P.S. #1. Chem 3201*

(A)

Chapt 1 #3: Since it is an amino acid, there must be oxygen present.

% Oxygen = 100 − (32.00 + 6.71 + 18.66) = 42.63 %

∴ ratio of atoms:

C $\frac{32.00}{12.011} = 2.664$

H $\frac{6.71}{1.008} = 6.656$

N $\frac{18.66}{14.007} = 1.332$

O $\frac{42.63}{15.999} = 2.664$

Dividing by 1.332 gives $C_2H_5NO_2$ as empirical formula

Chapt 1 #6: (a) C_8H_7NO

Units of unsatn = (# C's + 1) − # H's/2 + # N's/2

= 9 − 7/2 + 1/2 = 6

"Index of hydrogen deficiency"

P.S # 1. Chem 3201*

Chapt 1 # 6(b): $C_3H_7NO_3$

Sites of unsat'n = $4 - \frac{7}{2} + \frac{1}{2}$

$= 1$

Chapt 1 # 6 (c) Recall halogens can be treated as H ∴ monovalent.

Thus, for $C_4H_4BrNO_2$:

Sites = $5 - \frac{4}{2} + \frac{1}{2} - \frac{1}{2}$

↑ ↑ ↑ ↑ Br

#(C's+1) H N

$= 3$

6(d): Similarly for $C_5H_3ClN_4$

Sites of unsat'n = $6 - \frac{3}{2} - \frac{1}{2} + \frac{4}{2}$

$= 6$

6(e): For $C_{21}H_{22}N_2O_2$:

sites = $22 - \frac{22}{2} + \frac{2}{2} = 12$

Chapt 1 #8: Mass of C in Sample = $\frac{12}{44} \times 24.87$

$= 6.78$ mg

Mass of H in Sample = $\frac{2}{18} \times 5.82$

$= .65$ mg.

∴ Mass of O in sample = $11.32 - (6.78 + .65) = 3.89$ mg

Ratio of atoms: C $\frac{6.78}{12.011} = .564 = 2.32$

H $\frac{.65}{1.008} = .644 = 2.65$

O $\frac{3.89}{15.999} = .243 = 1$

∴ Mult x3

Need to get to a whole number ratio,

to give $C_{6.96} H_{7.95} O_3$

(b) ∴ Looks like $C_7 H_8 O_3$ is empirical formula.

(c) Mass of this formula is $7(12) + 8(1) + 3(16) = 140$ grams

∴ Molecular formula is $\frac{420}{140} = 3 \times C_7 H_8 O_3$

∴ $C_{21} H_{24} O_9$

(d) # units of unsat'n = $22 - \frac{24}{2}$

$= 10$

Since each aromatic ring is 4 units (benzene) ∴ 2 possible aromatic rings.

Chapt 1 # 9(a): if only C & H

Base formula = $\frac{136}{13} = 10 + 6/13$ ← remainder

↑ number

∴ Formula is $C_{10}H_{16}$

if 2 oxygens present : mass is $2 \times 16 = 32$

∴ need to subtract C_2H_8 from base formula

∴ $C_{10}H_{16} - C_2H_8 + O_2 = C_8H_8O_2$