

# What is the pH and pOH Formula?

## Worksheet

$\text{pH} = \log[\text{H}^+]$  and  $\text{pOH} = \log[\text{OH}^-]$ . Since  $[\text{H}^+][\text{OH}^-] = 10^{-14}$  at 25°C, adding  $\text{pH} + \text{pOH}$  always gives 14. Low pH = acidic, high pH = basic.

$$\text{pH} = -\log_{10}([\text{H}^+])$$

## Questions

1.  $[\text{H}^+] = 10 \text{ M}$ . What is pH?

- A) 4
- B) 4
- C) 10
- D) 0.0001

2. A solution has  $\text{pH} = 9$ . Is it acidic or basic?

- A) Acidic
- B) Basic
- C) Neutral
- D) Cannot tell

3.  $\text{pH} + \text{pOH}$  at 25°C equals

- A) 7
- B) 10
- C) 14
- D) 0

4. If  $[\text{H}^+]$  increases, pH

- A) Increases
- B) Decreases
- C) Stays the same
- D) Becomes negative

5. A solution has  $[\text{H}^+] = 0.001 \text{ M}$ . Find pH.

6. A solution has  $\text{pH} = 10$ . Find  $[\text{H}^+]$ .

7. At 25°C, a solution has  $\text{pOH} = 4$ . Find pH.

8. Define: What is pH?

9. Define: What is the relationship between pH and pOH?

10. Define: If  $[\text{H}^+] = 10$ , what is pH?

## Answer Key

1. A)  $4 - \text{pH} = \log(10) = 4$ . The logarithm of 10 is 4, so  $(4) = 4$ .
2. B) Basic -  $\text{pH} > 7$  is basic. At  $\text{pH} 9$ ,  $[\text{H}] < [\text{OH}]$ .
3. C)  $14 - [\text{H}][\text{OH}] = 10$ , so  $\log[\text{H}] \log[\text{OH}] = 14$ .
4. B) Decreases -  $\text{pH} = \log[\text{H}]$ . Higher  $[\text{H}]$  larger log more negative lower  $\text{pH}$ .
5.  $\text{pH} = -\log[\text{H}] = -\log(0.001) 0.001 = 10 \text{ pH} = -\log(10) = -(-3) = 3$
6.  $\text{pH} = -\log[\text{H}] 10 = -\log[\text{H}] \log[\text{H}] = -10 [\text{H}] = 10 \text{ M}$
7.  $\text{pH} + \text{pOH} = 14 \text{ pH} = 14 - 4 = 10$  (Solution is basic)
8.  $\text{pH} = \log[\text{H}]$ . It measures acidity:  $\text{pH} < 7$  is acidic,  $\text{pH} = 7$  is neutral,  $\text{pH} > 7$  is basic.
9. At  $25\text{C}$ ,  $\text{pH} + \text{pOH} = 14$  (because  $[\text{H}][\text{OH}] = 10$ ).
10.  $\text{pH} = \log(10) = 5$ . This is slightly acidic.

### **Bounlu**

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