QUIZ: WHAT DO ALL ACIDS AND BASES HAVE IN COMMON?

Consider the properties of the three substances, W, X and Y in the Table given below to answer questions 1&2.

1. Which one of the following substances would produce hydrogen ions when dissolved in water?

Table

Substance	**Colour change of litmus paper**	**Reaction with Na_2CO_3**	**Reaction with zinc**
W	Red to Blue	Does not react	H_2 gas is produced
X	Blue to Red	CO_2 is produced	H_2 gas is produced
Y	No colour change	No reaction	No reaction at room temp

(a) W only
(b) X only
(c) W and X only
(d) X and Y only

2. Which substance would produce hydroxyl ions when dissolved in water?
(a)W only
(b) X only
(c) Y only
(d) All the three substances W, X & Y.

3. The Concentrations of four solutions of HCl are as follows:
(a) 1.0Mol L^{-1}
(b) 0.5 Mol L^{-1}
(c) 0.2 Mol L^{-1}
(d) 0.1 Mol L^{-1}
Which solution of the acid will have the highest pH value?

4. The pH of four solutions of NaOH are as follows:

pH Values

(a) 9.5
(b) 10.7
(c) 11.8
(d) 13.4

Which solution of NaOH is the strongest base?

5. Arrange the following solutions of acids and bases in increasing order of their pH.

Sol. A = 0.25 Mol L^{-1} HCl
Sol. B = 0.25 Mol L^{-1} NaOH
Sol. C = 0.5 Mol L^{-1} HCl
Sol. D = 0.5 Mol L^{-1} NaOH

(a) C, A, B, D
(b) A, C, D, B
(c) A, D, B, C
(d) D, B, A, C

6. pH ranges of some solutions are given below. In which of these solutions, there are least chances of development of micro-organisms.

(a) 2 - 2.2
(b) 5 - 5.6
(c) 7 - 7.8
(d) 8 - 8.1

7. A farmer sent the soil of his unfertile land for testing. Scientists told him that pH of the soil is in the range 5 - 5.6. Which of the following substances he should use for treatment of the soil.

(a) Organic manure
(b) Ammonium sulphate
(c) Potassuim nitrate
(d) Calcium carbonate

Answers:

1. (b)
Explanation: The substance 'X' shows the properties of an acid. Hence it releases H^+ ions when dissolved in water.

2. (a)
Explanation: The substance W shows the properties of a base. Hence it releases hydroxyl ions when dissolved in water.

3. (d)
Explanation: Solution (d) is of lowest concentration of hydrochloric acid, HCl. It dissociates in water as follows:
$HCl \longrightarrow H^+ + Cl^-$
In solution, the concentration of H^+ ions is the lowest and thus it is the lowest in strength.
As the acidic nature increases with increase in H^+ ion concentration, the pH of the solution decreases. Lower the pH, stronger is the acid. Inversely, higher the pH, weaker is the acid.

4. (d)
Explanation: As pH increases, the H^+ ion concentration decreases but its OH^- ion concentration increases. As the solution D has the highest pH, it has highest concentration of OH^- ions and hence it is the strongest base.

5. (a)
Explanation: As pH values increase, the strength of acids decreases and the strength of base increases.
Note for the teacher: Similar questions may be framed by giving different values of pH and asking about the relative strengths of acids and bases.

6. (c)
Explanation: Living systems work properly in the pH range 7 to 7.8 most efficiently.

7. (d)
Explanation: pH range 5 to 5.6 shows that soil is acidic in nature, so treatment should be done with some basic substance. Calcium carbonate is basic in nature. Therefore, it is a suitable substance.