

Bank Questions

Q1/ Calculate the pH and pOH for each of the following solution:

- 0.021M NaOH solution.
- A solution prepared from the mixing of 50.0 mL of 0.02 M HCl with 25 mL of 0.01M KOH.
- 0.01 M H₂C₂O₄ solution. (K_{a1} = 5.9 x 10⁻² ; K_{a2} = 6.4 x 10⁻⁵)
- 0.01M sodium cyanide solution. (K_a HCN = 4.0 x 10⁻¹⁰)
- A buffer solution is prepared by mixing 500.0 mL of 0.10 M NaOCl and 500.0 mL of 0.20 M HOCl. [K_a(HOCl) = 3.2 × 10⁻⁸].
- A buffer solution that contains 0.25M Benzoic acid (C₆H₅CO₂H) and 0.15 M sodium benzoate (C₆H₅COONa). [K_a (C₆H₅CO₂H) = 6.5×10⁻⁵].
- A buffer solution prepared by dissolving 0.2 mole of cyanic acid (HCNO) and 0.8 mol of sodium cyanate (NaCNO) in enough water to make 1.0 liter of solution, Calculate the pH and pOH after addition of 1 mL of 0.1 M NaOH. [K_a(HCNO) = 2.0×10⁻⁴]

Answer/

The image shows handwritten solutions for the bank questions on graph paper. The solutions are organized into two columns. The left column contains solutions for questions (a) and (b), while the right column contains solutions for questions (c) and (d). The solutions include chemical equations, equilibrium expressions, and calculations for pH and pOH.

Q1/

(a) 0.021 M NaOH

$$\text{NaOH} \rightarrow \text{Na}^+ + \text{OH}^-$$

0.021 M	0.021 M	0.021 M
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$$\text{pOH} = -\log [\text{OH}^-] = -\log 0.021 = 1.68$$

$$\text{pH} = 14 - \text{pOH} = 14 - 1.68 = 12.32$$

(b)

$$[\text{H}^+] = \frac{\text{No. of mmol of HCl} - \text{No. of mmol NaOH}}{V_{\text{total}}} = \frac{(50 \times 0.02) - (25 \times 0.01)}{75}$$

$$= \frac{1 - 0.25}{75} = 0.01 \text{ M}$$

$$\text{pH} = -\log 0.01 = 2$$

$$\text{pOH} = 14 - 2 = 12$$

(c) 0.01 M H₂C₂O₄

$$\text{H}_2\text{C}_2\text{O}_4 \rightleftharpoons \text{H}^+ + \text{HC}_2\text{O}_4^-$$

0.01	0.0	0.0
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at equilibrium

0.01 - X	X	X
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$$K_{a1} = 5.9 \times 10^{-2} = \frac{[\text{H}^+][\text{HC}_2\text{O}_4^-]}{[\text{H}_2\text{C}_2\text{O}_4]} = \frac{X^2}{0.01 - X}$$

when 0.01 - X ≈ 0.01

$$5.9 \times 10^{-2} = \frac{X^2}{0.01} \Rightarrow X = \sqrt{5.9 \times 10^{-2} \times 0.01} = 0.024 \text{ M}$$

$$\text{H} = 0.024 \text{ M}$$

$$\text{pH} = -\log 0.024 = 1.61$$

$$\text{pOH} = 14 - 1.61 = 12.38$$

(d)

$$\text{NaCN} \rightarrow \text{Na}^+ + \text{CN}^-$$

0.01 M	0.01 M	0.01 M
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$$\text{CN}^- + \text{H}_2\text{O} \rightleftharpoons \text{HCN} + \text{OH}^-$$

0.01	0.0	0.0
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at equilibrium

0.01 - X	X	X
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$$K_b = \frac{K_w}{K_a} = \frac{1 \times 10^{-14}}{4 \times 10^{-10}} = 2.5 \times 10^{-5}$$

$$K_b = \frac{[\text{HCN}][\text{OH}^-]}{[\text{CN}^-]} = \frac{X^2}{0.01 - X} \Rightarrow 2.5 \times 10^{-5} = \frac{X^2}{0.01} \Rightarrow X = 5 \times 10^{-4} \text{ [OH]}$$

$$\text{pOH} = -\log [\text{OH}^-] = -\log 5 \times 10^{-4} = 3.3$$

$$\text{pH} = 14 - 3.3 = 10.7$$

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Q/ Answer the followings

- 1- **Soxhlet extraction** this process is otherwise known as continuous hot extraction.
- 2- In volatilization method origin phase is **liquid** while final phase (formed phase) is **solid**.
- 3- **Extraction** is the method of removing active constituents from solid or liquid by means of liquid solvent.
- 4- Dissolution of extractive substance out of intact plant cell by diffusion requires **steeping** and **swelling**.

Q/ Write name of extraction methods.

Methods of extraction :

- Infusion
- Decoction
- Digestion
- Maceration
- Percolation
- Continues hot extraction
- Supercritical fluid extraction
- Counter current extraction
- Microwave assisted extraction
- Ultrasonication-Assisted Extraction: