

P.S. #1. Chem 3201*

(A)

Chapt 1 #3:

Since it is an amino acid, there must be oxygen present.

$$\% \text{ Oxygen} = 100 - (32.00 + 6.71 + 18.66) = 42.63 \%$$

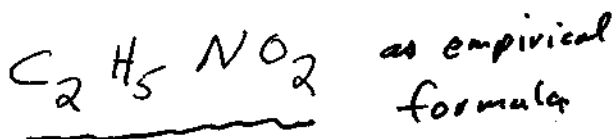
$$\therefore \text{ratio of atoms} = \begin{array}{l} \text{C} \quad \frac{32.00}{12.011} = 2.664 \end{array}$$

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

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

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

Dividing by 1.332 gives



Chapt 1 #6: (a) $C_8 H_7 NO$

$$\# \text{ Units of unsat'n} = (\# \text{ C's}) - \frac{\# \text{ H's}}{2} + \frac{\# \text{ N's}}{2}$$

$$/// = 9 - \frac{7}{2} + \frac{1}{2} = 6$$

"Index of hydrogen deficiency"

Chapt 1 # 6(b): $C_3H_7NO_3$

$$\begin{aligned} \# \text{ Sites of unsat'n} &= 4 - \frac{7}{2} + \frac{1}{2} \\ &= 1 \end{aligned}$$

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

Thus, for $C_4H_4BrNO_2$:

$$\begin{aligned} \# \text{ Sites} &= 5 - \frac{4}{2} + \frac{1}{2} - \frac{1}{2} \\ &\quad \uparrow \quad \uparrow \quad \uparrow \quad \uparrow \\ &\quad \#(C's) \quad H \quad N \quad Br \\ &= 3 \end{aligned}$$

6(d): Similarly for $C_5H_3ClN_4$

$$\begin{aligned} \# \text{ Sites of unsat'n} &= 6 - \frac{3}{2} - \frac{1}{2} + \frac{4}{2} \\ &= 6 \end{aligned}$$

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

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

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

Need to get to a whole number ratio, \therefore mult x3

to give C_{6.96} H_{7.95} O₃

(b) \therefore looks like C₇H₈O₃ is empirical formula.

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

\therefore Molecular formula is $\frac{420}{140} = 3 \times \text{C}_7\text{H}_8\text{O}_3$

\therefore C₂₁H₂₄O₉

(D)

$$(d) \text{ \# units of unsat'n} = 22 - \frac{24}{2}$$
$$= 10$$

Since each aromatic ring is 4 units

(benzene) \therefore 2 possible aromatic rings

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

$$\text{Base formula} = \frac{136}{13} = 10 + \frac{6}{13}$$

↑
units

← units

\therefore Formula is $C_{10}H_{16}$

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

\therefore need to subtract C_2H_8 from base formula

