Viva Questions with Answers on Experiments Based On pH Change.

1. Define pH.

Ans. It is defined as the negative logarithm of hydronium ion concentration in moles per litre.

$pH = -\log [H_3O^+]$.

2. What do you mean by pOH ?

Ans. It is negative logarithm of OH^- ion concentration.

$pOH = -\log [OH^-] = 14 - pH$.

3. What is pH of pure water at 25°C ?

Ans. 7.

4.What does pH of a solution signify ?

Ans. It signifies the H_3O^+ ion concentration in moles per litre.

5. What is pH of a solution if it is acidic ?

Ans. pH of an acidic solution is less than 7.

6. Write self ionisation of water. What is the value of ionic product of water at 298 K ?

Ans.

The value of ionic product of water at 298 K

$= 1.0 \times 10^{-14}\ mol^2\ L^{-2}$

7. What is ionic product of water ?

Ans. $K_w = [H_3O^+][OH^-]$.

8. Is pH of pure water affected by rise in temperature ?

Ans. The pH value slightly decreases with the rise in temperature. This is due to increase in

degree of dissociation of water with rise in temperature which in turn results in increase in the concentration of hydronium ions.

9. Is the value of ionic product of water affected by addition of acid or base ?

Ans. No, if a little of acid is added its H_3O^+ ion concentration increases and correspondingly OH- ion concentration decreases. Thus ionic product of water remains same.

10. What happens to the pH of the solution if a little acid is added to water ?

Ans. When a little acid is added then concentration of H_3O^+ ions in the solution increases. Thus, pH of the solution decreases.

11. 10 ml. lemon juice is diluted with an equal volume of water. What effect is likely to be observed on the pH of the solution?

Ans. The pH of the solution (diluted lemon juice) would be more than that of pure lemon juice.

12. Out of lemon juice and apple juice which one would have lower pH ?

Ans. Lemon juice would have lower pH as it is more acidic.

13. If any two acidic solutions are mixed what would happen to the pH of the mixture ?

Ans. pH of the mixture would lie in between the pH values of the two solutions.

14. What is the effect of dilution on pH of (i) an acidic solution (ii) a basic solution.

Ans. (i) pH of an acidic solution increases on dilution (ii) pH of a basic solution decrease on dilution.

15. Will the pH of 0.1 M acetic acid be the same as that of 0.1 M hydrochloric acid ?

Ans. pH of 0.1 M acetic acid would be more than pH of 0.1 M HCl because acetic acid, being a weak acid, is only partially ionised and hence produces lower cone, of H_3O^+ (aq).

16. What is an acid-base indicator ?

Ans. An acid-base indicator is an organic compound which changes its colour within certain pH range.

17. What do you mean by universal indicator ?

Ans. It is a mixture of several indicators having different pH ranges. It shows many colour changes over a wide range of pH. Each colour corresponds to a certain approximate pH.

18. What is the relationship between pH and pOH of an aqueous solution ?

Ans. The relationship is

$pH + pOH = pK_w = 14$ (at 298 K)

19. Does addition of a salt having a common ion to a weak acid change the pH of the solution ?

Ans. Yes, the pH of the solution increases.

20. The pH of a solution is 4.5. How does this solution affect a litmus paper ?

Ans. The solution is acidic and it will turn blue litmus red.

21. What do you think about pH of lemon juice or orange juice ?

Ans. The lemon juice or orange juice contains vitamin C which is ascorbic acid. The solution being acidic has pH less than 7.

22. Calculate the pH of NaOH solution which is 1×10^{-14} M.

Ans. Assuming that NaOH is fully ionised

$[OH^-] = 1 \times 10^{-14}\ mol^2\ L^{-1}$

Now $K_w = [H_3O^+][OH^-]$

or $10^{-14} = [H_3O^+][10^{-4}]$

or $[H_3O^+] = \frac{10^{-14}}{10^{-4}} = 10^{-10}$ mol L^{-1}

pH = – log $[H_3O^+]$

= – log $[10^{-10}]$ = **10**.

23. Which of the following solutions has lower pH : 0.1 M HCl or 0.1 M CH3COOH ?

Ans. 0.1 M HCl would have lower pH because HCl being a strong acid produces higher concentra¬tion of hydronium ions.

24. pH of sodium carbonate solution would be less than 7 or more than 7.

Ans. More than 7 because sodium carbonate, being a salt of strong base and weak acid, gives alkaline solution due to hydrolysis.

25. Explain why pH of 0.1 M solution of HCl is same as that of 0.05 M H_2SO_4.

Ans. HCl and H_2SO_4 are strong acids and are completely ionised in aqueous solution 0.1 M HCl and 0.05 M H_2SO_4 produce almost same cone, of H_3O^+ (aq) on ionisation and hence have practially equal pH. (Note that 1 molecule of H_2SO_4 gives $2H_3O^+$ ions on ionisation).