

Name : .....

## pH Calculation Worksheet

1. Calculate the pH and pOH for the following solutions:

a)  $[H^+] = 1 \times 10^{-5} \text{ M}$

b)  $[OH^-] = 3 \times 10^{-8} \text{ M}$

c)  $[H^+] = 2.5 \times 10^{-2} \text{ M}$

d)  $[OH^-] = 7.5 \times 10^{-3} \text{ M}$

e)  $[H^+] = 1.2 \times 10^{-14} \text{ M}$

f)  $[H^+] = 6.0 \text{ M}$

2. Write the equation for the dissociation of sodium hydroxide.

3. Find the pH of a 0.000841 M solution of sodium hydroxide.

4. A particular brand of root beer has a hydrogen concentration equal to  $1.9 \times 10^{-5} \text{ M}$ . What are the pH and pOH of this root beer ?

5. Dr. Pepper has a  $[H^+] = 1.4 \times 10^{-5} \text{ M}$ . What is its pH ?

6. Calculate the pH of a solution formed when 35 mL of 1.00 M HCl is mixed with 175 mL of 0.25 M NaOH.

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## pH Calculation Worksheet

1. Calculate the pH and pOH for the following solutions:

a)  $[H^+] = 1 \times 10^{-5} \text{ M}$

$$\text{pH} = -\log [H^+] = -\log (1 \times 10^{-5}) = 5$$

$$\text{pOH} = 14 - \text{pH} = 14 - 5 = 9$$

b)  $[OH^-] = 3 \times 10^{-8} \text{ M}$

$$\text{pOH} = -\log [OH^-] = -\log (3 \times 10^{-8}) = 7.52$$

$$\text{pH} = 14 - \text{pOH} = 14 - 7.52 = 6.48$$

c)  $[H^+] = 2.5 \times 10^{-2} \text{ M}$

$$\text{pH} = -\log [H^+] = -\log (2.5 \times 10^{-2}) = 1.6$$

$$\text{pOH} = 14 - \text{pH} = 14 - 1.6 = 12.4$$

d)  $[OH^-] = 7.5 \times 10^{-3} \text{ M}$

$$\text{pOH} = -\log [OH^-] = -\log (7.5 \times 10^{-3}) = 2.12$$

$$\text{pH} = 14 - \text{pOH} = 14 - 2.12 = 11.88$$

e)  $[H^+] = 1.2 \times 10^{-14} \text{ M}$

$$\text{pH} = -\log [H^+] = -\log (1.2 \times 10^{-14}) = 13.92$$

$$\text{pOH} = 14 - \text{pH} = 14 - 13.92 = 0.08$$

f)  $[H^+] = 6.0 \text{ M}$

$$\text{pH} = -\log [H^+] = -\log (6) = -0.78$$

$$\text{pOH} = 14 - \text{pH} = 14 + 0.78 = 14.78$$

2. Write the equation for the dissociation of sodium hydroxide.



3. Find the pH of a 0.000841 M solution of sodium hydroxide.

$$[OH^-] = 0.000841 \text{ M}$$

$$\text{pOH} = -\log [OH^-] = -\log (0.000841) = 3.08$$

$$\text{pH} = 14 - 3.08 = 10.9$$

4. A particular brand of root beer has a hydrogen concentration equal to  $1.9 \times 10^{-5} \text{ M}$ . What are the pH and pOH of this root beer ?

$$\text{pH} = -\log(1.9 \times 10^{-5}) = 4.72$$

$$\text{pOH} = 14 - 4.72 = 9.28$$

5. Dr. Pepper has a  $[H^+] = 1.4 \times 10^{-5} \text{ M}$ . What is its pH ?

$$\text{pH} = -\log(1.4 \times 10^{-5}) = 4.85$$

6. Calculate the pH of a solution formed when 35 mL of 1.00 M HCl is mixed with 175 mL of 0.25 M NaOH.

$$\text{Moles of HCl} = \text{Volume} \times \text{Molarity} = 35 \text{ mL} \times 1.00 \text{ M} = 0.035 \text{ mol}$$

$$\text{Moles of NaOH} = 175 \text{ mL} \times 0.25 \text{ M} = 0.04375 \text{ mol}$$

$$\text{Excess moles of NaOH} = 0.04375 \text{ mol} - 0.035 \text{ mol} = 0.00875 \text{ mol}$$

$$\text{Total volume} = 35 \text{ mL} + 175 \text{ mL} = 210 \text{ mL} = 0.21 \text{ L}$$

$$\text{Concentration of excess NaOH, } [OH^-] = 0.21 \text{ L} / 0.00875 \text{ mol} = 0.0417 \text{ M}$$

$$\text{pOH} = -\log [OH^-] = -\log (0.0417) = 1.38$$

$$\text{pH} = 14 - 1.38 = 12.62$$