

CHEMISTRY

BOOKS - SURA CHEMISTRY (TAMIL ENGLISH)

IONIC EQUILIBRIUM

Mcqs Evaluation

1. Concentration of the Ag^+ ions in a saturated solution of $Ag_2C_2O_4$ is $2.24 \times 10^{-4} molL^{-1}$
solubility product of $Ag_2C_2O_4$ is

A. $2.42 \times 10^{-8} \text{mol}^3 \text{L}^{-3}$

B. $2.66 \times 10^{-12} \text{mol}^3 \text{L}^{-3}$

C. $4.5 \times 10^{-11} \text{mol}^3 \text{L}^{-3}$

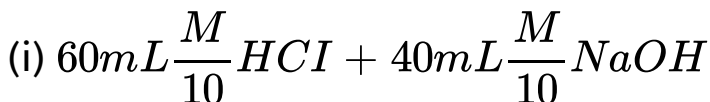
D. $5.619 \times 10^{-12} \text{mol}^3 \text{L}^{-3}$

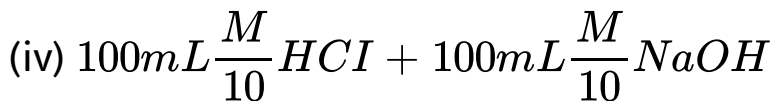
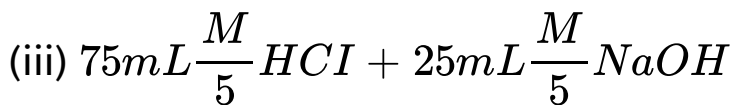
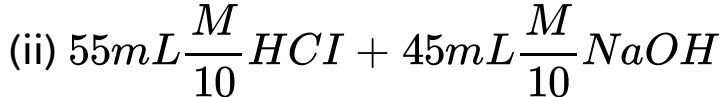
Answer: D



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2. Following solutions were prepared by mixing different volumes of NaOH of HCl different concentrations.





pH of which one of them will be equal to 1?

A. iv

B. i

C. ii

D. iii

Answer: D



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3. The solubility of $BaSO_4$ in water is $2.42 \times 10^{-3} gL^{-1}$ at 298K. The value of its solubility product (K_{sp}) will be, (Given molar mass of $BaSO_4 = 233 gmol^{-1}$)

A. $1.08 \times 10^{-14} mol^2 L^{-2}$

B. $1.08 \times 10^{-12} mol^2 L^{-2}$

C. $1.08 \times 10^{-10} mol^2 L^{-2}$

D. $1.08 \times 10^{-8} mol^2 L^{-2}$

Answer: C



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4. pH of saturated solution of $Ca(OH)_2$ is 9. The solubility product (K_{sp}) of $Ca(OH)_2$

A. 0.5×10^{-15}

B. 0.25×10^{-10}

C. 0.125×10^{-15}

D. 0.5×10^{-10}

Answer: A



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5. Conjugate base of Bronsted acids H_2O and HF are

A. OH^- and H_2FH^+ , respectively

B. H_3O^+ and F^- , respectively

C. OH^- and F^- , respectively

D. H_3O^+ and H_2F^+ , respectively

Answer: C



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6. Which will make basic buffer?

A. 50mL of 0.1M NaOH + 25mL of
 $0.1\text{M CH}_3\text{COOH}$

B. 100mL of $0.1\text{M CH}_3\text{COOH}$ + 100mL of
 $0.1\text{M NH}_4\text{OH}$

C. 100mL of 0.1M HCl + 200mL of
 $0.1\text{M NH}_4\text{OH}$

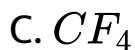
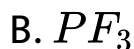
D. 100mL of 0.1M HCl + 100mL of
 0.1M NaOH

Answer: C



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7. Which of the following fluoro- compounds is most likely to behave as a Lewis base ?

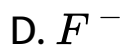
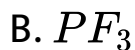
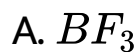


Answer: B



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8. Which of these is not likely to act as Lewis base?

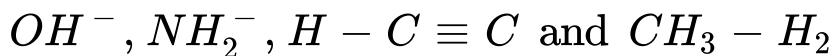


Answer: A

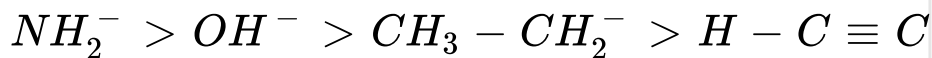


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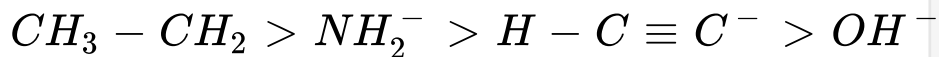
9. What is the decreasing order of strength of bases?



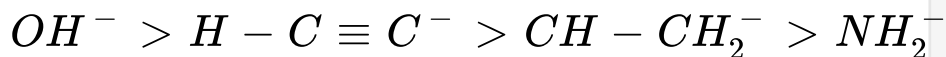
B.



C.



D.



Answer: C



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10. The aqueous solutions of sodium formate, anilinium chloride and potassium cyanide are

respectively

- A. acidic, acidic, basic
- B. basic, acidic, basic
- C. basic, neutral, basic
- D. none of these

Answer: B



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11. The percentage of pyridine (C_5H_5NH) that forms pyridinium ion (C_5H_5NH) in a 0.10M aqueous

pyridine solutions

(K_b for $C_5H_5N = 1.7 \times 10^{-9}$) is

A. 0.006 %

B. 0.013 %

C. 0.77 %

D. 1.6 %

Answer: B



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12. Equal volumes of three acid solutions of pH

1, 2 and 3 are mixed in a vessel, What will be the H^+

ion concentration in the mixture?

A. 3.7×10^{-2}

B. 10^{-6}

C. 0.111

D. none of these

Answer: A



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13. The solubility of $AgCl(s)$ with solubility product

1.6×10^{-10} in 0.1M NaCl solution would be

A. $1.26 \times 10^{-5} M$

B. $1.6 \times 10^{-9} M$

C. $1.6 \times 10^{-11} M$

D. Zero

Answer: B



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14. If the solubility product of lead iodide is 3.2×10^{-8} , its solubility will be

A. $2 \times 10^{-3} M$

B. $4 \times 10^{-4} M$

C. $1.6 \times 10^{-5} M$

D. $1.8 \times 10^{-5} M$

Answer: A



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15. Using Gibb's free energy change, $\Delta G^\circ = 57.34 kJ mol^{-1}$, for the reaction, $X_2Y_{(s)} \rightleftharpoons 2X^+ + Y_{(aq)}^{2-}$ calculate the solubility product of X_2Y in water at 300 K ($R = 8.3 JK^{-1} Mol^{-1}$)

A. 10^{-10}

B. 10^{-12}

C. 10^{-14}

D. can not calculated from the given data.

Answer: A



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16. MY and NY_3 , are insoluble salts and have the same K_{sp} value of 6.2×10^{-13} at room temperature.

Which statement would be true with regard to MY and NY_3 ?

- A. The salts MY and NY_3 are more soluble in 0.5 M KY than in pure water.
- B. The addition of the salt of KY to the suspension of MY and NY_3 will have no effect on their solubility's
- C. The molar solubility of MY and NY_3 in water are identical
- D. The molar solubility of MY in water is less than that of NY_3

Answer: D



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17. What is the PH of the resulting solutions when equal volumes of 0.1 M NaOH and 0.01M HCl are mixed?

A. 2.0

B. 3

C. 7.0

D. 12.65

Answer: D



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18. The dissociation constant of a weak acid is 1×10^{-3} . In order to prepare a buffer solution and with a $pH = 4$, the $[Acid] / [Salt]$ ratio should be

A. 4:3

B. 3:4

C. 10:1

D. 1:10

Answer: D



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19. The pH of 10^{-5} M KOH solution will be

A. 9

B. 5

C. 19

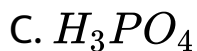
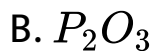
D. none of these

Answer: A



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20. $H_2PO_4^-$ the conjugate base of



Answer: C



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21. Which of the following can act as Lowery-Bronsted and well as base?





Answer: C



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22. The pH of an aqueous solution is Zero. The solution is

A. slightly acidic

B. strongly acidic

C. neutral

D. basic

Answer: B



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23. The hydrogen ion concentration of a buffer solution consisting of a weak acid and its salts is given by

A. $[H^+] = \frac{K_a[\text{acid}]}{[\text{salt}]}$

B. $[H^+] = K_a[\text{salt}]$

$$C. [H^+] = K_a[\text{acid}]$$

$$D. [H^+] = \frac{K_a[\text{acid}]}{[\text{salt}]}$$

Answer: A

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24. Which of the following relation is correct for degree of hydrolysis of ammonium acetate?

$$A. h = \sqrt{\frac{K_h}{C}}$$

$$B. h = \sqrt{\frac{K_a}{K_b}}$$

$$C. h = \left(\frac{K_a}{K_e \cdot K_b} \right)$$

$$D. h = \left(\frac{K_a \cdot K_b}{K_b} \right)$$

Answer: C



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25. Dissociation constant of NH_4OH is 1.8×10^{-5}

the hydrolysis constant of NH_4Cl would be

A. 1.8×10^{-19}

B. 5.55×10^{-10}

C. 5.55×10^{-5}

D. 1.80×10^{-5}

Answer: B



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Exercise Answer The Following Questions

1. What are Lewis acids and bases? Give two example for each.



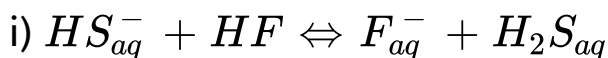
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2. Discuss the Lowery - Bronsted concept of acids and bases.



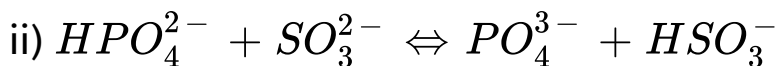
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3. Identify the conjugate acid base pair for the following reaction in aqueous solution.



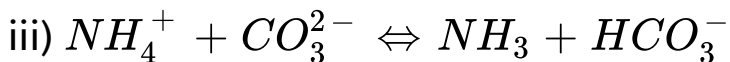
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4. Identify the conjugate acid base pair for the following reaction in aqueous solution.



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5. Identify the conjugate acid base pair for the following reaction in aqueous solution.



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6. Account for the acidic nature of HClO_4 . In terms of Bronsted - Lowry theory, identify its conjugate base.



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7. When aqueous ammonia is added to $CuSO_4$ solution, the solution turns deep blue due to the formation of tetramminecopper (II) complex, $[Cu(H_2O)_4]_{aq}^{2+} + 4NH_3(aq) \rightleftharpoons [Cu(NH_3)_4]_{aq}^{2+}$, among H_2O and NH_3 Which is stronger Lewis base.



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8. The concentration of hydroxide ion in a water sample is found to be $2.5 \times 10^{-6} M$. Identify the nature of the solution.



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9. A lab assistant prepared a solution by adding a calculated quantity of HCl gas $25^{\circ}C$ to get a solution with $[H_3O^+] = 4 \times 10^{-5}M$. Is the solution neutral (or) acidic (or) basic.



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10. Calculate the pH of 0.04 M HNO_3 Solution.



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11. (i) Define solubility product.

(ii) What is the pH of an aqueous solution obtained

by mixing 6 gram of acetic acid and 8.2 gram of sodium acetate and making the volume equal to 500 ml. (Given: K_a for acetic acid is 1.8×10^{-5})

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12. Define the ionic product of water. Give its value at room temperature.

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13. Explain common ion effect with an example.

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14. State Ostwald's dilution law.

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15. Define pH.

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16. Calculate the pH of 1.5×10^{-3} M solution of $Ba(OH)_2$.

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17. 50 ml of 0.05 M HNO_3 is added to 50 ml of 0.025 M KOH . Calculate the pH of the resultant solution.



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18. The K_a value for HCN is 10^{-9} . What is the pH of 0.5 M HCN solution ?



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19. Calculate the extent of hydrolysis and the pH of 0.1 M ammonium acetate. Given that

$$K_a = K_b = 1.8 \times 10^{-3}.$$



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20. Derive an expression for the hydrolysis constant and degree of hydrolysis of salty of strong acid and weak base.



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21. Solubility product of Ag_2CrO_4 is 1×10^{-12} What is the solubility of Ag_2CrO_4 in 0.01 M $AgNO_3$ solution?



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22. Write the expression for the solubility product of $Ca_3(PO_4)_2$.



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23. A saturated solution, prepared by dissolving $CaF_2(s)$ in water, has $[Ca^{2+}] = 3.3 \times 10^{-4} M$.
What is the K_{sp} of CaF_2 ?



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24. K_{sp} of $AgCl$ is 1.8×10^{-10} . Calculate molar solubility in 1M $AgNO_3$.

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25. A particular saturated solution of silver chromate Ag_2CrO_4 has

$$[Ag^+] = 5 \times 10^{-5} \text{ and } [CrO_4]^{2-} = 4.4 \times 10^{-4} M$$

. What is the value of K_{sp} for Ag_2CrO_4 ?

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26. Write the expression for the solubility product of



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27. K_{sp} of Ag_2CrO_4 is 1.1×10^{-12} . What is solubility of Ag_2CrO_4 in $\otimes .1MK_2CrO_4$.



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28. Will a precipitate be formed when 0.150L of 0.1MPb(NO₃)₂ and 0.100L of 0.2M NaCl are mixed ? $K_{sp}(PbCl_2) = 1.2 \times 10^{-5}$.



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29. K_{sp} of $Al(OH)_3$ is $1 \times 10^{-15} M$. At what pH does $1.0 \times 10^{-3} M Al^{3+}$ precipitate on the addition of buffer of NH_4Cl and NH_4OH solution.

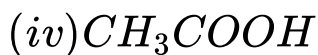
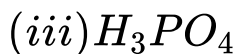
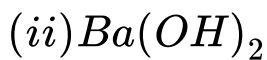


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Exercise Evaluate Yourself

1. Classify the following as acid (or) base using Arrhenius concept

(i) HNO_3



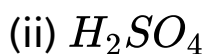
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2. Write a balanced equation for the dissociation of the following in water and identify the conjugate acid - base pairs.



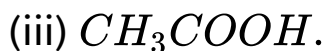
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3. Write a balanced equation for the dissociation of the following in water and identify the conjugate acid - base pairs.



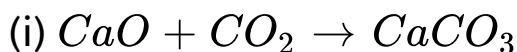
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4. Write a balanced equation for the dissociation of the following in water and identify the conjugate acid - base pairs.



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5. Identify the Lewis acid and the Lewis base in the following reactions.



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6. Identify the Lewis acid and the Lewis base in the following reactions.



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7. H_3BO_3 accepts hydroxide ion from water as shown below

$H_3BO_3(aq) + H_2O(l) \rightleftharpoons B(OH)_4^- + H^+$ Predict the nature of H_3BO_3 using Lewis concept.



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8. At a particular temperature, the K_w of a neutral solution was equal to 4×10^{-14} . Calculate the concentration of $[H_3O^+]$ and $[OH^-]$.



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9. a) Calculate pH of $10^{-8} M H_2SO_4$

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10. b) Calculate the concentration of hydrogen ion in moles per litre of a solution whose pH is 5.4

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11. c) Calculate the pH of an aqueous solution obtained by mixing 50 ml of 0.2 M HCl with 50ml 0.1M $NaOH$.

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12. K_b for NH_4OH is 1.8×10^{-5} . Calculate the percentage of ionisation of $0.06M$ ammonium hydroxide solution.

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13. a) Explain the buffer action in a basic buffer containing equimolar ammonium hydroxide and ammonium chloride.

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14. b) Calculate the pH of a buffer solution consisting of $0.04MCH_3COOH$ and $0.4MCH_3COONa$.

What is the change in the pH after adding 0.01 mol of HCl to 500 ml of the above buffer solution.

Assume that the addition of HCl causes negligible change in the volume . Given ($K_s = 1.8 \times 10^{-5}$).



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15. (a) How can you prepare a buffer solution of pH 9.

you are provided with 0.1 M NH_4OH solution and

ammonium chloride crystals. (Given : pK_b for

NH_4OH is 4.7 at $25^\circ C$).



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16. (b) What volume of 0.6 M sodium formate solution is required to prepare a buffer solution is required to prepare a buffer solution of pH 4.0 by mixing it with 100 ml of 0.8 M formic acid . (Given pK_a for formic acid is 3.75).

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17. Calculate the

i) Hydrolysis constant,

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18. Calculate the

ii) degree of hydrolysis and



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19. Calculate the

iii) pH of 0.05 M sodium carbonate solution pK_a for

HCO_3^- is 10.26.



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Mcqs Additional Questions And Answers

1. Which one among the following is the strongest Bronsted base.

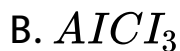


Answer: D



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2. Which of the following is not a Lewis acid?



Answer: D



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3. Analyses the equilibrium



A. H_3O^+ is the conjugate base of H_2O

B. ClO_4^- is the conjugate base of HClO_4

C. H_2O is the conjugate acid of H_3O^+

D. HClO_4 is the conjugate acid of H_3O^+

Answer: B

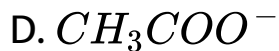


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4. Pick the strongest conjugate base among the following

A. Cl^-

B. NO_2^-



Answer: D



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5. Pick out the incorrect statement regarding Lewis acids and bases.

A. A Lewis acid is a electron deficient molecule

B. Lewis bases is one which an electron pair

C. Lewis base is cation.

D. Both (a) and (c)

Answer: C

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6. Pick the odd one out



Answer: C



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7. With regard to the strength of acids and bases.

Find the incorrect statement among the following.

A. Strong acid is one that completely dissociates

in water

B. K_4 is the dissociation constant

C. CH_3COOH is a weak acid

D. Smaller the K_4 value, greater is the acid

strength

Answer: D



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8. K_w represents

A. ionic product constant of water

B. Solubility product of water

C. Equilibrium constant of water

D. Buffer index

Answer: A



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9. HCl is a strong acid since

A. It can be easily oxidised

B. It can be easily ionised

C. It dissociates completely to give H^+ ions in solution

D. Both (a) and (b)

Answer: C



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10. The conjugate base of NH_2^- is



Answer: D



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11. Ionic product of water increases when

A. Pressure decreases

B. H^+ ions are added

C. OH^- ions are added

D. temperature increases`

Answer: D



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12. For two acids A and B, K_a values at $25^\circ C$ are 2×10^6 and 1.8×10^{-4} respectively. Which among the following is true with respect to the above data.

A. A and B are equally acidic

B. A is stronger than B

C. B is stronger than A

D. K_a value is not a measure of acid strength

Answer: B



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13. An aqueous solution with pH value zero is

A. acidic

B. basic

C. amphoteric

D. neutral

Answer: A



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14. Which among the following has the highest pH?

A. $1M \text{ } NH_4OH$

B. $1M \text{ } HCl$

C. $1M \text{ } NaOH$

D. $0.1M \text{ } NaOH$

Answer: C



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15. The pH of pure water at $25^{\circ}C$ is

A. 0

B. 1

C. 7

D. 14

Answer: C



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16. The relationship between degree of dissociation of a weak acid and its dissociation constant in a very dilute solution is

A. $K_a = \alpha^2 C$

B. $K_a = \frac{\alpha^2 C}{(1 + \alpha)}$

C. $K_a = \frac{\alpha^2}{(1 - \alpha)C}$

D. $K_a = \frac{\alpha}{C(1 - \alpha)}$

Answer: A



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17. Degree of dissociation α is

A. $\alpha = \frac{K_a}{C}$

B. $\alpha = \frac{C^2}{K_a}$

C. $\alpha = \sqrt{\frac{K_a}{C}}$

D. $\alpha = \sqrt{\frac{C}{K_a}}$

Answer: C



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18. Addition of sodium chloride to a saturated solution of silver chloride.

- A. dissociation of $AgCl$ increases
- B. concentration of Cl^- decreases
- C. dissociation of $AgCl^-$ decreases
- D. concentration of Ag^+ increases

Answer: C



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19. pH of buffer depends upon concentration of

- A. acid (H^+)
- B. Conjugate base (OH^-)

C. Salt

D. Both (a) and (b)

Answer: D



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20. An example of basic buffer is

A. NH_4OH and NH_4Cl

B. NH_4OH and $NaOH$

C. $NaOH$ and NH_4Cl

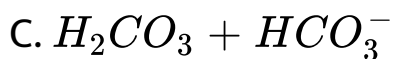
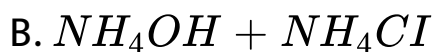
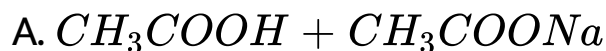
D. $NaOH$ and KOH

Answer: A



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21. The buffer present in human blood is



D. Both (a) and (b)

Answer: C



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22. Buffer index is

A. $B\eta = \frac{dB}{pK_a}$

B. $B\eta = \frac{dB}{d(pH)}$

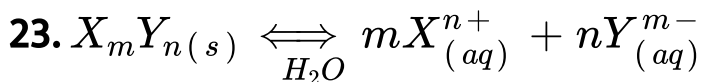
C. $B\eta = \frac{dB}{pH}$

D. $B\eta = \frac{dB}{pOH}$

Answer: B



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solubility product K_{sp} is

A. $[X^{n+}]^m [Y^{m-}]^n$

B. $[X^{n+}] [Y^{m-}]$

C. $[X^{n+}]^m / [Y^{m-}]^n$

D. $[X^{n+}] / [Y^{m-}]$

Answer: A



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24. The condition for a compound to be precipitated is

- A. Ionic product = solubility product
- B. Ionic product $<$ solubility product
- C. Ionic product $>$ solubility product
- D. Ionic product \leq solubility product

Answer: C



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25. Which among the following is incorrect regarding acid?

- A. It produces H^+ ions in aqueous solution
- B. It can donate a proton to another substance
- C. It can accept a proton from another substance
- D. It accepts a pair of electrons.

Answer: C



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26. Degree of dissociation is nearly equal to 1 for

A. Strong acids and strong bases

B. Strong acids and weak bases

C. Weak acids and strong bases

D. Weak acids and weak bases

Answer: A



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27. When sodium acetate is added acid, the degree of ionisation of acetic acid

A. increases

B. decreases

C. does not change

D. becomes zero

Answer: B



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28. NH_4OH is a weak base because

A. it has low vapour pressure

B. it is only partially ionised

C. it is completely ionised

D. it has low density

Answer: B



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29. Which one of the following formula represents Ostwald's dilution law for a binary whose degree of dissociation is α and concentration C .

A. $K = \frac{(1 - \alpha)C}{\alpha}$

B. $K = \frac{\alpha^2 C}{1 - \alpha}$

C. $K = \frac{(1 - \alpha)C}{\alpha^2}$

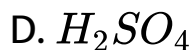
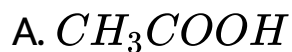
$$D. K = \frac{\alpha^2 C}{(1 - \alpha)C}$$

Answer: B



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30. Ostwald's dilution law is applicable in the case of the solution of



Answer: A



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31. Which one of the following relationship is correct ?

A. $pH = \frac{1}{[H^+]}$

B. $pH = \log_{10} [H^+]$

C. $\log_{10} pH = [H^+]$

D. $pH = \log_{10} \cdot \frac{10}{[H^+]}$

Answer: D





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32. When 10^{-6} mole of a monobasic strong acid is dissolved in one litre of solvent, the pH of the solution is

A. 6

B. 7

C. less than 6

D. more than 7

Answer: A



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33. When pH of a solution is 2, the hydrogen ion concentration in moles litre⁻¹ is

A. 1×10^{-12}

B. 1×10^{-2}

C. 1×10^{-7}

D. 1×10^{-4}

Answer: B



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34. The pH of a solution containing 0.1 N NaOH solution is

A. 1

B. 10^{-1}

C. 13

D. 10^{-13}

Answer: C



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35. A solution which is resistant to changes of pH on addition of small amounts of an acid or a base is known as

- A. buffer solution
- B. true solution
- C. isohydric solution
- D. ideal solution

Answer: A



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36. The hydrogen ion concentration of a buffer solution consisting of a weak acid and its salts is given by

A. $[H^+] = K_a \frac{[\text{Acid}]}{[\text{Salt}]}$

B. $[H^+] = K_a[\text{salt}]$

C. $[H^+] = K_a[\text{acid}]$

D. $[H^+] = \frac{K_a[\text{salt}]}{[\text{Acid}]}$

Answer: A



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Exercise Assertion Reason

1. Assertion : HNO_3 is a strong acid.

Reason : HNO_3 is completely ionised in solution and so has high K_a value

- A. (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true but (R) does not explain (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: A



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2. Assertion : According to Bronsted concept, H_2O is an a neutral substance.

Reason : H_2O molecules can accept as well as donate a proton .

A. (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) does not explain (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A



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3. Assertion : pH of acetic acid decreases with dilution.

Reason : On dilution, degree of ionisation of acetic acid decreases.

A. (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) does not explain (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D



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4. Assertion : A solution containing acetic acid and sodium acetate acts as a buffer solution.

Reason : The pH of the above buffer would be equal to pK_a of acetic acid.

A. (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) does not explain (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: B



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5. Assertion : Solubility of AgCl in water decreases in the presence of NaCl .

Reason : Sodium chloride under goes hydrolysis in water.

- A. (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true but (R) does not explain (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: B



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6. Assertion : The dissociation of acetic acid decreases on addition of sodium acetate.

Reason : It is due to common ion effect.

A. (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) does not explain (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A



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7. Assertion : Ostwald's dilution law is $K_a = \frac{\alpha^2 C}{1 - \alpha}$

Reason : Ostwald's dilution law is applicable only to strong electrolyte.

- A. (A) and (R) are true and (R) is the correct explanation of (A)
- B. Both (A) and (R) are true but (R) does not explain (A)
- C. (A) is true but (R) is false
- D. Both (A) and (R) are false

Answer: C



8. Assertion : K_w increases with increase in temperature.

Reason : Concentration of H_3O^+ and OH^- increases.

A. (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) does not explain (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A



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9. Assertion : In the reaction , $I_2 + I^- \rightarrow I_3^-$, I_2 acts as a Lewis base.

Reason : In this reaction I_2 donates a electron pair to I^- .

A. (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) does not explain (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: D



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10. Assertion : BF_3 is a Lewis acid.

Reason : It accepts a pair of electrons due to the presence of vacant orbital in the valence shell of boron.

A. (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) does not explain (A)

C. (A) is true but (R) is false

D. Both (A) and (R) are false

Answer: A



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Exercise Very Short Answer

1. What are the limitations of Arrhenius concept?

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2. Define Buffer solution.

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3. What are the two types of buffer? Give an example for each.

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4. Define neutralisation reaction.

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5. Give a condition for a compound to be precipitated.

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6. When temperature is increased, will ionic product of water increase or decrease? Give reason to justify your answer.

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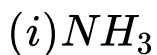
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7. Magnesium is not precipitated from a solution of its salt by a mixture of NH_4OH and NH_4Cl . Explain.



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8. Write down the conjugate acid and base of the following



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9. BF_3 is termed as an acid though it does not contain H^+ ions. Explain .



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10. The K_w of neutral solution is 10^{-12} at a particular temperature. What are its pH and pOH values?



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11. Calculate the ionisation constant for the conjugate base of HF. Ionisation constant of HF at

298K is 6.8×10^{-4} .

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12. How is common ion effect related to the solubility of the electrolyte?

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13. Why is aqueous solution of $FeCl_3$ acidic?

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14. What are the limitations of Ostwald's dilution law?

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15. Define pH.

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16. What are the two types of buffer? Give an example for each.

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Exercise Short Answer

1. Based on Arrhenius concept, define acid and bases and give an example for each.



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2. What do you mean by auto ionisation of water?



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3. Buffer index is



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4. How will you calculate solubility product from molar solubility ?

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5. For an aqueous solution of NH_4Cl , prove that

$$[H^+] = \sqrt{K_a \cdot C}$$

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6. What is Henderson equation ?

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7. What do you mean by buffer action?

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Exercise Long Answer

1. (i) Derive the relation between pH and pOH

(ii) Give three uses of emulsions.

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2. Explain buffer action with example.



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3. Derive Henderson - Hassel Balch equation.



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4. On hydrolysis of salts of strong acid and strong base, the solution obtained is neutral. Justify your answer with a suitable example.



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5. Derive an expression for the hydrolysis constant for the hydrolysis of salt of weak acid and weak base.



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6. Derive the hydrolysis constant for the hydrolysis of salt of strong base and weak acid. Deduce its pH.



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Exercise Problems For Practice

1. The hydrogen ion concentration of a fruit juice is $3.3 \times 10^{-2} M$. What is the pH of the juice ? Is it acidic or basic ?



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2. Calculate the pH of a buffer containing 0.08 mole of acetic acid and 0.12 mole of sodium acetate per dm_2 of the solution. The ionisation constant of acetic acid is 1.8×10^{-5} .



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3. Calculate the pH of 0.1 M CH_3COOH solution.

Dissociation constant of acetic acid is $1.8 \times 10^{-5} M$.

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4. Calculate the pH of 0.1 M acetic acid if its ionisation constant $K_a = 1.8 \times 10^{-5}$.

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5. pH of a solution is 5.5 at $25^\circ C$. Calculate its

$[OH^-]$

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6. Calculate the pH of solution with H_3O^+ concentration in mol dm^{-3} .

(i) 10^{-4}

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7. Calculate the pH of solution with H_3O^+ concentration in mol dm^{-3} .

(ii) 10^{-7}

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8. Calculate the pH of solution with H_3O^+ concentration in mol dm^{-3} .

(iii) 6.8×10^{-3}



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9. Calculate the pH of solution with H_3O^+ concentration in mol dm^{-3} .

(iv) 3.2×10^{-5}



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10. Calculate the pH of solution with H_3O^+ concentration in mol dm^{-3} .

(v) 0.035



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11. Calculate the pH of solution with H_3O^+ concentration in mol dm^{-3} .

(vi) 0.25



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12. Calculate the pH of solution with H_3O^+ concentration in mol dm^{-3} .

(vii) 5.4×10^{-9}



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13. Calculate the pH of solution with H_3O^+ concentration in mol dm^{-3} .

(viii) 7.1×10^{-7}



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14. Calculate the pH of 0.02 m $Ba(OH)_2$ aqueous solution assuming $Ba(OH)_2$ as a strong electrolyte.

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15. The ionisation constant of 0.2 M formic acid is 1.8×10^{-4} . Calculate its percentage ionisation.

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16. Calculate the pH of 0.001 M HCl solution

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17. Calculate the pH of a buffer mixture which contains 7.5 gms of acetic acid and 10.25 gms of sodium acetate in 1 litre of the solution. K_a for acetic acid is 1.8×10^{-5} .



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18. If a solution has a pH of 7.41, determine its H^+ concentration.



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19. Calculate the pH of 0.02 M HCl.



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20. The degree of dissociation of acetic acid in 0.1 M solution is 0.04 . Calculate K_a for acetic acid. Where α is the degree of dissociation, C is the concentration of the acid in moles/ lit.



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21. Calculate the K_b for ammonium hydroxide given its degree of dissociation to be 0.042 in 0.01 N solution.



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22. A 0.02 M solution of a weak mono basic acid is 5% ionised. Calculate the ionisation constant of the acid.



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23. Calculate the hydrogen ion concentration from the following pH value :

(i) 5.5



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24. Calculate the hydrogen ion concentration from the following pH value :

(ii) 8.6 and



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25. Calculate the hydrogen ion concentration from the following pH value :

(iii) 3.2



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26. A buffer solution containing 0.1 mole of ammonium hydroxide and 0.15 mole of ammonium chloride per litre of the solution. Calculate the pH of the buffer solution. K_b for ammonium hydroxide is 1.8×10^{-5} .



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27. Calculate the pH of 0.01 M NaOH.



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28. Calculate the pH of $0.1M NH_4OH$ if

$$K_b = 1.75 \times 10^{-5}.$$



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Exercise Unit Test

1. The solubility of $AgCl(s)$ with solubility product

1.6×10^{-10} in $0.1M NaCl$ solution would be

A. $1.26 \times 10^{-5} M$

B. $1.6 \times 10^{-9} M$

C. $1.6 \times 10^{-11} M$

D. Zero

Answer: B

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2. Concentration of the Ag^+ ions in a saturated solution of $Ag_2C_2O_4$ is $2.24 \times 10^{-4} mol L^{-1}$
solubility product of $Ag_2C_2O_4$ is

A. $2.42 \times 10^{-8} mol^3 L^{-3}$

B. $2.66 \times 10^{-12} mol^3 L^{-3}$

C. $4.5 \times 10^{-11} mol^3 L^{-3}$

$$D. 5.619 \times 10^{-12} \text{ mol}^3 \text{ L}^{-3}$$

Answer: D

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3. Assertion : The dissociation of acetic acid decreases on addition of sodium acetate.

Reason : It is due to common ion effect.

A. (A) and (R) are correct and (R) explains (A)

B. (A) and (R) are correct but (R) does not explain (A)

C. (A) is correct but (R) is wrong

D. Both (A) and (R) are false.

Answer: A



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4. The hydrogen ion concentration of a buffer solution consisting of a weak acid and its salts is given by

$$\text{A. } [H^+] = \frac{K_a[\text{acid}]}{[\text{salt}]}$$

$$\text{B. } [H^+] = K_a[\text{salt}]$$

$$C. [H^+] = K_a[\text{acid}]$$

$$D. [H^+] = \frac{K_a[\text{salt}]}{[\text{acid}]}$$

Answer: A



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Exercise Short Answer

1. How will you calculate solubility product from molar solubility?



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1. State Ostwald's dilution law.



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