Answer on Question #54860 - Chemistry - Physical chemistry

Question:

The pH of a 10 raised to power -10 M NaOH solution is nearest to? and how?

(1) 10; (2) 7; (3) 4; (4) -10

Solution

The NaOH concentration is $c(NaOH) = 10^{-10}$ M

The ionic product of water is $[H^+][OH^-] = 10^{-14}$

Proton condition is $[OH^-] = [H^+] + 10^{-10}$

$[OH^-]^2 - 10^{-10}\,[OH^-] - 10^{-14} = 0$

$[OH^-] = 1.0005 \times 10^{-7}$

$[H^+] = 10^{-14}/[OH^-]$

$pH = -\lg[H^+] = 6.99 \approx 7$

Answer: (2) 7