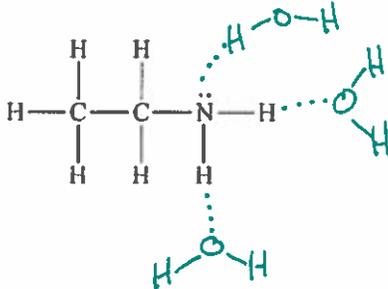


Free-Response ANSWER SHEET

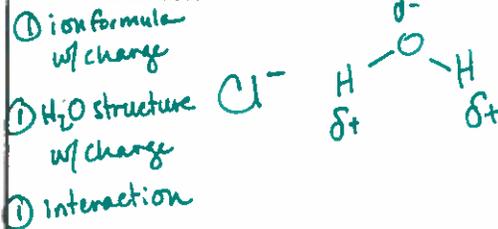
(MC score _____ FR score 42 Total raw _____ total % _____)

1. [6 pts] Sketch a hydrogen bonding interaction of the molecule below with a molecule of water.

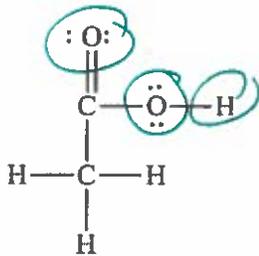
all interactions shown - only 1 required



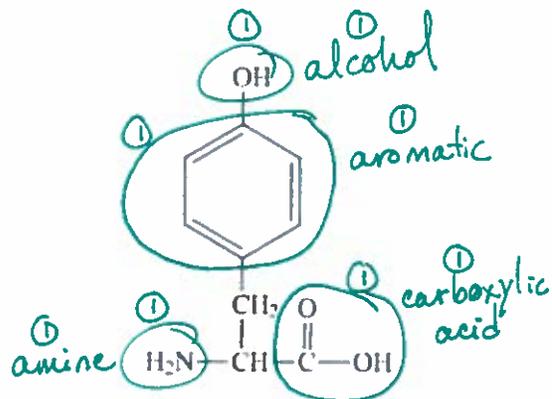
3. [3 pts] In the space below, sketch the interaction of a chloride ion with a water molecule. Represent charges accurately in the ion and in the water molecule.



2. [7 pts] In the molecule shown below, circle all atoms that can participate in hydrogen bonding.



4. [8 pts] The molecule shown below is an amino acid, a component of proteins. Circle and name all functional groups in this molecule.



5. [10 pts] Write a balanced equation, with appropriate phase labels, for the combustion of ethane. In each reaction, Up to 2 points may be lost for each error!



- phase labels wrong/missing
- not balanced
(reminder--did you include phase labels?)
- errors in form of reaction

6. **[8 pts] Write a balanced equation, with appropriate phase labels, for the following reaction:

Aluminum metal reacts with oxygen gas to form aluminum oxide



- errors in compound formulas (up to 2 points/formula)

(reminder--did you include phase labels?)

Free-Response ANSWER SHEET

(MC score _____ FR score 42 Total raw _____ total % _____)

1. ****[8 pts]** Write a balanced equation, with **appropriate** phase labels, for the following reaction:
Aluminum metal reacts with oxygen gas to form aluminum oxide



in each reaction, up to 2 points may be lost for each error:
 - phase labels missing/wrong
 - not balanced
 - errors in form of reaction
 (reminder--did you include phase labels?)
 - errors in formula of each reactant or product

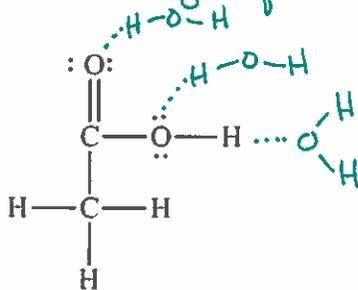
2. [10 pts] Write a balanced equation, with **appropriate** phase labels, for the **combustion of butane**.



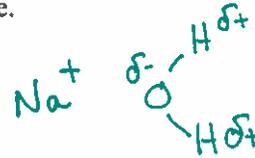
(reminder--did you include phase labels?)

3. [6 pts] Sketch a hydrogen bonding interaction of the molecule below with a molecule of water.

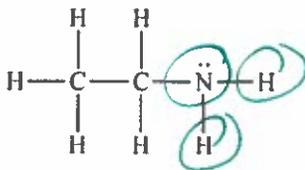
All interactions shown--only 1 required



5. [3 pts] In the space below, sketch the interaction of a sodium ion with a water molecule. Represent charges accurately in the ion and in the water molecule.



4. [7 pts] In the molecule shown below, circle all atoms that can participate in hydrogen bonding.



6. [8 pts] The molecule shown below is an amino acid, a component of proteins. Circle and name all functional groups in this molecule.

