My Mom/Dad calls me

**DIRECTIONS:** This examination is in two parts. **PART I** consists of eight multiple-choice questions (each worth 4 pts). Circle the correct answer. **PART II** (68 pts.) involves questions requiring write-up on your part. Be brief, clear and to the point.

**RELAX, STAY CALM AND DO YOUR BEST**

**GOOD LUCK**

**PART I: MULTIPLE CHOICE QUESTIONS**

(32 pts.)

I. Arrange the following molecules in order of increasing acidity:

- \( \text{C}_\text{H}_3\text{C}\text{O}_2\text{H} \)
- \( \text{Cl}\text{C}_\text{H}_3\text{C}\text{O}_2\text{H} \)
- \( \text{Cl}\text{Cl}\text{C}_\text{H}_3\text{C}\text{O}_2\text{H} \)
- \( \text{Cl}_2\text{C}_\text{H}_3\text{C}\text{O}_2\text{H} \)

1. (a) 4<3<2<1
2. (b) 4<1<2<3
3. (c) 4<3<1<2
4. (d) 3<4<2<1
5. (e) 1<3<2<4

II. Which of the following compounds would you expect to be the weakest base?

(a) \( \text{CH}_3\text{C} \)
(b) \( \text{N} \text{CH}_3\)
(c) \( \text{CH}_3\text{N} \)
(d) \( \text{OCH}_3\text{N} \)
(e) \( \text{OCH}_3\text{N} \)
III. Arrange each of the following molecules in order of decreasing basicity:

(a) 1 > 3 > 2 > 4
(b) 4 > 2 > 1 > 3
(c) 3 > 2 > 4 > 1
(d) 3 > 2 > 1 > 4
(e) 1 > 3 > 4 > 2

IV. Which of the following molecules possesses the most acidic hydrogen?

V. The IR spectrum of a compound exhibits only a characteristic strong absorption band at 1735 cm\(^{-1}\). Which of these compounds could it be?

(a) 1 - Butanol
(b) Methyl propanoate
(c) Butanoic acid
(d) Butanamide
(e) None of these

VI. Which reagent would serve as the basis for a simple chemical test to distinguish between \(\beta\)-Naphthol and D-phenyl ether?

(a) cold dilute NaOH
(b) cold dilute NaHCO\(_3\)
(c) cold conc. H\(_2\)SO\(_4\)
(d) cold dilute HCl
(e) more than one of these
VII. Which compound would have a UV absorption band at **shortest wavelength**?

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

VIII. For each pair, pick out the **stronger** acid.

(a) A,D,E  
(b) A,C,F  
(c) B,D,E  
(d) B,C,E  
(e) none of these
II. For each of the following pair, predict which one in each pair will have a higher value for the listed property. Explain your reasoning briefly but clearly. (42 points)

1. **DIPOLAR MOMENT:**
   - ![Dipolar Moment 1](image1)
   - ![Dipolar Moment 2](image2)

2. **ACIDITY:**
   - ![Acidity 1](image3)
   - ![Acidity 2](image4)

3. **STABILITY:**
   - ![Stability 1](image5)
   - ![Stability 2](image6)

4. **ACIDITY:**
   - ![Acidity 3](image7)
   - ![Acidity 4](image8)
5. **SOLUBILITY IN Aq. NaOH SOLUTION:**

\[
C(\text{NO}_2)_4 \quad \text{and} \quad HC(\text{NO}_2)_3
\]

6. **SOLUBILITY IN HCl:**

1 - Azacyclopentan-2-one and 1 - Azacyclopentan-4-one

7. **ELECTRO POSITIVE EFFECT OF THE GROUP:**

-NH-COCH₃ and -CO-NHCH₃

III. Draw stepwise all the canonical structures for:

\[H₃C=\text{CO}\quad \text{CHO}\]

(1) and

\[H₂N-\text{NHCH}_{3}\]

(2) (Use backpage, if necessary)
IV. An organic compound of M.F. C₆H₁₀O₂ gives the following spectral data:

\[ \text{ir: } 3500 \text{ cm}^{-1} (\text{S, broad}); \ 1700 \text{ cm}^{-1} (\text{S}) \].

Deduce \textbf{all the possible structures} for the organic substance. Explain your reasoning clearly.

(12 pts.)