Acids and Bases

Answer Key

1. **Answer**: D

Explanation: Recall that hydroxides of groups I and II in the periodic table are strong bases. Among the choices, only Al do not belong to either of the two groups. Therefore, its hydroxide, $Al(OH)_3$, is a weak base.

2. **Answer:** A

Explanation: Option B is incorrect because by definition, a Bronsted-Lowry acid is the species that donates a proton. That is not the case in this particular reaction. Option C is also incorrect, because again, by definition, a Bronsted-Lowry base is the species that accepts a proton. In this reaction, NH_3 does not accept a proton, but it donates an electron pair to BF_3. Therefore, NH_3 satisfies the definition of a Lewis base.

3. **Answer:** E

Explanation: Option A is incorrect because CN^- is actually the conjugate base of HCN. The reaction liberates H_3O^+ in the solution so the pH is expected to go down, since liberation of H_3O^+ acidifies the solution, making option B incorrect. Lastly, option C is also incorrect because in the forward reaction, H_2O accepts a proton, which is the exact definition of Bronsted-Lowry base.

4. **Answer:** B

Explanation: HNO_3 is a strong acid. Hence, it will dissociate completely and the dissociation reaction proceeds to completion. To compute the pH, we simply use the equation $pH = -\log[H_3O^+]$, where $[H_3O^+] = 0.005$ M.

5. **Answer:** B

Explanation: As mentioned in the discussion, strong acids include HCl, HBr, HI, H_2SO_4 (first dissociation only), HNO_3, and $HClO_4$.