

KEY

Prof. Bryan Hanson
Chemistry 310

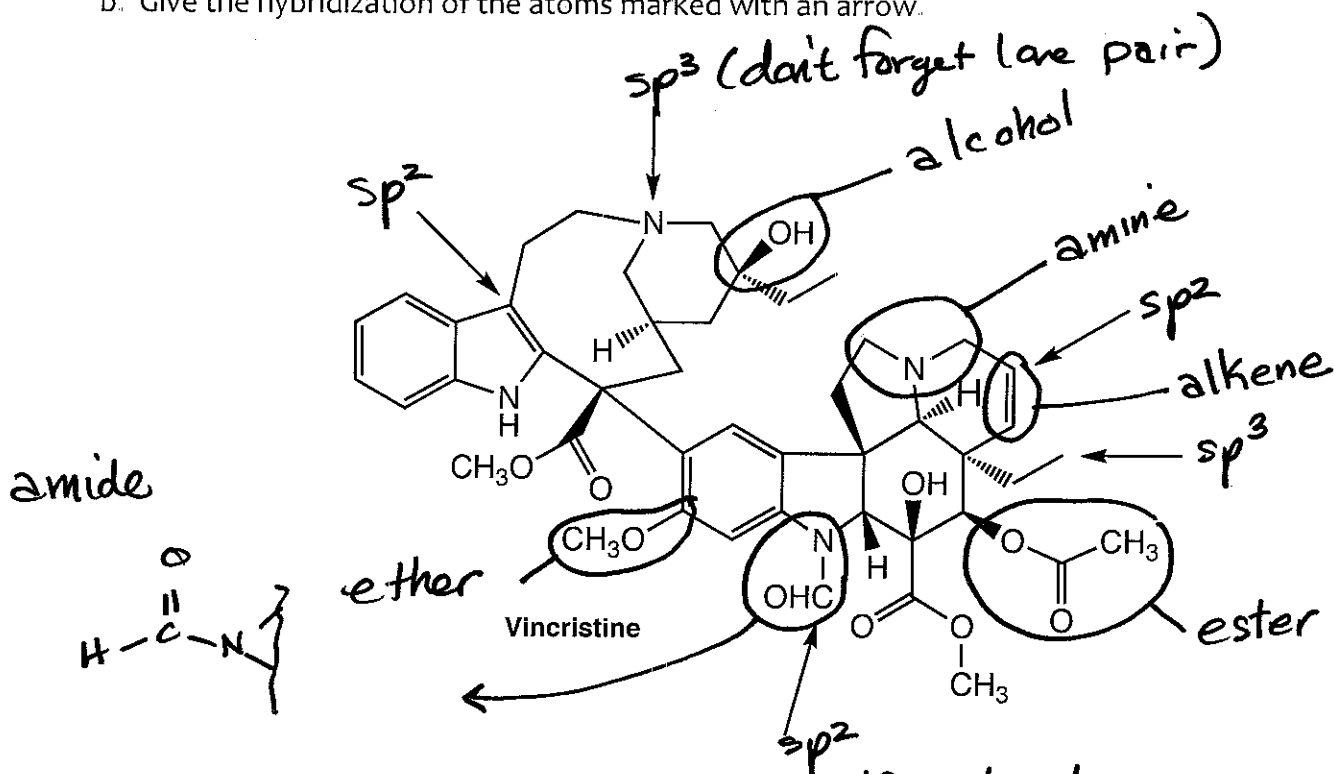
Review Questions on Important Skills & Concepts from Chemistry 120

If you have trouble with these problems, please review your organic text, or consult the sources on the course web page. A key will be posted at the course web site.

1. Vincristine is an important anticancer agent. Its structure is below.

a. Circle and categorize all the functional groups in vincristine.

b. Give the hybridization of the atoms marked with an arrow.




c. How many π bonds are present in vincristine? 12 π bonds

d. How many chiral centers does vincristine have? 9

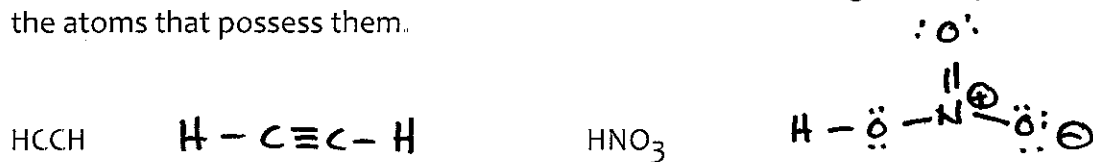
2. Fill in this chart.

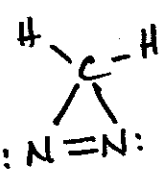
name	hybridization	# groups	bond angle	max # π bonds	max # σ bonds
tetrahedral	sp^3	4	109.5	0	4
trigonal planar	sp^2	3	120	1	3
linear	sp	2	180°	2	2

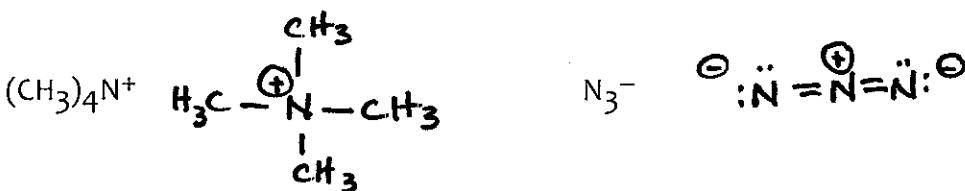
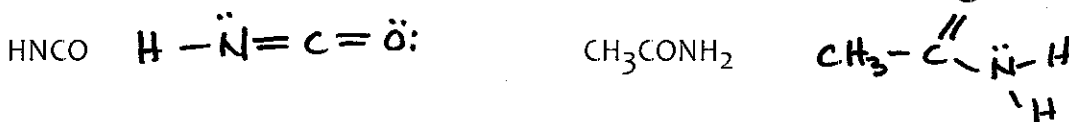
Note  for O₃ is a valid Lewis structure but the connectivity has been ruled out by expts

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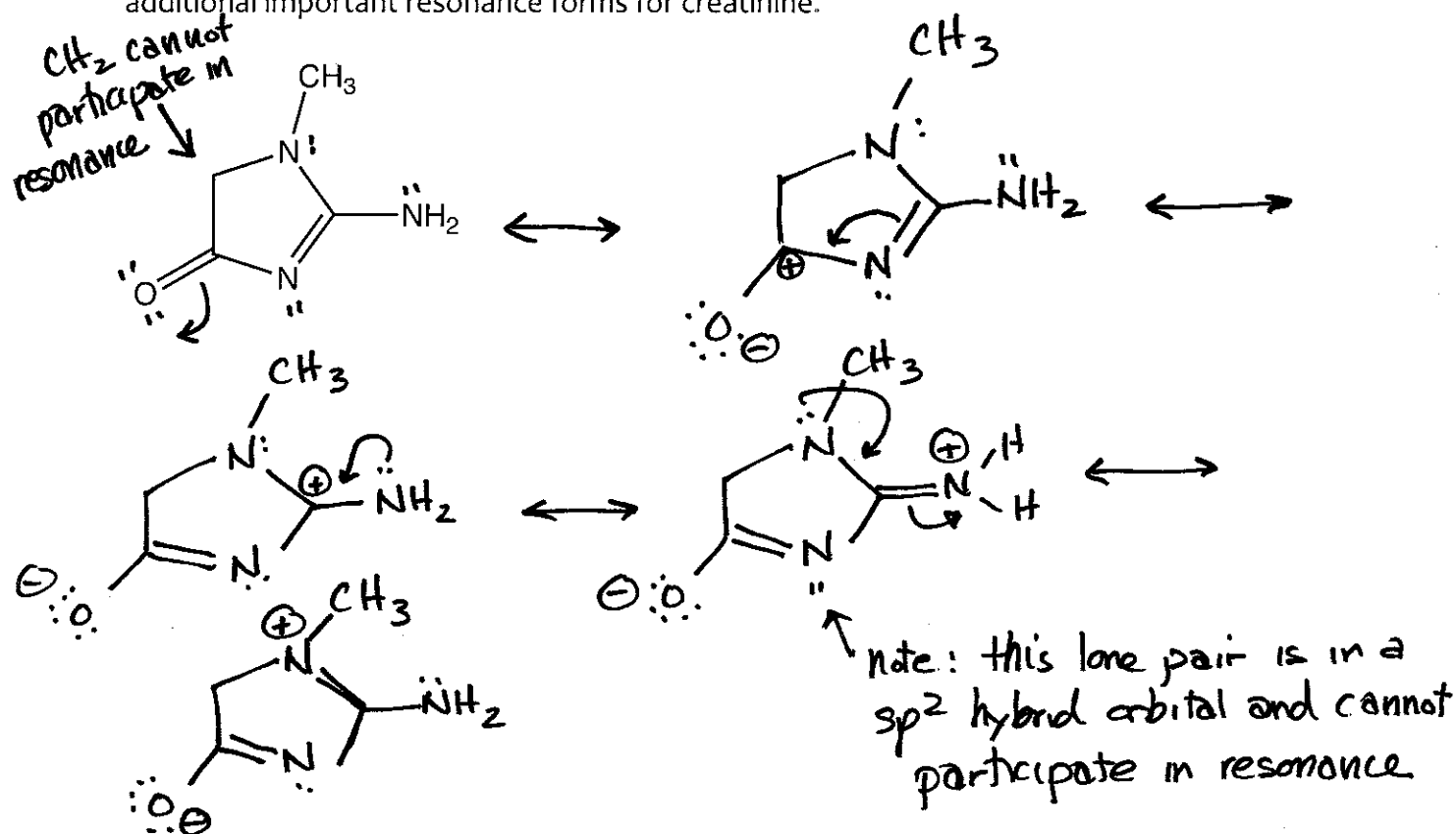
3. Draw one Lewis Structure for each molecule below, showing all lone pairs and formal charges on the atoms that possess them.



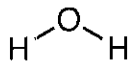
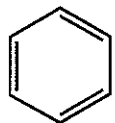
Note:

for CH₂N₂ has been ruled out too.



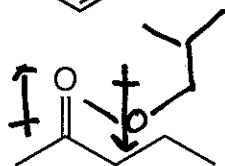
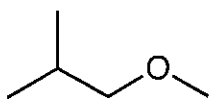
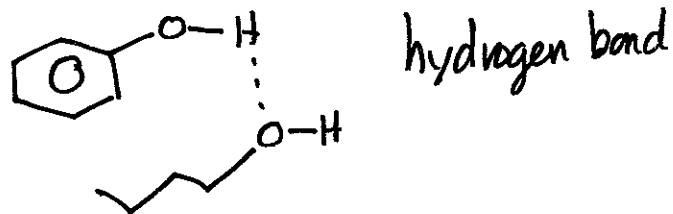
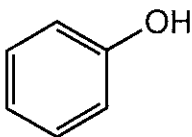
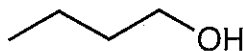
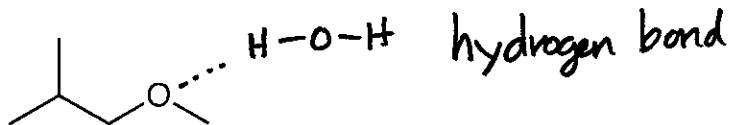
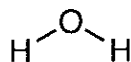
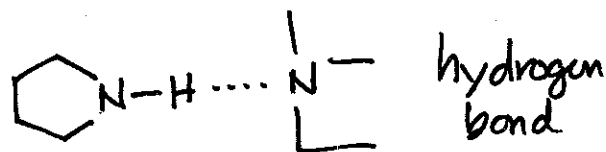
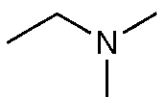
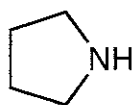
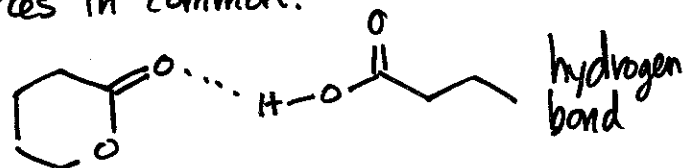
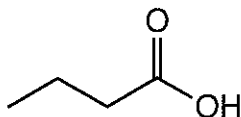
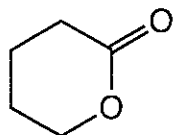
4. Creatinine is an important molecule in metabolism; its level in urine is a good clinical measure of renal function. Begin by adding any missing lone pairs to the structure given. Then draw five ~~four~~ additional important resonance forms for creatinine.



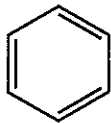
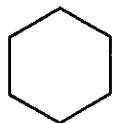
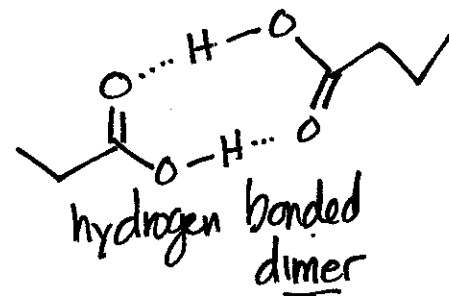
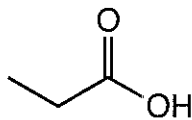
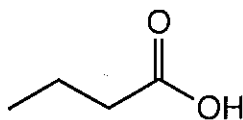
5. Consider the pairs of molecules shown below. They are all liquids; would you expect the pair to form a homogeneous solution if mixed? If so, draw a picture showing how they can interact with each other via typical intermolecular forces. Name the intermolecular forces involved.



These will not interact as they don't share any intermolecular forces in common.



dipole-dipole attraction

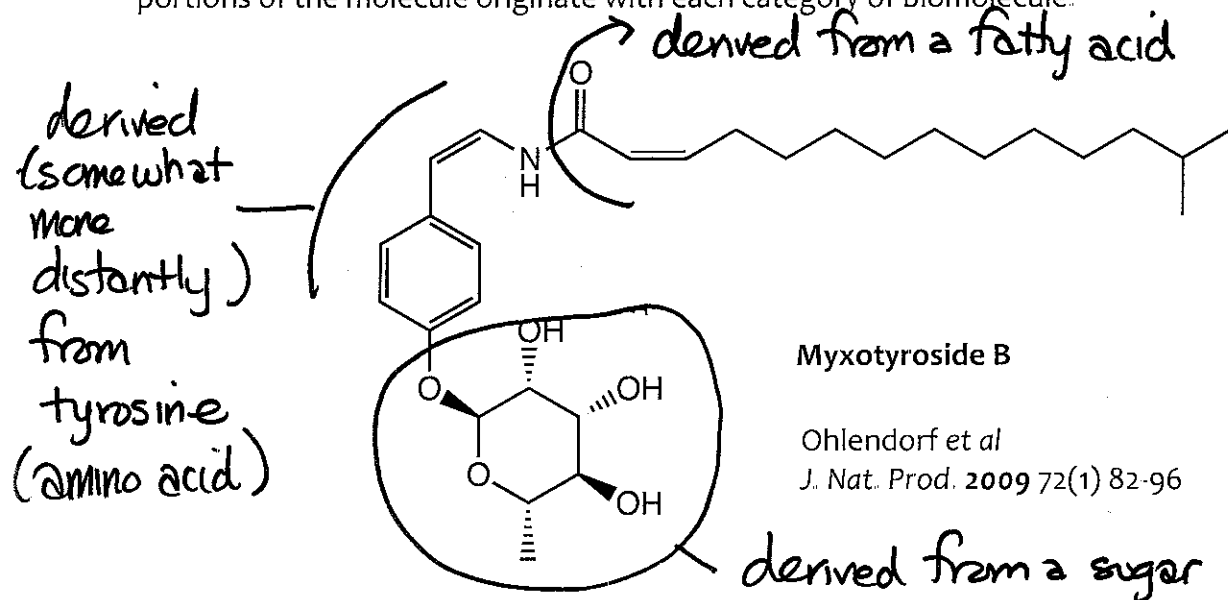


London forces (a regular low-cost of London forces!)



6. The molecule below was recently isolated from a bacterium in the genus *Myxococcus*.

a. What categories of biomolecules are apparently used to create myxotyroside B? Indicate what portions of the molecule originate with each category of biomolecule.

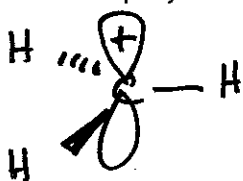


b. Comment on the probable solubility behavior of myxotyroside B.

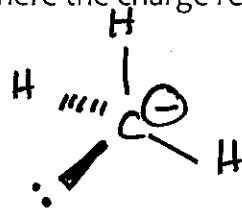
It has a long hydrocarbon tail + a very polar region - it should act as a detergent

c. How many stereoisomers are possible for myxotyroside B? 2^7 (5 chiral centers + 2 alkenes) = 128

7. Consider the ions CH_3^+ and $:\text{CH}_3^-$. Describe the bonding in each ion in terms of the orbitals that are employed. Be sure to indicate exactly where the charge resides.



sp^2 hybridized
left over 2p atomic orbital is empty.
Charge is due to the absence of e^- in this orbital



sp^3 hybridized
charge resides in a sp^3 hybrid orbital but is formally assigned to the C.