CHEMISTRY 230 SEMESTER 01-2015

Print out this homework on letter sized paper. Answer the questions carefully and then submit your answers on Wednesday morning during class. Note that if there is clear evidence of copying, the whole exercise may attract a zero mark, and the matter may be reported to the authorities!

1) Write out the electronic configurations of the following atoms showing occupancy of orbitals: (4)
   N C

   O H

2) Draw Lewis (or Kekulé) structures[1] for each of the following, showing formal charges where appropriate. Show all lone pairs. (12)
   a) CH_4 b) C_2H_6

   c) C_2H_4 d) C_2H_2

   e) CO f) H_3CNH_2

   g) H_3COH h) $H_3COH_2^+$

   i) H_2CO j) $(NH_2)CO$

   k) $(CH_3)_2CH^+$ l) $CH_3CH_2^-$

[1] Shared electron pairs may be shown as two dots or a dash. Bruice distinguishes Lewis and Kekulé formulas, but many people don't.

3) State the hydrisation (sp, sp^2, sp^3 or unhybridised) of the central atom in each of the following species and describe the geometry surrounding this central atom in terms such as linear, trigonal planar, trigonal pyramidal or tetrahedral. (8)

a) NH_3

b) CH_3^+

c) H_2O

d) CH_3^+

e) CH_4

f) NH_4^+

g) H_3O^+

h) $CH_3C{\equiv}CH$

4) Predict approximate bond angles (to the nearest 10°) in the following cases: (8)

a) H-N-H in NH_3

b) H-C-H in CH_4

c) H-O-H in H_2O

d) H-C-H in CH_3^+

e) H-C-H in C_2H_2

f) H-C-H in $CH_3C{\equiv}N$

g) H-C-H in C_2H_4

h) H-C-H in C_2H_6