Acid and Base Particle Models

New Regents original practice • Name: _____ Date: _____
Show your work for written answers.

Use H_3O^+ for hydronium and OH^- for hydroxide. An acidic aqueous solution has a greater concentration of H_3O^+ than of OH^-.

1 When an acid HA transfers a proton to H_2O, which ion forms from H_2O?

(1) OH^-

(2) H_3O^+

(3) O^{2-}

(4) H_2^+

2 Water reacts with ammonia according to $NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$. Explain why NH_3 acts as a base. [1]

Answer and work

_____

_____

3 In a neutral water sample, how do the concentrations of H_3O^+ and OH^- compare?

(1) Both must be exactly zero.

(2) H_3O^+ is greater.

(3) OH^- is greater.

(4) They are equal.

4 Two equal-volume samples start with equal amounts of monoprotic acid. Acid X ionizes almost completely. Acid Y ionizes only slightly. Identify the stronger acid and explain. [1]

Answer and work

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Counting Ions in Water Models

Use the information below to answer the questions.

The models show relative ion counts in equal volumes at the same temperature. Water molecules and counterions are omitted. The counts are simplified for comparison.

Model	**H_3O^+ count**	**OH^- count**
P	18	2
Q	6	6
R	2	18

5 Which model represents a basic sample?

(1) P

(2) Q

(3) R

(4) P and Q

6 How many times as great is the hydronium concentration in P as in R? Use the counts and explain why volume matters. [1]

Answer and work

7 What can be concluded from model Q?

(1) It represents an acidic sample.

(2) It represents a basic sample.

(3) It represents a neutral sample.

(4) It contains no ions.

8 Model P represents an acidic sample. Explain why its hydronium count alone cannot determine whether the acid used to make it was strong or weak. [1]

Answer and work