

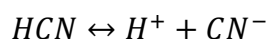
## Answer on the question #63575, Chemistry / Physical Chemistry

### Question :

Mass of CN ION in 1.5 l of 1 M HCN so.  $K_a$  of hcn =  $4.9 \times 10^{-10}$

### Solution:

The reaction of HCN dissociation is:



Constant of dissociation is:

$$K_a = \frac{[\text{H}^+][\text{CN}^-]}{[\text{HCN}]}$$

Let's say, we have the concentration of  $\text{CN}^-$  equal to  $x$ . Then, the concentration of  $\text{H}^+$  is also  $x$ , and the concentration of  $\text{HCN}$  is  $1 - x$ . We can rewrite the expression for dissociation constant:

$$K_a = \frac{x \cdot x}{1 - x} = 4.9 \cdot 10^{-10}$$

Let's assume that  $x$  is much less than 1. Then we get:

$$x = \sqrt{4.9 \cdot 10^{-10}} = 2.2 \cdot 10^{-5} \text{ M}$$

As we see, our assumption is right.

Now, we can get the number of the moles of  $\text{CN}^-$  and its mass in 1.5L of solution:

$$n(\text{CN}^-) = [\text{CN}^-]V = 2.2 \cdot 10^{-5} (\text{mol L}^{-1}) \cdot 1.5 (\text{L}) = 3.3 \cdot 10^{-5} \text{ mol}$$

$$m(\text{CN}^-) = n(\text{CN}^-) \cdot M(\text{CN}^-) = 3.3 \cdot 10^{-5} (\text{mol}) \cdot 26.0174 (\text{g mol}^{-1}) = 8.64 \cdot 10^{-4} \text{ g}$$

**Answer:**  $8.64 \cdot 10^{-4} \text{ g}$