To prepare a buffer with a pH of 4.00 using C_6H_5COOH, ($pK_a = 4.19$) and its conjugate base, what concentration ratio of $C_6H_5COO^-$ to C_6H_5COOH must be used?

Henderson-Hasselbalch equation: $pH = pKa - \log([HA] / [A^-])$

$pH = pKa + \log([A^-] / [HA])$

1. $10^{-0.19} = 0.65$ to 1 of $[C_6H_5COO^-]$ to $[C_6H_5COOH]$
2. $10^{0.19} = 1.6$ to 1 of $[C_6H_5COO^-]$ to $[C_6H_5COOH]$
3. $10^{4.00} = 1.0 \times 10^4$ to 1 of $[C_6H_5COO^-]$ to $[C_6H_5COOH]$
4. $10^{4.19} = 1.6 \times 10^4$ to 1 of $[C_6H_5COO^-]$ to $[C_6H_5COOH]$

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Henderson-Hasselbalch equation: $pH = pKa - \log([HA] / [A^-])$

$pH = pKa + \log([A^-] / [HA])$

53%	1.	$10^{-0.19} = 0.65$ to 1 of $[C_6H_5COO^-]$ to $[C_6H_5COOH]$
36%	2.	$10^{0.19} = 1.6$ to 1 of $[C_6H_5COO^-]$ to $[C_6H_5COOH]$
8%	3.	$10^{4.00} = 1.0 \times 10^4$ to 1 of $[C_6H_5COO^-]$ to $[C_6H_5COOH]$
3%	4.	$10^{4.19} = 1.6 \times 10^4$ to 1 of $[C_6H_5COO^-]$ to $[C_6H_5COOH]$

pH = -log[0.00421] = 2.38
(to how many sig figs?)

hint: first ask yourself, how many sig figs are in [H_3O^+]

1. 2.4
2. 2.38
3. 2
4. 2.375

pH = -log[0.00421] = 2.38
(to how many sig figs?)

hint: first ask yourself, how many sig figs are in $[H_3O^+]$

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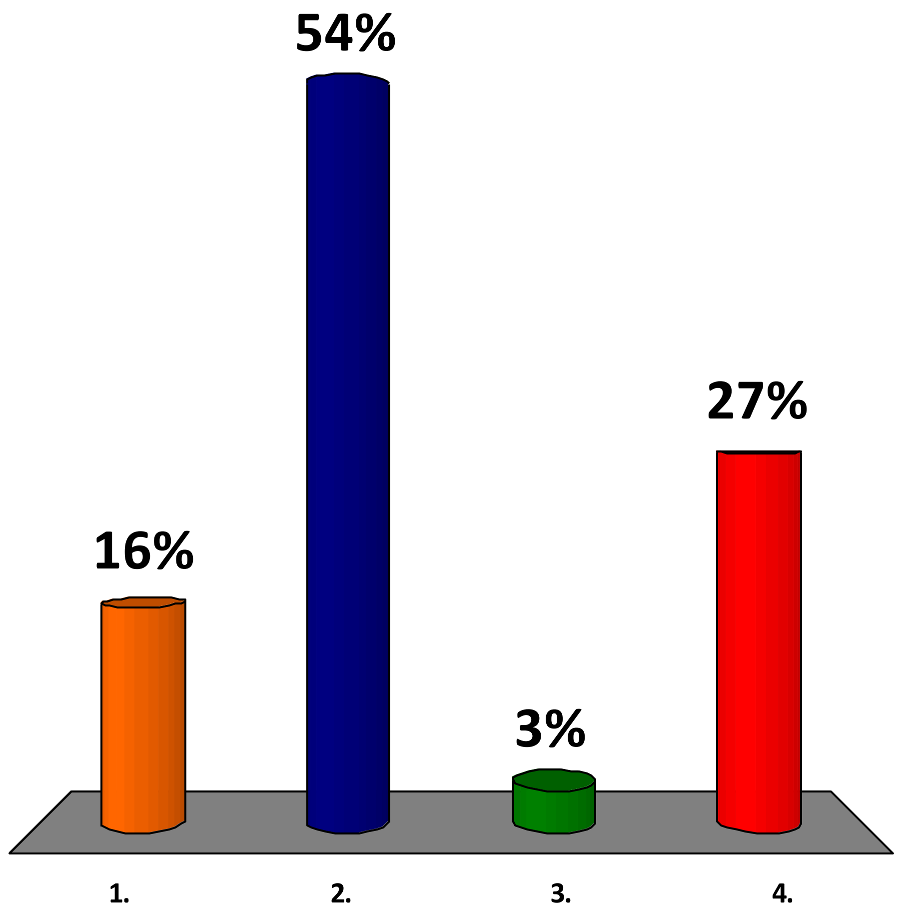
2. 2.38
3. 2
4. 2.375



0.75×10^{-3} moles of OH^- reacting with 2.5×10^{-3} moles of HCOOH produces how many moles of HCO_2^-?

1. $2.5 \times 10^{-3} - 0.75 \times 10^{-3} = 1.75 \times 10^{-3}$
2. 0.75×10^{-3}
3. 2.5×10^{-3}
4. Depends on the K_b of HCO_2^-
5. Depends on the K_a of HCO_2^-

0.75×10^{-3} moles of OH^- reacting with 2.5×10^{-3} moles of HCOOH produces how many moles of HCO_2^-?

17% 1. $2.5 \times 10^{-3} - 0.75 \times 10^{-3} = 1.75 \times 10^{-3}$

70% 2. 0.75×10^{-3}

5% 3. 2.5×10^{-3}

5% 4. Depends on the K_b of HCO_2^-

3% 5. Depends on the K_a of HCO_2^-

$$\mathbf{HCO_2^- (aq) + H_2O(\mathit{l}) \rightleftharpoons HCOOH (aq) + OH^-(aq)}$$

H_2CO_2	$K_a = 1.8 \times 10^{-4}$	$pK_a = 3.75$
HCO_2^-	$K_b = 5.6 \times 10^{-11}$	$pK_b = 10.25$

Set up your equation using the appropriate ionization constant.

1. $K_a = 1.8 \times 10^{-4} = x^2/(0.0600 - x)$
2. $K_b = 5.6 \times 10^{-11} = x^2/(0.0600 - x)$
3. $pK_a = 3.75 = x^2/(0.0600 - x)$
4. $pK_b = 10.25 = x^2/(0.0600 - x)$

$$HCO_2^- (aq) + H_2O(l) \rightleftharpoons HCOOH (aq) + OH^-(aq)$$

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Set up your equation using the appropriate ionization constant.

20% 1. $K_a = 1.8 \times 10^{-4} = x^2/(0.0600 - x)$

76% ✓ 2. $K_b = 5.6 \times 10^{-11} = x^2/(0.0600 - x)$

3% 3. $pK_a = 3.75 = x^2/(0.0600 - x)$

2% 4. $pK_b = 10.25 = x^2/(0.0600 - x)$

Consider a probe, HA, that is only glows in the deprotonated (A^-) state.

The pK_a of the probe is 10.0, and the pH of blood is 7.4.

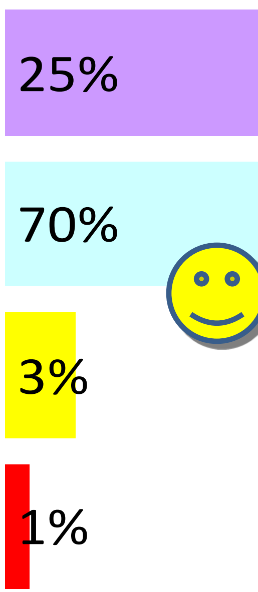
Which of the following is true?

1. Most of the probe will be in the deprotonated form (A^-) form in the bloodstream and glow.
2. Most of the probe will be in the protonated (HA) form in the bloodstream and not glow.
3. The ratio will be 50% 50% in the bloodstream.
4. More information is required.

Consider a probe, HA, that is only glows in the deprotonated (A^-) state.

The pK_a of the probe is 10.0, and the pH of blood is 7.4.

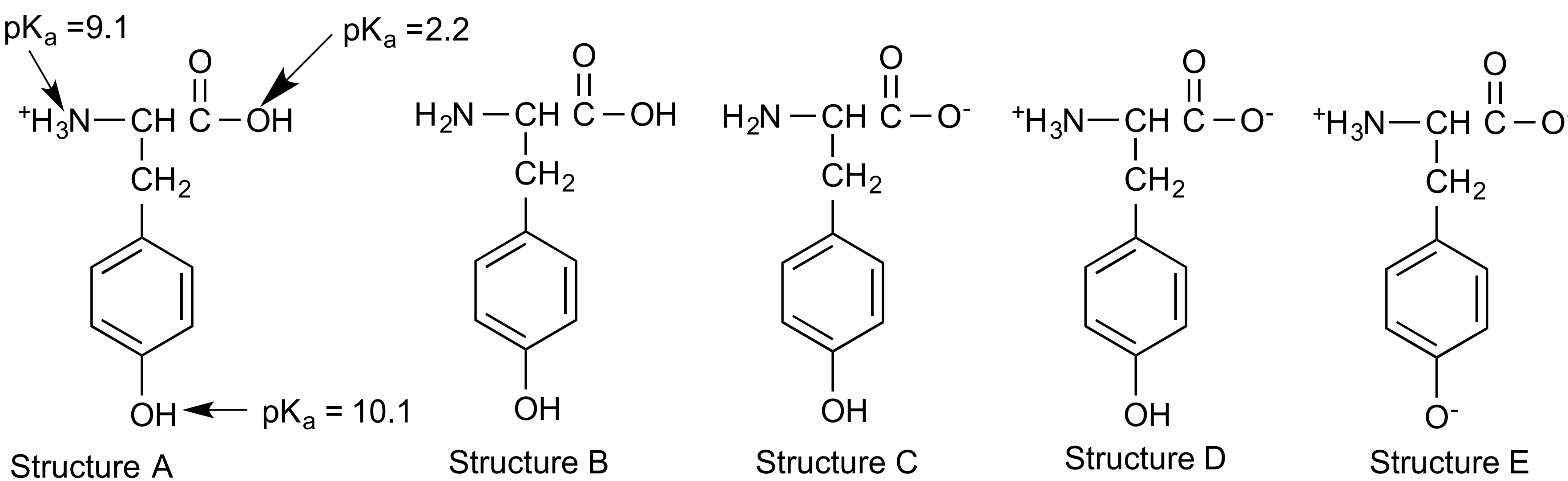
Which of the following is true?



1. Most of the probe will be in the deprotonated form (A^-) form in the bloodstream and glow.
2. Most of the probe will be in the protonated (HA) form in the bloodstream and not glow.
3. The ratio will be 50% 50% in the bloodstream.
4. More information is required.

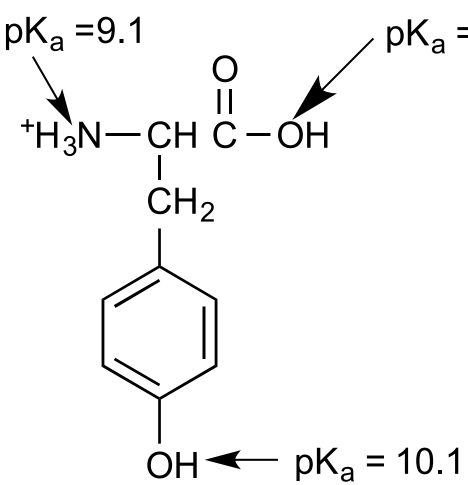
Which structure do you predict the amino acid tyrosine (Tyr) to have at pH 7.4?

1. Structure A
2. Structure B
3. Structure C
4. Structure D
5. Structure E

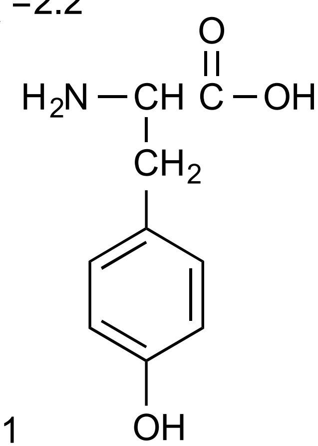


Which structure do you predict the amino acid tyrosine (Tyr) to have at pH 7.4?

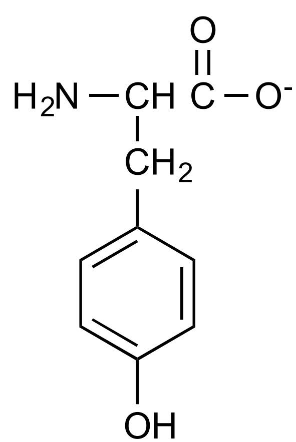
11%	1. Structure A
20%	2. Structure B
20%	3. Structure C
39%	4. Structure D
10%	5. Structure E



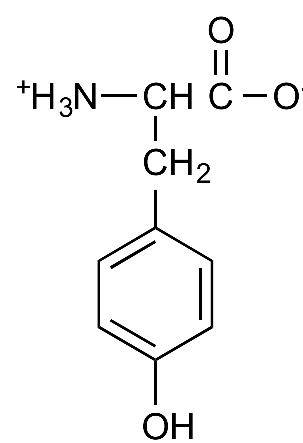
Structure A



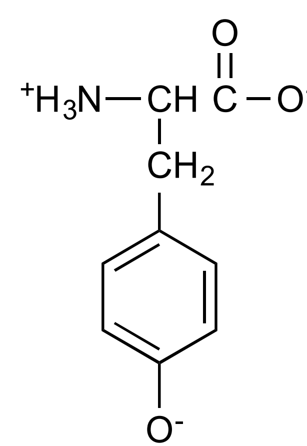
Structure B



Structure C



Structure D



Structure E

What is the oxidation number of nitrogen in N_2O?

1. -2
2. -1
3. 0
4. +1
5. +2

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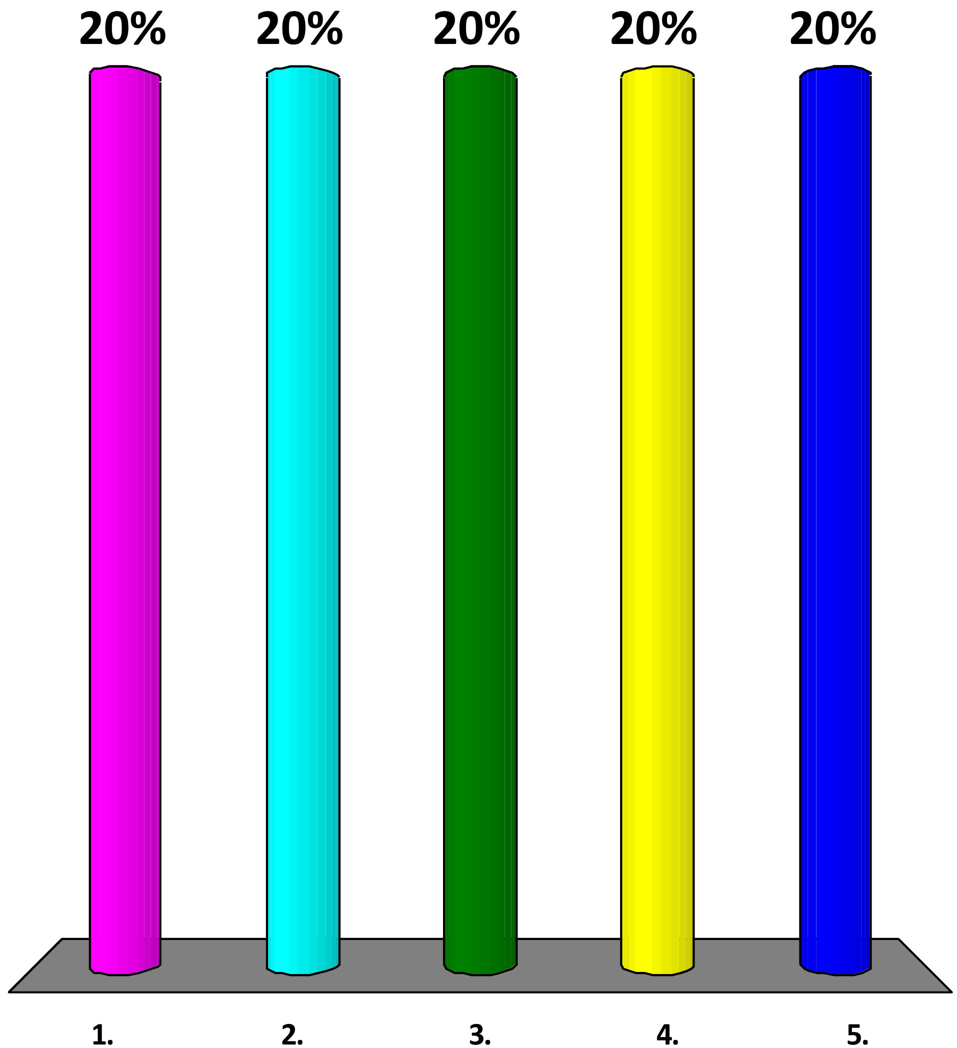
What is the oxidation number of nitrogen in N_2O?

1. -2
2. -1
3. 0
4. +1 ✓
5. +2



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For the half reaction:

$Cr_2O_7^{2-} \rightarrow Cr^{3+}$

Cr is…

1. Reduced (it loses electrons)
2. Reduced (it gains electrons)
3. Oxidized (it loses electrons)
4. Oxidized (it gains electrons)

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For the half reaction:

$$Cr_2O_7^{2-} \rightarrow Cr^{3+}$$

Cr is…

25%		1. Reduced (it loses electrons)
25%	☺	2. Reduced (it gains electrons)
25%		3. Oxidized (it loses electrons)
25%		4. Oxidized (it gains electrons)

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