

## Answer on Question #67489 - Chemistry - General Chemistry

**Question:**  $\text{CH}_3\text{NH}_2$  has a  $K_b = 4.4 \times 10^{-4}$ . If a 0.0100 M solution of  $\text{CH}_3\text{NH}_2$  is prepared, the expected pH will be in which of the following pH ranges?

- (A) 10-12
- (B) 8-10
- (C) 4-6
- (D) 2-4

### **Solution**

$\text{CH}_3\text{NH}_2$  is a medium strength base (can be seen from the value of  $K_b$ ). For such a compound, we can find pOH (and then pH) in the solution by the formula used in analytical chemistry for medium strength acids and bases:

$$[\text{OH}^-] = \frac{-K_b + \sqrt{K_b^2 + 4K_bC}}{2};$$
$$[\text{OH}^-] = \frac{-4.4 \times 10^{-4} + \sqrt{(4.4 \times 10^{-4})^2 + 4 \times 4.4 \times 10^{-4} \times 0.01}}{2} \approx 1.889 \times 10^{-3} \frac{\text{mol}}{\text{L}}.$$
$$p\text{OH} = -\log[\text{OH}^-] = -\log(1.889 \times 10^{-3}) \approx 2.724.$$
$$p\text{H} = 14 - p\text{OH} = 14 - 2.724 = 11.276.$$

**Answer:** (A) the expected pH will be in the range 10-12.