) the following molecules in order of increasing acidity; pK_a values are provided. Remember, $pK_a = -\log[K_a]$.

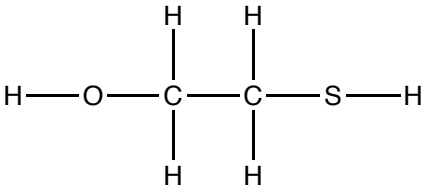
CF_3-CH_2-OH	CH_3-CH_2-OH	$CHCl_2-CH_2-OH$	CH_2F-CH_2-OH
$pK_a = 12.46$	$pK_a = 16.0$	$pK_a = 12.89$	$pK_a = 14.42$

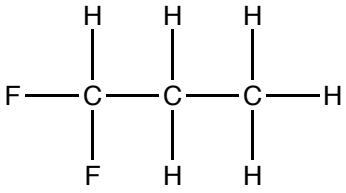
11. Four structures are drawn below. For each structure, circle the H (or H's) that would be most easily removed by a base.

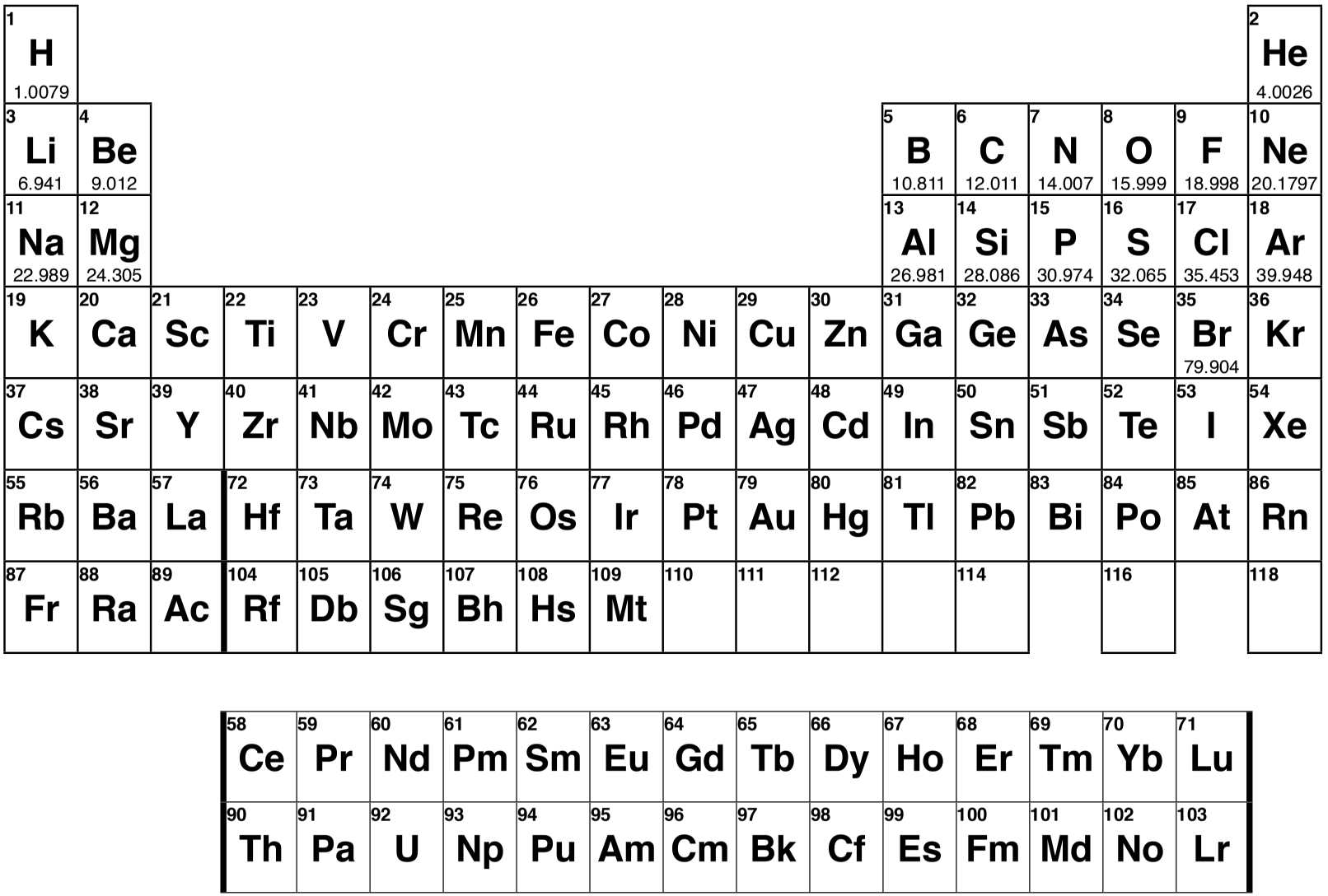











1 H 1.0079
2 He 4.0026
3 Li 6.941
4 Be 9.012
5 B 10.811
6 C 12.011
7 N 14.007
8 O 15.999
9 F 18.998
10 Ne 20.1797
11 Na 22.989
12 Mg 24.305
13 Al 26.981
14 Si 28.086
15 P 30.974
16 S 32.065
17 Cl 35.453
18 Ar 39.948
19 K
20 Ca
21 Sc
22 Ti
23 V
24 Cr
25 Mn
26 Fe
27 Co
28 Ni
29 Cu
30 Zn
31 Ga
32 Ge
33 As
34 Se
35 Br 79.904
36 Kr
37 Cs
38 Sr
39 Y
40 Zr
41 Nb
42 Mo
43 Tc
44 Ru
45 Rh
46 Pd
47 Ag
48 Cd
49 In
50 Sn
51 Sb
52 Te
53 I
54 Xe
55 Rb
56 Ba
57 La
72 Hf
73 Ta
74 W
75 Re
76 Os
77 Ir
78 Pt
79 Au
80 Hg
81 Tl
82 Pb
83 Bi
84 Po
85 At
86 Rn
87 Fr
88 Ra
89 Ac
104 Rf
105 Db
106 Sg
107 Bh
108 Hs
109 Mt
110
111
112
114
116
118
58 Ce
59 Pr
60 Nd
61 Pm
62 Sm
63 Eu
64 Gd
65 Tb
66 Dy
67 Ho
68 Er
69 Tm
70 Yb
71 Lu
90 Th
91 Pa
92 U
93 Np
94 Pu
95 Am
96 Cm
97 Bk
98 Cf
99 Es
100 Fm
101 Md
102 No
103 Lr