

NUMERICALS OF IONIC EQUILIBRIUM

A. Numerical related to pH

1. Calculate the pH and pOH of 0.1M HCl solution. **Ans: pH=1 and pOH=13**
2. Calculate the pH of 0.2M H₂SO₄ solution. **Ans: 0.39**
3. Calculate the pH of 0.2N H₂SO₄ solution. **Ans: 0.69**
4. If a solution has a pH of 7.41 at 25^o C. calculate its [OH⁻]. **Ans: 2.5×10^{-7} M**
5. Calculate hydrogen ion concentration of a solution whose pH is 5.5. **Ans: 3.16×10^{-6}**
6. Calculate the pH of 2 gram per litre of NaOH solution. **Ans: 12.7**
7. Calculate the pH of 1×10^{-8} M HCl solution. **Ans: 6.95**
8. Calculate the pH of 10^{-7} M HCl solution. **Ans: 6.7**
9. Calculate the pH of 10^{-7} M NaOH solution. **Ans: 7.3**
10. If a solution having pH 5 is 1000 times diluted with water, then find the pH of the resulting. **Ans: 6.95**
11. The pH of acid solution is 3. It is diluted 200 times. What is the new pH of the dilute solution? **Ans: 5.30**
12. 200ml of an aqueous solution of HCl having pH =2 is mixed with 300 ml of an aqueous solution of NaOH having pH =12. What will be the pH of the resulting mixture? **Ans: 11.31**
13. Equal volume of two solution having pH 4 and pH 5 are mixed together. Calculate the pH of the resulting mixture. **Ans: 4.25**
14. 20 cc of 1/5 N HCl, 50 cc of 1/2 N HNO₃ and 100 cc of 1/10 N H₂SO₄ are mixed together. Find the pH of mixture. **Ans: 0.69**

B. Numerical related Ostwald's dilution law

15. Calculate the [H⁺] and the pH of 0.1 M acetic acid ($K_a = 1.8 \times 10^{-5}$) **Ans: 2.87**
16. Calculate concentration of all the species present in 0.01M solution of formic acid at 25^oc. Find out the degree of dissociation. Given, ionization constant of formic acid at 25^oc (K_a for HCOOH = 2.1×10^{-4}) **Ans: [H⁺]= 0.0014**
17. Find out the pH of 0.002 M acetic acid solution if it is 2.5% ionized at this dilution. Also find out the ionization constant of acid. **Ans: pH=4.3 and $K_a = 1.25 \times 10^{-6}$**
18. Calculate the percentage dissociation of 0.1 M HCN at equilibrium having dissociation constant of $K_a = 1.8 \times 10^{-5}$. **Ans: 1.34%**
19. calculate the pH of 1 molar solution of acetic Acid. To what volume, one litre of this solution be diluted so that the pH of the solution that is formed will be twice of the original value. ($K_a = 1.8 \times 10^{-5}$) **Ans: 54945.05 L**

C. Numerical related to solubility and solubility product

20. The solubility of AgCl in water at 25°C is found to be 1.06×10^{-5} mole L⁻¹. calculate the solubility product of AgCl at this temperature. **Ans: 1.12×10^{-1}**
 21. The solubility of calcium fluoride (CaF₂) in water at 18°C is 2.05×10^{-4} mole per litre. Calculate its solubility product. **Ans 3.45×10^{-11}**
 22. The solubility product of silver chromate is 1.9×10^{-12} at a certain temperature. Calculate its solubility at the same temperature. **Ans: 7.8×10^{-5} M**
 23. The solubility product of Mg (OH)₂ at 25°C is 1.4×10^{-11} . calculate the solubility of Mg (OH)₂ at this temperature. **Ans: 1.518×10^{-4} moleL⁻¹**
 24. The solubility product of chalk (Calcium Carbonate) is 9.3×10^{-8} . Calculate its solubility in gram per litre. **Ans: 3.05×10^{-2} g/l**
 25. The solubility product of CaF₂ in water at 18°C is 3.45×10^{-11} . Calculate its solubility in g/l. **Ans: 1.62×10^{-2} g/l**
 26. 0.00143g of AgCl dissolved in one litre of water at 25°C to form a saturated solution. What is the K_{sp} of the salt. (Ag = 108, Cl = 35.5) **Ans: 9.93×10^{-11}**
 27. The solubility of silver chloride (AgCl) in water at 298K is 1.43×10^{-3} gram per litre. Calculate the value of solubility product. **Ans: 9.93×10^{-11}**
-
28. The solubility product constant of barium sulphate (BaSO₄) in water at 25°C is 1×10^{-10} . Calculate the value of solubility of barium sulphate in gram per litre. (Ba=137) **Ans: 2.33×10^{-3} gm L⁻¹**
 29. If volume of 25 cm³ of 0.05M Ba (NO₃)₂ are mixed with 25cm³ of 0.02M NaF will any BaF₂ precipitated? (K_{sp} of BaF₂ = 1.7×10^{-6} at 298K) **Ans: ppt occurs**
 30. The solubility product constant (K_{sp}) of Ca (OH)₂ at 25°C is 4.42×10^{-5} . A 500ml of saturated solution of Ca (OH)₂ is mixed with an equal volume of 0.4M NaOH. What mass of Ca (OH)₂ is precipitated out? **Ans: 0.731 g/l**

GOOD LUCK