CHEMISTRY

BOOKS - S DINESH & CO CHEMISTRY (HINGLISH)

IONIC EQUILIBRIUM

Acid-Base Equilibria

1. An aqueous solution of acid is characterised by the presence of

A. H^{+} ions

B. H_2^{+} ions

C. H_4O^{+} ions

D. H_3O^{+} ions

Answer: D

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2. If ammonia is added to pure water, the concentration of a chemical species already present will decrease. The species is

A. O^{2-}

B. OH^{-}

C. H_3O^{+}

D. H_2O

Answer: C

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3. Which of the following represents the conjugate pair of NH_3?

A. $\ddot{N}H_2^-$

B. NH_4^+

C. Both (A) and (B)

D. N^{3-}

Answer: C

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4. One of the following is a Bronsted acid but not a Bronsted base

A. H_2S

B. H_2O

C. HCO_3^-

D. NH_3

Answer: A

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5. The Bronsted acid which gives the weakest conjugated base is

A. HF

B. H_2S

C. HCl

D. H_2O

Answer: C

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6. Which equilibrium can be described as an acid-base reaction using the Lewis acid-base definition but not using Bronsted and Lowry concept ?

A. $NH_3 + CH_3COOH \Leftrightarrow CH_3COO^- + NH_4^+$

B. $H_2O + CH_3COOH \Leftrightarrow CH_3COO^- + H_2O^+$

C. $4NH_3 + Cu^{2+} \Leftrightarrow \left[Cu\left(NH_3\right)_4\right]^{2+}$

D. $HCl + CH_3COOH \Leftrightarrow CH_3COO^+H_2 + Cl^-$

Answer: C

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7. According to the Lewis acid - base concept

A. species in which all atoms have completed their octets is an acid

B. negatively charged ions are acids

C. molecule in which a central atom has vacnt d-orbitals available act as an acid

D. all positively charged ions are acids.

Answer: C

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8. Which of the following is a Lewis acid ?

A. H_2O

B. $SnCl_4$

C. C_2H_5OH

D. Cl^-

Answer: B

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9. Which of the following can act both as a Bronsted acid and a Bronsted base?

A. O^{2-}

B. HCl

C. HSO_4^-

D. Na_2CO_3

Answer: C

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10. Which of the following is not a Lewis base ?

A. CN^{-}

B. ROH

C. NH_3

D. $AlCl_3$

Answer: D

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11. Conjugate base of $\overset{\Theta}{OH}$ is

A. H_2O

B. H_3O^+

C. H^+

D. O^{2-}

Answer: D

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12. In which of the following reactions does NH_3 act as acid

A. $NH_3 + HCl \rightarrow NH_4Cl$

B. $NH_3 + H^+ \rightarrow NH_4^+$

C. $NH_3 + Na \rightarrow NaNH_2 + \frac{1}{2}H_2$

D. NH_3 cannot act as acid.

Answer: C

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13. Conjugate base of a strong acid is

A. a weak base

B. a strong base

C. neutral

D. a weak acid

Answer: A

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14. In the reaction

$HNO_3 + H_2O \Leftrightarrow H_2O^+ + NO_3^-$

the conjugate base of HNO_3 is

A. H_2O

B. H_3O^+

C. NO_3^-

D. unpredictable

Answer: C

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15. Which of the following substance in an Arrhenius Base but not the Bronsted base ?

A. $NaOH(s)$

B. CO_3^{2-}

C. NH_3

D. H_2O

Answer: A

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16. Which species among the following is a Lewis acid but is not a Bronsted acid ?

A. HCl

B. BF_3

C. NH_2

D. O^{2-}

Answer: B

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17. The conjugate bas of hydrazoic acid is

A. HN_3^-

B. N_2^-

C. N_3^{-1}

D. N^{-3}

Answer: C

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18. HCl base not behave as acid in

A. NH_3

B. C_6H_6

C. H_2O

D. C_2H_5OH

Answer: B

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19. The decreasing order of strength of the bases, $OH^-, NH_2^-, H-C\equiv C^-$ and $CH_3-CH_2^-$:

A. $CH_3CH_2^- > NH_2^- > H-C \equiv C^- > OH^-$

B. $H-C \equiv C^- > CH_3-CH_2^- > NH_2^- > OH^-$

C. $OH^- > NH_2^- > H-C \equiv C^- > CH_3CH_2^-$

D. $NH_2^- > H-C \equiv C^- > OH^- CH_3CH_2^-$

Answer: A

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COMMON ION EFFECT/SOLUBILITY PRODUCT

1. Which of the following will suppress the ionisation of acetic acid in aqueous solution ?

A. $NaCl$

B. HCl

C. KCl

D. unpredictable

Answer: B

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2. Let the solubilities of $AgCl$ in H_2O, and in $0.01MCaCl_2$, $0.01MNaCl$, and $0.05MAgNO_3$ be S_1, S_2, S_3, S_4, respectively. What is the correct relationship between these quantities.

A. $S_1 > S_2 > S_3 > S_4$

B. $S_1 > S_2 = S_3 > S_4$

C. $S_1 > S_3 > S_2 > S_4$

D. $S_4 > S_2 > S_3 > S_1$

Answer: C

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3. Which of the following metal sulphides has maximum solubility in water?

A. $CdS\left(K_{sp} = 36 \times 10^{-30}\right)$

B. $FeS\left(K_{sp} = 11 \times 10^{20}\right)$

C. $HgS\left(K_{sp} = 32 \times 10^{-54}\right)$

D. $ZnS\left(K_{sp} = 11 \times 10^{-22}\right)$

Answer: B

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4. NH_4OH is weak base but it becomes still weaker in the aqueous solutions of

A. 0.1 M HCl

B. 0.1 M NH_4Cl

C. 0.1 M H_2SO_4

D. 0.1 M CH_3COOH.

Answer: B

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5. The addition of NaCl to AgCl decreases the solubility of AgCl because

A. Solubility product decreases

B. Solubility product remains constant

C. Solution becomes unsaturated

D. Solution becomes supersaturated

Answer: D

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6. When HCl gas is passed through a saturated solution of common salt, pure NaCl is precipitated because

A. HCl is highly soluble in water

B. The ionic product $[Na]^{+}\left[Cl^{-}\right]$ becomes greater than the K_{sp}

C. The K_{sp} in NaCl is lowered by Cl^{-}

D. HCl cause precipitation

Answer: B

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7. In the third group of qualitive analysis, the precipitating reagent is NH_4Cl/NH_4OH. The function of NH_4Cl is to

A. Increase the ionisation of NH_4OH

B. Suppress the ionisation of NH_4OH

C. Convert the ions of group third into their respective chlorides

D. Stabilise the hydroxides of group third cations.

Answer: B

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8. The ionic product of an ionic solid

A. It is always equal to its solubility product

B. Can be $<$ or equal to K_{sp}

C. Always $< K_{sp}$

D. Can be $<$, equal to or $> K_{sp}$

Answer: D

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9. For the precipitation of cations of group four in the qualitative analysis, the medium is made alkaline before passing H_2S gas. The purpose of alkaline solution is

A. to supress the ionisation of H_2S

B. to increase the ionisation of H_2S

C. to increase the ionisation of metal salt

D. to decrease the ionisation of metal salt.

Answer: B

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10. If the solubility of Ag_2CrO_4 is S mol/L, its solubility product will be

A. S^2

B. S^3

C. $4S^3$

D. $2S^3$

Answer: C

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11. The solubility product of $Al_2(SO_4)_3$ is given by the expression.

A. $[Al^{3+}][SO_4^{2-}]$

B. $[Al^{3+}]^2[SO_4^{2-}]$

C. $[Al^{3+}]^3[SO_4^{2-}]^2$

D. $[Al^{3+}]^2[SO_4^{2-}]^3$

Answer: D

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12. When the ionic product of a solution exceeds the solubility product, the solution becomes

A. saturated

B. unsaturated

C. a colloid

D. supersaturated and precipitation of salt occurs.

Answer: D

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13. The solubility of calomel in water at $25^{\circ}C$ is x mole / litre. Its solubility product is

A. $4x^3$

B. $12x^3$

C. $108x^5$

D. x^2

Answer: A

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14. The addition of HCl will not suppress the ionisation of

A. acetic acid

B. H_2S

C. benzoic acid

D. sulphuric acid.

Answer: D

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15. Which pair will show common ion effect ?

A. $BaCl_2 + Ba(NO_3)_2$

B. $NaCl + HCl$

C. $NH_4OH + NH_4Cl$

D. $AgCN + KCN$

Answer: C

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Ionic Product of Water / pH-Concept

1. The units of ionic product of water (K_w) are

A. $mol^{-1}L^{-1}$

B. $mol^{-2}L^{-2}$

C. $mol^{-2}L^{-1}$

D. $mol^{2}L^{-2}$

Answer: D

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2. The value of pK_w of water

A. increases with increase in temperature

B. decreases with rise in temperature

C. does not change with variation in temperature

D. increases till $50^\circ C$ and there after decreases.

Answer: B

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3. The pH value of $0.001M$ aqueous solution of $NaCI$ is

A. 7

B. 4

C. 11

D. unpredictable

Answer: A

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4. In 0.02 M solution of perchlorid acid $(HClO_4)$ at 298 K the sum of pH and pOH is equal to

A. 14

B. 7

C. between 6 and 7

D. cannot be predicted

Answer: A

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5. The pH of pure water at $80^{\circ} C$ will be

A. > 7

B. < 7

C. $= 7$

D. cannot be predicted

Answer: B

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6. In a neutral solution

A. H_3O^+ ions are not present

B. OH^- ions are not present

C. Both H_3O^+ ions and OH^- ions are not present

D. Both H_3O^+ ions and OH^- ions are present in small but equal concentration.

Answer: D

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7. The addition of $FeCl_3$ to water

A. decreases the value of K_w

B. increases the value of K_w

C. has no effect on the value of K_w

D. gives rise to a basic solution.

Answer: C

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8. Assuming H_2SO_4 to be completely ionised the pH of a $0.05M$ aqueous of sulphuric acid is approximately

A. 0.01

B. 0.005

C. 2

D. 1

Answer: D

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9. The pH value of 0.02 M HCl is

A. Less than 6

B. $6 - 7$

C. 8

D. 2

Answer: D

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10. At a certain temperature the value of pK_w is 13.4 and the measured pH of soln is 7. The solution is

A. acidic

B. basic

C. neutral

D. unpredictable

Answer: B

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11. Which of the following will have the highest pH?

A. $\frac{M}{10}HCl$

B. $\frac{M}{100}HCl$

C. $\frac{M}{10}NaOH$

D. $\frac{M}{100}NaOH$

Answer: C

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12. Which of the following solutions will have $pH = 10$ at $298K$?

A. $1 \times 10^{-10} MHCl$ solution

B. $1 \times 10^{-4} M$ NaOH solution

C. $1 \times 10^{-10} M$ NaOH solution

D. Both (A) and (B)

Answer: B

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13. When 20 mL $M/20$ NaOH is added to 10 ml of $M/10$ HCl. The resulting has pH

A. < 7

B. $= 7$

C. > 7

D. ≈ 2

Answer: B

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14. Which of the following has maximum pH ?

A. 1 N CH_3COOH

B. 1N HCl

C. 1 N H_2SO_4

D. 1 N HNO_3

Answer: A

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15. Solution of equal pH and pOH is called

A. Dilute solution

B. Protonic solution

C. Neutral solution

D. Buffer solution

Answer: C

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16. The pH of tears coming out of a person's eye is approximately

A. 6.4

B. 7.4

C. 7.4

D. 2.36

Answer: B

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17. When aqueous solutions of two acids have same concentration of common ions, they are called as

A. Isotonic solutions

B. Isohydric solutions

C. Isomeric solutions

D. Hypertonic solutions.

Answer: B

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18. A solution of HCl contains $0.1920g$ of an acid in $0.5 litre$ of a solution. The degree of dissociation is 95%. The pH of the solution is

A. 2

B. 1

C. 3

D. 4

Answer: A

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19. Equal volumes of two HCl solutions of $pH = 3$ and $pH = 5$ were mixed. What is the pH of the resulting solution ?

A. 3.3

B. 4.0

C. 4.5

D. 2.0

Answer: A

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20. pOH of H_2O is 7.0 at $298K$. If water is heated at $350K$, which of the following statement should be true?

A. pOH will decrease

B. pOH will increase

C. pOH will remain seven

D. Concentration of H^+ ions will increase but that of OH^- will decrease.

Answer: A

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21. Which of the following solution will have pOH equal to 11 at 298 K

A. $1 \times 10^{-11} M$ HCl

B. $1 \times 10^{-3} HCl$

C. 1×10^{-3} NaOH

D. pOH of solution cannot be 11

Answer: B

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22. The pH of a solution is 7.00. To this solution, sufficient base is added to increase the pH to 12.0. The increase in $\overset{\Theta}{OH}$ ion concentration is

A. 5 times

B. 1000 times

C. 10^5 times

D. 4 times

Answer: C

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23. A solution has pOH equal to 13 at $298K$. The solution will be

A. Highly acidic

B. Highly basic

C. Moderately basic

D. unpredictable

Answer: A

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Buffer solutions / Salt Hydrolysis

1. Which of the following combinations will constitute buffer solution ?

A. $CuSO_4/H_2SO_4$

B. CH_3COOH/CH_3COONH_4

C. CH_3COOH/CH_3COONH_4

D. $NaCl/NaOH$

Answer: C

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2. When $2mol$ of HCI is added to $1L$ of an acidic buffer, its pH changes from 3.4 to 2.9. The buffer capacity of the buffer solution is

A. 2

B. 0

C. 4

D. 8

Answer: C

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3. A solution which resists the cahnge in its pH value on addition of some amount of acid or base is called

A. Isotonic solutions

B. isomorphic solution

C. buffer solution

D. neutral solution

Answer: C

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4. Choose the correct statement out of the following

A. In CH_3COOH/CH_3COONa buffer, the reserve acidity of the solution is due to CH_3COO^- ions

B. It is not necessary that an acidic substance must contain hydrogen ions

C. HCO_3^- is bronsted base and cannot act as bronsted acid

D. Sodium carbonate does not contain OH^- ions and thus is not a base.

Answer: B

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5. The pH of a dilute solution of acetic acid wea found to be 4.3. The addition of a small crystal of sodium acetate will cause pH to

A. become less than 4.3

B. become more than 4.3

C. remain equal to 4.3

D. unpredictable

Answer: B

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6. Which of the following is not a buffer solution ?

A. (CH_3COOH/CH_3COONa)

B. $(HCl/NaCl)$

C. $(HCOOH/HCOONa)$

D. (NH_4OH/NH_4Cl)

Answer: B

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7. Buffer solution is one which has

A. Reserve acidity

B. Reserve alkalinity

C. pH equal to zero

D. Reserve acidity and reserve alkalinity

Answer: D

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8. A buffer solution is used in

A. preparation of potash alum

B. the removal of PO_4^{-3} ions

C. increasing the pH value of a solution

D. precipitation of $Cr(OH)_3$ from $CrCl_3$

Answer: B

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9. Which of the following salts will not undergo hydrolysis in water?

A. Sodium sulphate

B. Ammonium sulphate

C. Aluminium sulphate

D. All the salts will hydrolyse.

Answer: A

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10. Which of the following salts will not change the pH of pure water on dissociation ?

A. KCl

B. $AlCl_3$

C. Na_2CO_3

D. $Al_2(SO_4)_3$

Answer: A

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11. A salt X is dissolved in water having $pH = 7$. The resulting solution has a pH more than 7. The salt is made by neutralisation of

A. A strong acid and strong base

B. A strong acid and weak base

C. A weak acid and weak base

D. A weak acid and strong base.

Answer: D

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12. pK_a values of four acids are given below at $25^\circ C$. Indicate the strongest acid

A. 2.0

B. `2.5

C. 3.0

D. 4.0

Answer: A

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13. A solution of $Cu(NO_3)_2$ in water is acidic due to

A. ionisation

B. acidic impurities

C. hydrolysis

D. dissociation

Answer: C

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14. pH for the solution of salt undergoing anionic hydrolysis (say CH_3COONa) is given by:

A. $pH = \frac{1}{2}pK_w - \frac{1}{2}pK_b - \frac{1}{2}\log_c$

B. $pH = \frac{1}{2}pK_w + \frac{1}{2}pK_a - \frac{1}{2}pK_b$

C. $pH = \frac{1}{2}pK_w + \frac{1}{2}pK_a + \frac{1}{2}\log_c$

D. None

Answer: C

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15. The salt hydrolysis of the salt of strong acid and weak base is called

A. Anionic hydrolysis

B. Cationic hydrolysis

C. Amphoteric hydrolysis

D. None

Answer: B

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16. pH of an acidic buffer is given by

A. $pH = pK_a + \log. \frac{[\text{Salt}]}{[\text{Acid}]}$

B. $pH = pK_a - \log. \frac{[\text{Salt}]}{[\text{Acid}]}$

C. $pH = K_a + \log. \frac{[\text{Salt}]}{[\text{Acid}]}$

D. None

Answer: A

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17. Aqueous solution of copper sulphate

A. turns blue litmus red

B. turns red litmus blue

C. does not affect litms

D. affect both red and blue litmus.

Answer: A

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18. The pH range for phenolphthalein is

A. 3.2-4.5

B. 4.5-6.5

C. 5.5-7.4

D. 8.3-10.5

Answer: D

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19. Which indicator should be used in titrating KOH against oxalic acid ?

A. Litmus

B. Methyl orange

C. Methyl red

D. Phenolphthalein.

Answer: D

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20. In the estimation of an oxalate with $KMnO_{40}$ solution which of the following is used as indicator ?

A. Methyl orange

B. Phenolphthalein

C. Starch

D. None of the above.

Answer: D

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21. A universal indicator

A. can be used in all acid-base titrations

B. is a mixture of several indicators

C. is useful in the titration of a weak acid against weak base

D. has limited pH range like any other indicator.

Answer: B

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22. If K_1 and K_2 are respective equilibrium constants for two reactions :

$XeF_6(g) + H_2O \Leftrightarrow XeOF_4(g) + 2HF_g$

$XeO_4(g) + XeF_6(g) \Leftrightarrow XeOF_4(g) + XeO_3F_2(g)$

Then equilibrium constant for the reaction

$XeO_4(g) + 2HF(g) \Leftrightarrow XeO_3F_2(g) + H_2O(g)$ will be

A. K_1K_2

B. $K_1/\left(K_2\right)^2$

C. $K_1\left(K_2\right)^{-1}$

D. K_2/K_1

Answer: D

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23. If H_3O^+ ion concentration of a solution is increased by 10 times , its pH will

A. increase by one

B. decrease by one

C. increase by 10

D. decrease by 10

Answer: B

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24. The following reaction takes place in the body

$CO_2 + H_2O \Leftrightarrow H_2CO_3 \Leftrightarrow H^+ + HCO_3^-$. If CO_2 escapes from the system

A. pH will decrease

B. $\left[H_2CO_3\right]$gets changed

C. $\left[H_3O^+\right]$ concentration will decrease

D. The forward reaction is favoured.

Answer: C

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25. Three sparingly soluble salts M_2X, MX and MX_3 have the same solubility product. Their solubilities will be in the order

A. $MX_3 > MX > M_2X$

B. $MX > MX_3 > M_2X$

C. $MX > M_2X > MX_3$

D. $MX_3 > M_2X > MX$

Answer: D

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26. The dissociation constant of monobasic acids A, B, C and D are $6 \times 10^{-4}, 5 \times 10^{-5}, 3.6 \times 10^{-6}$, and 7×10^{-10}, respectively. The pH values of their $0.1M$ aqueous solutions are in the order.

A. $HX > HX > HY > HD$

B. $HD > HY > HX > HA$

C. All the solutions have same pH

D. $HX > HD > HY > HA$.

Answer: B

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27. Solutions X and Y contain one mole and two mols of CH_3XOONH_4 per litre respectively. The extent of hydrolysis

A. More in X

B. More in Y

C. Same in both

D. unpredictable

Answer: C

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28. pH of a solution solution at $25^{\circ}C$ is 2. If the pH is to be doubled , the hydronium ion concentration of the solution should be

A. doubled

B. halved

C. decreased by 100 times

D. increased by 100 times.

Answer: C

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29. At certain temperature, dissociation constant of formic acid and acetic acid are 1.8×10^{-4} and 1.8×10^{-5} respectively. At what concentration of acetic solution, the $H_{93})O^{+}$ ion concentration is same as that in 0.001 M formic acid solution

A. $0.01M$

B. $1 \times 10^{-3}M$

C. $1 \times 10^{-1}M$

D. $1 \times 10^{-4}M.$

Answer: A

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MULTIPLE CHOICE QUESTIONS

1. The dissociation constants of two acids HA_1 and HA_2 are 3.0×10^{-4} and 1.8×10^{-5} respectively. The relative strengths of the acids will be

approximately

A. $1:4$

B. $4:1$

C. $1:16$

D. $16:1$

Answer: B

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2. If the ionisation constant of acetic acid is 1.8×10^{-5}, at what concentration will it be dissociated to 2% ?

A. 1 M

B. 0.018 M

C. 0.18 M

D. 0.045 M

Answer: D

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3. A 0.20 M solution of methanoic acid has degree of ionization of 0.032. Its dissociation constant would be

A. 2.1×10^{-2}

B. 2.1×10^{-4}

C. 1.1×10^{-6}

D. 9.6×10^{-8}

Answer: B

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4. Solubility of salt A_2B_3 is 1×10^{-4}, its solubility product is

A. 1.08×10^{20}

B. 1.08×10^{18}

C. 2.6×10^{-18}

D. 8×10^{-15}

Answer: D

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5. The value of K_{sp} is $HgCI_2$ at room temperature is 4.0×10^{-15}. The concentration of CI^{Θ} ion in its aqueous solution at saturation point is

A. 1×10^{-5}

B. 2×10^{-5}

C. 2×10^{-15}

D. 8×10^{-15}

Answer: B

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6. The solubility product of silver chromate is 4×10^{-12}. The molar solubility of the salt is

A. 1.0×10^{-4} mol L^{-1}

B. 2×10^{-10} mol L^{-1}

C. 1.0×10^{-8}mol L^{-1}

D. 2×10^{-6} mol L^{-1}

Answer: A

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7. What is the solubility of $PbSO_4$ in $0.01 M Na_2SO_4$ solution if K_{sp} for $PbSO_4 = 1.25 \times 10^{-9}$?

A. 1.25×10^{-7}mol L^{-1}

B. 1.25×10^{-9} mol L^{-1}

C. 1.25×10^{-10} mol L^{-1}

D. 0.10 mol L^{-1}

Answer: A

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8. What would be the solubility of silver chloride in $0.10 M NaCI$ solution?

$K_{sp}f$ or $AgCI = 1.20 \times 10^{-10}$

A. 0.1M

B. $1.2 \times 10^{-6} M$

C. $1.2 \times 10^{-9} M$

D. $1.2 \times 10^{-10} M$

Answer: C

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9. $M_2SO_4\left(M^{\oplus}\right.$ is a monovalent metal ion) has a K_{sp} of 3.2×10^{-6}at $298K$. The maximum concentration of SO_4^{2-} ion that could be attained in a saturated solution of this solid at $298K$ is

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

B. $7 \times 10^{-2}M$

C. $2.89 \times 10^{-4}M$

D. $2 \times 10^{-2}M$

Answer: D

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10. K_{sp} for lead iodate $\left[Pb\left(IO_3\right)_2 is 3.2 \times 10^{-14}\right.$ at a given temperature. The solubility in $molL^{-1}$ will be

A. 2.0×10^{-5}

B. $\left(3.2 \times 10^{-7}\right)^{1/2}$

C. 3.8×10^{-7}

D. 4.0×10^{-6}

Answer: A

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11. At $90^{\circ} C$, pure water has $\left[H_3O^{\oplus}\right] = 10^{-6.7} molL^{-1}$. What is the value of K_w at $90^{\circ} C$?

A. 10^{-6}

B. 10^{-12}

C. $10^{13.4}$

D. $10^{-6.7}$

Answer: C

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12. An acid HA is $40\ \%$ dissociated in an aqueous solution. The hydronium ion concentration of its $0.2M$ solution would be

A. 0.08 M

B. 0.4 M

C. 0.2 M

D. None of the above.

Answer: A

Watch Video Solution

13. If the solubility product of MOH is $1 \times 10^{-10} mol^2 dm^{-6}$ then pH of its aqueous solution will be

A. 12

B. 9

C. 6

D. 3

Answer: B

Watch Video Solution

14. The pH of an aqueous solution of $Ba(OH)_2$ is 10. If the K_{sp} of $Ba(OH)_2$ is 1×10^{-9}, then the concentration of Ba^{2+} ions in the solution in $molL^{-1}$ is

A. 1×10^{-2}

B. 1×10^{-4}

C. 1×10^{-1}

D. 1×10^{-5}

Answer: C

Watch Video Solution

15. If K_a of $HCN = 4 \times 10^{-10}$, then the pH of 2.4×10^{-1} molar HCN(aq) is

A. $2x10^{-5}$

B. 4.7

C. 2.0

D. 5.0

Answer: D

Watch Video Solution

16. How many grams of $NaOH$ must be dissolved in $1L^{-1}$ of the solution to given it a pH value of 12?

A. 0.20 g $litre^{-1}$

B. 0.40 g $litre^{-1}$

C. 0.10 g $litre^{-1}$

D. 1.2 g $litre^{-1}$

Answer: B

Watch Video Solution

17. $20cm^3$ of xM solution of HCI is exactly neutralised by $40cm^3$ of $0.05MNaOH$ solutions, the pH of HCI solution is

A. 1

B. 2

C. 1.5

D. 2.5

Answer: A

Watch Video Solution

18. The pH of a solution is 5.00. To this solution, sufficient acid is added to lower the pH to 2.00. The corresponding increase in $H_3O^{\oplus}$ ion concentration is

A. 1000 times

B. 2.5 times

C. 100 times

D. 5 times

Answer: A

Watch Video Solution

19. 0.01M solution of H_2A has pH equal to 4. If k_{a1} for the acid is 4.45×10^{-7}, the concentration of HA^- ion in solution would be

A. 0.01 M

B. 4.45×10^{-5}

C. 8.0×10^{-5}

D. unpredictable

Answer: B

Watch Video Solution

20. A solution was prepared by dissolving 0.0005 mol of $Ba(OH)_2$ in 100 mL of the solution. If the base is assumed to ionise completely, the pOH of the solution will be

A. 12

B. 10

C. unpredictable

D. 2

Answer: D

Watch Video Solution

21. The pH of a $0.1M$ solution of NH_4Oh (having dissociation constant $K_b = 1.0 \times 10^{-5}$) is equal to

A. 10

B. 6

C. 11

D. 12

Answer: C

Watch Video Solution

22. A monoprotic acid (HA) is 1% ionised in its aqueous solution of $0.1M$ strength. Its pOH will be

A. 11

B. 3

C. 10

D. 2

Answer: A

Watch Video Solution

23. When CO_2 dissolves in water, the following equilibrium is established.

$CO_2 + 2H_2O \Leftrightarrow H_3O^+ + HCO_3^-$

for which the equilibrium constant is 3.8×10^{-6} and pH 6.0. What would be the ratio of concentration of bicarbonate ion to carbon dioxide $i.e.\ \left[HCO_3^-\right]/\left[CO_2\right]$

A. 3.8×10^{12}

B. 3.8

C. 6

D. 13.4

Answer: B

Watch Video Solution

24. How many gram of CaC_2O_4 will dissolve in distilled water to make one litre of saturated solution ? $\left(K_{sp} = 2.5 \times 10^{-9}\right.$ and its molecular mass is 128)

A. 0.0064 g

B. 0.0128 g

C. 0.0032 g

D. 0.0640 g

Answer: A

Watch Video Solution

25. The solubility product of $BaCrO_4$ is $2.4 \times 10^{-10}M^2$. The maximum concentration of $Ba\left(N0_3\right)_2$ possible without precipitation in a 6×10^{-4} M K_2CrO_4 solution is :

A. $4 \times 10^{-7}M$

B. 1.2×10^{-10} M

C. 6×10^{-4} M

D. $3 \times 10^{-4}M.$

Answer: A

Watch Video Solution

26. Calculate approximate pH of 10^{-10} M NaOH at $25\,^\circ C.$

A. 7

B. 10

C. between 10 and 11

D. between 6 and 7

Answer: A

Watch Video Solution

27. A certain weak acid has a dissociation constant 1.0×10^{-4}. The equilibrium constant for its reaction with a strong base is :

A. 1×10^{-4}

B. 1×10^{-10}

C. ∞

D. 1×10^{10}

Answer: D

Watch Video Solution

28. To 10 mL of an aqueous solution some strong acid having pH $= 2$ is mixed with 990 mL of the buffer solution with $Ph = 4.0$. The pH of resulting solution is

A. 4.0

B. 4.10

C. 3.8

D. 4.25

Answer: A

Watch Video Solution

29. If K_{sp} of $Mg(OH)_2$ is 1.2×10^{-11} . Then the highest pH of the 0.1 M solution of Mg^{2+} ion from which $Mg(OH)_2$ is not precipitated is

A. 4.96

B. 6.96

C. 7.54

D. 9.04

Answer: D

Watch Video Solution

30. The dissociation constant of H_2S and HS^- are respectively 10^{-7} and 10^{-13}. The pH of 0.1 M aqueous solution of H_2S will be

A. 4

B. 3

C. 5

D. 2.5

Answer: A

Watch Video Solution

31. Ammonium carbamate decomposes as $NH_2COONH_4(s) \Leftrightarrow 2NH_3(g) + CO_2(g)$. The value of K_p for the reaction is $2.9 \times 10^{-5} atm^3$. If we start the reaction with 1 mole of the compound, the total pressure at equilibrium would be

A. 0.0766 atm

B. 0.0194 atm

C. 0.194 atm

D. 0.0582 atm

Answer: D

Watch Video Solution

32. The hydronium ion concentration in pure water is 1×10^{-7} mol L^{-1}. The degree of dissociation of water is

A. 1.8×10^{-9}

B. 0.8×10^{-8}

C. 9.8×10^{-6}

D. 3×10^{-9}

Answer: A

Watch Video Solution

33. K_a for HCN is 5.0×10^{-10} at $25^\circ C$. For maintaining a constant pH of 9. Calculate the volume of $5.0 M KCN$ solution required to be added to 10 mL of $2.0 M HCN$ solution.

A. 2 mL

B. 5 mL

C. 3mL

D. 4mL

Answer: A

Watch Video Solution

34. pK_a of CH_3COOH is 4.74 . The pH of 0.01 M CH_3COONa IS

A. 4.74

B. 8.37

C. 9.48

D. None of these

Answer: B

Watch Video Solution

35. pK_b of NH_3 is 4.74. The pH when 100 mL of 0.01 M NH_3 solution is 50% neutralised by 0.01 M HCl is

A. 4.74

B. 2.37

C. 9.26

D. 9.48

Answer: C

Watch Video Solution

36. The pH of $1MPO_4^{3-}(aq)$ solution is,

[Given $pK_b = \left(PO_4^{3-}\right) = 1.62\Big]$

A. 13.19

B. 1.62

C. 8.1

D. 4.86

Answer: A

Watch Video Solution

37. Hydrolysis constant of NH_4^+ is 5.55×10^{-10}. The ionisation constant of NH_4^+ is

A. 1.8×10^9

B. 5.55×10^{-10}

C. 5.55×10^4

D. 1.8×10^{-5}

Answer: B

Watch Video Solution

38. The pH of 0.1 M $NaHCO_3$ is (Given K_{a1} and K_{a2} for H_2CO_3 are 6.38 and 10.26 respectively.)

A. 1.7

B. 5.68

C. 7

D. 8.32

Answer: D

Watch Video Solution

39. pK_{a1} and pK_{a_2} of H_2CO_3 are 6.38 and 10.26 respectively. The pH of 1 M and 0.1 M $NaHCO_3$ are

A. 8.32,7.32

B. 7.32,8.32

C. 8.32,8.32

D. 7.32,7.32

Answer: C

View Text Solution

40. pK_{a1}, pK_{a_2} and pK_{a_3} of H_3PO_4 are respectively x,y and z. pH of 0.1 M Na_2HPO_4 solution is

A. 1

B. $\frac{1}{2}(x+y)$

C. $\frac{1}{2}(y+z)$

D. $\frac{1}{2}(x+y+z)$

Answer: C

Watch Video Solution

41. pH of the solution containing 50.0 mL of 0.3 M HCl and 50.0 mL of 0.4 M NH_3 is

[Given $pK_a\left(NH_4^+\right) = 9.26$]

A. 4.74

B. 9.26

C. 8.78

D. 4.63

Answer: C

Watch Video Solution

42. pH at which an acidic indicator with $K_{\text{in}} = 1 \times 10^{-5}$ changes colour when the indicator is 1×10^{-3} M is

A. 8

B. 4

C. 3

D. 5

Answer: D

Watch Video Solution

43. pH at which a basic indicator with $K_{\text{in}} = 1 \times 10^{-10}$ changes colour when the indicator is $\times 10^{-2} M$ is

A. 8

B. 4

C. 2

D. 10

Answer: B

Watch Video Solution

44. A weak base, B, has basicity constant $K_b = 2 \times 10^{-5}$. The pH of any solution in which $[B] = \left[BH^{+}\right]$ is

A. 4.7

B. 7.9

C. 9.3

D. 9.7

Answer: C

Watch Video Solution

45. pH of 0.01 M $(NH_4)_2SO_4$ and 0.02 M NH_4OH buffer $(pK_a$ of $NH_4^+ = 9.26)$ is

A. $4.74 + \log 2$

B. $4.74 - \log 2$

C. $9.26 + \log 2$

D. $9.26 + \log 1$

Answer: D

Watch Video Solution

46. 100mL of $pH = 6$ solution is diluted to 100mL by water. pH of the solution will increase by

A. 9

B. 1

C. 0.7

D. 0.3

Answer: C

Watch Video Solution

47. Auto-ionisation of liquid NH_3 is

$2NH_3 \Leftrightarrow NH_4^{\oplus} + NH_2^{\ominus}$

with $K_{NH_3} = \left[NH_4^{\oplus}\right]\left[NH_2^{\ominus}\right] = 10^{-30} at - 50\ ^{\circ}C$ Number fo amide ions $\left(NH_2^{\ominus}\right)$, present per mm^3 of pure liquied NH_3 is

A. 600

B. 300

C. 200

D. 100

Answer: A

Watch Video Solution

48. BOH is a weak base, molar concentration of BOH that provides a $[OH]^-$ of $1.5 \times 10^{-3}M\left[K_b(BOH) = 1.5 \times 10^{-5}M\right]$ is

A. $1.5 \times 10^{-5}M$

B. $0.015M$

C. 0.0015

D. $0.15M$

Answer: D

Watch Video Solution

49. Which of the following solution will have pH of 4.74

A. 100 mL of 1 M $CH_3COOH\left(pK_a = 4.74\right)$ at the equivalence point using 1 M NaOH

B. 50 Ml OF 1 M $CH_3COONa + 25$ mL of 1 M HCl

C. 50mL of 1 M $CH_3COOH +$ 25 mL of 1 M NaOH

D. Both (B) and (C)

Answer: D

View Text Solution

50. Which of the following mixtures will act as a buffer solution when dissolved in 50 mL of water ?

A. 0.2 mol of aniline $+0.2$ mol HCl

B. 0.2 mol of aniline $+0.4$ mol of NaOH

C. 0.2 mol of NaCl $+0.1$ mol of HCl

D. 0.2 mol aniline + 0.1 mol of HCl

Answer: D

Watch Video Solution

51. For the reaction

$S_2O_3^{2-}(aq) + 2H_3O^+(aq) \Leftrightarrow S(s) + H_2SO_3(aq) + H_2O(l)$

Rate $= k\left[H_3O^+\right]\left[S_2O_3^{2-}\right]$

Reaction is fastest in

A. 0.1 M CH_3COOH

B. 0.1 M H_2SO_4

C. 0.1 M HCl

D. 0.1 M NaOH

Answer: B

Watch Video Solution

52. Both HCOOH and CH_3COOH solutions have equal pH. If K_1/K_2 (ration of acid ionisation constants) of these acids is 4, their molar concentration ratio will be

A. 2

B. 0.5

C. 0.05

D. 0.25

Answer: D

Watch Video Solution

53. pH of $Ca(OH)_2$ solution is 12. Millimoles of $Ca(OH)_2$ present in 100mL of solution will be

A. 1

B. 0.5

C. 0.05

D. 5

Answer: B

Watch Video Solution

54. A buffer solution contains 100mL of 0.01 M CH_3COOH and 200mL of 0.02 M CH_3COONa. 700mL of water is added, pH before and after dilution are $\left(pK_a = 4.74\right)$

A. 5.04,5.04

B. 5.04,0.504

C. 5.04,1.54

D. 5.34,5.34

Answer: D

Watch Video Solution

55. Assuming 100% ionization in case of strong electrolytes which of the following will have minimum pH

A. 0.1 M NH_4Cl

B. 0.1 M $(NH_4)_2SO_4$

C. 0.1M $(NH_4)_3PO_4$

D. All will have same pH.

Answer: B

Watch Video Solution

56. To prepare a buffer of pH 8.26, amount of $(NH_4)_2SO_4$ to be added into 500mL of $0.01 M NH_4OH$ solution $[pK_a(NH_4^+) = 9.26]$ is:

A. 0.05 mol

B. 0.025 mol

C. 0.10 mol

D. 0.005 mol.

Answer: B

Watch Video Solution

57. Percentange ionisation of weak acid can be calculated using the formula:

A. $100\sqrt{\frac{K_a}{C}}$

B. $\frac{100}{1+110^{\left(pK_a - pH\right)}}$

C. Both (A) and (B)

D. None of these

Answer: C

Watch Video Solution

58. pH of a mixture of $1M$ benzoic acid $(pK_a = 4.20)$ and $1MC_6H_5COONa$ is 4.5. In $300ml$ buffer, benzoic acid is $[\log 2 = 0.3]$

A. 200mL

B. 150 mL

C. 100mL

D. 50 mL

Answer: C

Watch Video Solution

59. If the freezing point of $0.1MHA(aq)$ solution is $-0.2046\,^{\circ}C$ then pH of solution is

(If K_f water $= 1.86mol^{-1}kg^{-1}$)

A. 1

B. 2

C. 1.3

D. 1.7

Answer: B

Watch Video Solution

60. If the equilibrium constant for the reaction of weak acid HA with strong base is 10^9, then pH of $0.1M$ Na A is:

A. 5

B. 9

C. 7

D. 8

Answer: B

Watch Video Solution

REVISION QUESTIONS FROM COMPETITVE EXAMS

1. The pH of decinormal solution of KOH is

A. 1

B. 4

C. 10

D. 13

Answer: D

Watch Video Solution

2. $0.1M$ solution of which of the substances will behave basic?

A. sodium borate

B. ammonium chloride

C. calcium nitrate

D. sodium sulphate

Answer: A

Watch Video Solution

3. In which of the following solvents will $AgBr$ has highest solubility?

A. 10^{-3} M NaBr

B. 10^{-3} M NH_4OH

C. Pure water

D. 10^{-3} M HBr

Answer: B

Watch Video Solution

4. Given that K_a for acetic acid as 1.8×10^{-5} and K_b for NH_4OH As 1.8×10^{-5} AT $25\,^\circ C$, predict the nature of aqueous solution of ammonium acetate

A. acidic

B. basic

C. Slightly acidic or basic

D. Neutral

Answer: D

Watch Video Solution

5. According to Lewis concept acid is

A. Proton donor

B. Electron pair donor

C. Electron pair acceptor

D. Proton acceptor

Answer: C

Watch Video Solution

6. Ostwald's dilution law is applicable to

A. Strong electrolytes only

B. Weak electrolytes only

C. Non-electrolytes

D. Strong as well as weak electrolytes.

Answer: B

Watch Video Solution

7. To a solution containing equimolar mixture of sodium acetate and acetic acid, some more amount of sodium acetate solution is adde. The pH of mixture solution.

A. increases with increase in temperature

B. decreases with rise in temperature

C. remains unchanged

D. unpredictable

Answer: C

Watch Video Solution

8. Fear or exitement, generally cause one to breathe rapidaly and it results in the decrease of concentration of CO_2 in blood. In what way it will change pH of blood ?

A. pH will increase

B. pH will decrease

C. No change

D. pH will adjust to 7

Answer: C

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9. The pH of a solution of hydrochloric acid is 4. The molarity of this solution is

A. 4.0

B. 0.4

C. 0.0001

D. 0.04

Answer: C

Watch Video Solution

10. Sulphanilic acid is a/an:

A. Arrhenius acid

B. Lewis base

C. Neither (A) nor (B)

D. Both (A) and (B)

Answer: D

Watch Video Solution

11. A compound having the formula NH_2CH_2COOH may behave

A. Only as an acid

B. Only as a base

C. Both as an acid and base

D. Neither acid nore base

Answer: C

Watch Video Solution

12. Which one of the following is the strongest acid ?

A. ClO_3OH

B. $ClO_2(OH)$

C. $SO(OH)_2$

D. $SO_2(OH)_2$

Answer: A

Watch Video Solution

13. When Na_2CO_3 solution is titrated against HCl solution, the indicator used is

A. Phenolphthalein

B. Methyl Orange

C. Methyl red

D. Starch

Answer: B

Watch Video Solution

14. Why only As^{+3} gets precipitated as As_2S_3 and not Zn^{+2} as ZnS when H_2S is passed through an acidic soluiotn containing As^{+3} and Zn^{+2} ?

A. Solubility product of As_2S_3 is less than that of ZnS

B. Enough As^{+3} are present in acidic medium

C. Zinc salt does not ionise in acidic medium

D. Solubility product changes in presence of an acid.

Answer: A

Watch Video Solution

15. The product of ionic concentration in a saturated solution of an electrolyte at a given temperature is constant an is known as

A. Ionic product of the electrolyte

B. Solubility product

C. Ionization constant

D. Dissociation constant

Answer: B

Watch Video Solution

16. The correct order of increasing $\left[H_3O^{\oplus}\right]$ in the following aqueous solution is

A. 0.01 M $H_2S <$ 0.01 M $H_2SO_4 <$ 0.01 M NaCl $<$ 0.01 M $NaNO_2$

B. 0.01 M NaCl $<$ 0.01 M $NaNO_2 <$ 0.01 M $H_2S <$ 0.01 MH_2SO_4

C. 0.01 M $NaNO_2 <$ 0.01 M NaCl $<$ 0.01 M $H_2S <$ 0.01 M H_2SO_4

D. None

Answer: C

Watch Video Solution

17. One litre of water contains 10^{-7} mole H^+ ions. Degree of ionisation of water is:

A. $1.8 \times 10^{-7}\%$

B. $0.8 \times 10^{-9}\%$

C. $3.6 \times 10^{-9}\%$

D. $3.6 \times 10^{-7}\%$

Answer: A

Watch Video Solution

18. If the solubility of lithium sodium hexafluorido aluminate, $Li_3Na_3(AlF_6)_2$ is 's' " mol lt"^(-1)` , its solubility product is equal to :

A. S^8

B. $12S^3$

C. $18S^3$

D. $2916S^8$

Answer: D

Watch Video Solution

19. $10^{-6} M NaOH$ is diluted by 100 times. The pH of diluted base is

A. Between 6 and 7

B. Between 10 and 11

C. Between 7 and 8

D. Between 5 and 6

Answer: C

Watch Video Solution

20. The solubility of AgI in NaI solutions is less than that in pure wate because:

A. AgI forms complex with NaI

B. of common ion effect

C. K_{sp} of AgI is less than that of NaI

D. temperature of solution decreases.

Answer: B

Watch Video Solution

21. Which buffer solution out of the following will have $pH > 7$?

A. $CH_3COOH + CH_3COONa$

B. $HCOOH + HCOOK$

C. CH_3COONH_4

D. $NH_4OH + NH_4Cl$

Answer: D

Watch Video Solution

22. The concentration of Ag^+ ions in a given saturated solution of AgCl at $25^\circ C$ is $1.06 \times 10^{-5} g$ ion per litre. The solubility product of AgCl is

A. 0.353×10^{-10}

B. 0.530×10^{-10}

C. 1.12×10^{-10}

D. 2.12×10^{-10}

Answer: C

Watch Video Solution

23. The pH of solution having $\left[OH^-\right] = 10^{-7}$ is

A. 14

B. 0

C. 7

D. -7

Answer: C

Watch Video Solution

24. Which of the following is most soluble?

A. $Bi_2S_3\left(K_{sp} = 1 \times 10^{-70}\right)$

B. $MnS\left(K_{sp} = 7 \times 10^{-16}\right)$

C. $CuS\left(K_{sp} = 8 \times 10^{-37}\right)$

D. $Ag_2S\left(K_{sp} = 6 \times 10^{-51}\right)$

Answer: B

Watch Video Solution

25. At $80^{\circ}C$ distilled water has $\left[H_3O^+\right]$ concentration equal $\left[OH^-\right]1 \times 10^{-6}\text{mole}/litre$. The value of K_w at this temperature will be

A. 1×10^{-8}

B. 1×10^{-12}

C. 1×10^{-14}

D. 1×10^{-6}

Answer: B

Watch Video Solution

26. If $H^{\oplus}$ ion concentration of a solution is increased by 10 times, its pH will

A. incrrease

B. remain unchanged

C. decrease by one

D. increase by 10.

Answer: C

Watch Video Solution

27. A cerain sample of beer has a pH of 10. The concentration of hydrogen ion in the beer is

A. 10^{10} M

B. 10^{-2}M

C. 10^{-4} M

D. 10^{-10}

Answer: D

Watch Video Solution

28. If pH of A, B,C and D are 9.5, 2.5, 3.5 and 5.5 respectively, then strongest acid is

A. A

B. B

C. C

D. D

Answer: B

Watch Video Solution

29. The solubility of $PbCl_2$ is

A. $\sqrt{K_{sp}}$

B. $\left(K_{sp}\right)^{1/3}$

C. $\left(K_{sp}/4\right)^{1/3}$

D. $\left(8K_{sp}\right)^{1/2}$

Answer: C

Watch Video Solution

30. The conjugate base of HPO_4^{2-} is

A. PO_4^{3-}

B. $H_2PO_4^{-}$

C. H_3PO_4

D. H_3PO_3

Answer: A

Watch Video Solution

31. The precipitate of $CaF_2\left(K_{sp} = 1.7 \times 10^{-10}\right)$ is obtained when equal volumes of the following are mixed

A. $10^{-4}MCa^{2} + 10^{-4}MF^{-}$

B. $10^{-2}MCa^{2+} + 10^{-3}MF^{-}$

C. $10^{-2}MCa^{2+} + 10^{-5}MF^{-}$

D. $10^{-3}MCa^{2+} + 10^{-5}MF^{-}$

Answer: B

Watch Video Solution

32. The solubility product of barium sulphate is 1.5×10^{-9} at $18\,^{\circ}C$. Its solubility in water at $18\,^{\circ}C$ is

A. 1.5×10^{-9} mol L^{-1}

B. $1.5 \times 10^{-5} molL^{-1}$

C. $3.9 \times 10^{-9} molL^{-1}$

D. $3.9 \times 10^{-5} molL^{-1}$

Answer: D

Watch Video Solution

33. What will be the pH of a solution formed by mixing $40ml$ of $0.10MHCl$ with $10ml$ of $0.45MNaOH$?

A. 10

B. 12

C. 8

D. 6

Answer: B

Watch Video Solution

34. The pH value of blood does not change appreciably by a small addition of an acid or base, because the blood

A. contains serum protein which act as buffer

B. contains iron as a part of the molecule

C. can be easily coagulated

D. is body fluid.

Answer: A

Watch Video Solution

35. The pH of 10M HCl aqueous solution is

A. less than 0

B. zero

C. 2

D. 1

Answer: A

Watch Video Solution

36. The solubility of AgCl will be miniumum in

A. 0.001 M $AgNO_3$

B. pure water

C. 0.01 M $CaCl_2$

D. 0.01 M NaCl.

Answer: C

Watch Video Solution

37. The strongest base of the following species is

A. NH^{2-}

B. OH^{-}

C. O^{2-}

D. S^{2-}

Answer: A

Watch Video Solution

38. The pH of a solution obtaine by mixing $50mL$ of $0.4NHCl$ and $50mL$ of $0.2NNaOH$ is

A. $-\log 2$

B. $-\log 0.2$

C. 1.0

D. 2.0

Answer: C

Watch Video Solution

39. The pH indicators are

A. salts of strong acids and strong bases

B. salts of weak acids and weak bases

C. either weak acids or weak bases

D. either strong acids or strong bases

Answer: C

Watch Video Solution

40. Which of the following sulphate has the lowest solubility product ?

A. FeS

B. MnS

C. PbS

D. ZnS

Answer: C

Watch Video Solution

41. Dissociation constant of NH_4OH is 1.8×10^{-5}. The hydrolysis constant of NH_4Cl would be

A. 1.80×10^{-19}

B. 5.55×10^{-10}

C. 5.55×10^{-5}

D. 1.80×10^{-5}

Answer: B

Watch Video Solution

42. What is the percentage hydrolysis of NaCN is $N/80$ soluiton, when the dissociation constant for HCN is 1.3×10^{-9} and $K_w = 1.0 \times 10^{-14}$

A. 2.48

B. 5.26

C. 8.2

D. 9.6

Answer: A

Watch Video Solution

43. The solubility product of AgCl is 4.0×10^{-10} at 298 K . The solubility of AgCl in 0.04 M Ca Cl_2 will be

A. $2.0 \times 10^{-5}M$

B. $1.0 \times 10^{-4}M$

C. 5.0×10^{-9} M

D. $2.0 \times 10^{-4} M$

Answer: C

Watch Video Solution

44. Highest pH (14) is shown by

A. 0.1 M H_2SO_4

B. 0.1 M NaOH

C. 1 N NaOH

D. 1 N HCl

Answer: C

Watch Video Solution

45. If a neutral solution has $pK_w = 13.36$ at $50\,^\circ C$, then pH of the solution is

A. 6.68

B. 7

C. 7.68

D. None of these

Answer: A

Watch Video Solution

46. The pH value of $M/1000$ soution of KOH is water is

A. 3

B. 6

C. 11

D. 9

Answer: C

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47. In the equation $I_2 + I^- \rightarrow, I_3^-$ which is Lewis base

A. I_2

B. I^-

C. I_3^-

D. None.

Answer: B

Watch Video Solution

48. Which of the following on reaction with H_2S does not produce metallic sulphide ?

A. $CdCl_2$

B. $ZnCl_2$

C. $COCl_2$

D. $CuCl_2$

Answer: D

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49. BF_3 is acid according to

A. Lewis

B. Arrhenius

C. Bronsted and Lowery

D. Madam Curie

Answer: A

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

A. BF_3

B. $AlCl_3$

C. $FeCl_3$

D. PH_3

Answer: D

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51. When Na_2CO_3 solution is titrated against HCl solution, the indicator used is

A. Phenophthalein

B. Dilute H_2SO_4

C. Methyl orange

D. None

Answer: C

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52. Solubility of $AgCl$ at $20^{\circ}C$ is $1.435 \times 10^{-3} gperlitre$. The solubility product of $AgCl$ is

A. 1.0×10^{-10}

B. 2×10^{-10}

C. 1.035×10^{-5}

D. 1.8×10^{-3}

Answer: A

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53. The solubility product of silver chloride is 1.8×10^{-10} at 298 K. The solubility of AgCl in 0.01 M HCl solution in mol $/ dm^3$ is

A. 2.4×10^{-9}

B. 3.6×10^{-8}

C. 0.9×10^{-10}

D. 1.8×10^{-8}

Answer: A

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54. The maximum amount of $BaSO_4$ precipitated on mixing $BaCl_2$ (0.5 M) with H_2SO_4 (1M) will correspond to

A. 0.5 M

B. 0.1M

C. 1.5M

D. 2.0M

Answer: A

Watch Video Solution

55. The solubility of product $\left(K_{sp}\right)$ of AgCl is 1.8×10^{-10}. Precipitation of AgCl will occur only when equal volumes of solutions of

A. 10^{-4} M Ag^{+} and $10^{-4}MCl^{-}$ are mixed

B. $10^{-7}MAg^{+}$ and $10^{-7}MCl^{-}$ are mixed

C. $10^{-5}MAg^{+}$ and $10^{-5}MCl^{-}$ are mixed

D. $10^{-10}MAg^{+}$ and $10^{-10}MCl^{-}$ are mixed

Answer: A

Watch Video Solution

56. The solubility of calcium fluoride in saturated solution, it its solubility product is 3.2×10^{-11} is :

A. $2.0 \times 10^{-4} mol/L$

B. $12.0 \times 10^{-3} mol/L$

C. $0.2 \times 10^{-4} mol/L$

D. $2 \times 10^{-3} mol/L$

Answer: A

Watch Video Solution

57. A physician wishes to prepare a buffer solution at pH $= 3.58$ that efficiently resists a change in pH yet contains only small conc. Of the buffering agents. Which one of the followin weak together with its sodium salt would be best to use ?

A. m - chlorobenzoic acid $\left(pK_a = 3.98\right)$

B. p- chlorocinnamic acid $\left(pK_a = 4.41\right)$

C. 2,5- dihydroxy benzoic acid $\left(pK_a = 2.97\right)$

D. Acetoacetic acid $\left(pK_a = 3.58\right)$

Answer: D

Watch Video Solution

58. The K_{sp} of CuS, Ag_2S and HgS are 10^{-31}, 10^{-44} and 10^{-54} respectively. The solubility of these sulphides are in the order.

A. $Ag_2S > CuS > HgS$

B. $Ag_2S > HgS > CuS$

C. $HgS > Ag_2S > CuS$

D. $CuS > Ag_2S > HgS$.

Answer: A

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59. The pH of a solution increased from 3 to 6. Its $\left[H^{\oplus}\right]$ will be

A. reduced to half

B. doubled

C. reduced by 1000 times

D. increased by 1000 times

Answer: C

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60. The conjugate base of NH_2^- is

A. NH_3

B. NH^{-2}

C. NH_4^+

D. N_3^{-1}

Answer: B

Watch Video Solution

61. Which of the following solution cannot act as buffer?

A. $NaH_2PO_4 + H_3PO_4$

B. $CH_3COOH + CH_3COONa$

C. $HCl + NH_4OH$

D. $H_3PO_4 + NaH_2PO_4$

Answer: C

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62. Degree of dissociation of 0.1 N $CH_3COOH$is (Dissociation constant $= 1 \times 10^{-5}$)

A. 10^{-5}

B. 10^{-4}

C. 10^{-3}

D. 10^{-2}

Answer: D

Watch Video Solution

63. How many ml of 1 (M) H_2SO_4 is required neutralise 10 ml of 1 (M) NaOH solution?

A. 2.5

B. 5.0

C. 10.0

D. 20.0

Answer: B

Watch Video Solution

64. For preparing a buffer solution of $pH6$ by mixing sodium accetate and acetic, the ratio of the concentration of salt and acid should be $\left(K_a = 10^{-5}\right)$

A. $1:10$

B. $10:1$

C. $100:1$

D. $1:100$

Answer: B

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65. At $20\,^{\circ}C$, the Ag^{+} ion concentration in a saturated solution Ag_2CrO_4 is $1.5x10^{-4}$ mol / litre. At $20\,^{\circ}C$, the solubility product of Ag_2CrO_4 would be

A. 3.3750×10^{-12}

B. 1.6875×10^{-10}

C. 1.6875×10^{-12}

D. 1.6875×10^{-11}

Answer: C

Watch Video Solution

66. A white salt is readily soluble in water and gives a colourless solution with a pH of about 9. The salt would be

A. NH_4NO_3

B. CH_3COONa

C. CH_3COONH_4

D. $CaCO_3$

Answer: B

Watch Video Solution

67. Why are strong acids generally used as standard solutions in acid-base titrations ?

A. The pH at the equivalnet point will always be 7

B. They can be used to titrate both strong and weak bases

C. Strong acids form more stable solutions than weak acids

D. The salts of strong acid do not hydrolyse.

Answer: B

Watch Video Solution

68. The dissociation constant of a weak monobasic acid K_a is 1×10^{-5}. The pH of 0.1 M of that acid would be

A. 5

B. 1

C. 2

D. 3

Answer: D

Watch Video Solution

69. A buffer solution is prepared by mixing $10ml$ of $1.0M$ acetic acid & $20ml$ of $0.5M$ sodium acetate and then diluted to $100ml$ with distilled water. If the pK_a of CH_3COOH is 4.76. What is the pH of the buffer solution prepared?

A. 5.21

B. 4.76

C. 4.34

D. 5.22

Answer: B

Watch Video Solution

70. A monoprotic acid in a 0.1 M solution ionizes to $0.001\ \%$. Its ionisation constant is

A. 1.0×10^{-3}

B. 1.0×10^{-6}

C. 1.0×10^{-8}mol L^{-1}

D. 1.0×10^{-11}

Answer: D

Watch Video Solution

71. What is the correct representation for the solubility product of SnS_2 ?

A. $\left[Sn^{2+}\right]\left[S^{2-}\right]^2$

B. $\left[Sn^{4+}\right]\left[S^{2-}\right]^2$

C. $\left[Sn^{2+}\right]\left[2S^{2-}\right]$

D. $\left[Sn^{4+}\right]\left[2S^{2-}\right]^2$

Answer: B

Watch Video Solution

72. The concentration of $\left[H^{+}\right]$ and concentration of $\left[OH^{-}\right]$ of a 0.1 aqueous solution of 2% ionised weak acid is [Ionic product of water $= 1 \times 10^{-14}$]

A. 0.02×10^{-3} and $5 \times 10^{-11}M$

B. $1 \times 10^{-3}M$ and $3 \times 10^{-11}M$

C. $2 \times 10^{-3}M$ and $5 \times 10^{-12}M$

D. $3 \times 10^{-2}M$ and $4 \times 10^{-13}M$

Answer: C

Watch Video Solution

73. The strongest conjugate base is

A. NO_3^-

B. Cl^-

C. SO_4^{2-}

D. CH_3COO^-

Answer: D

Watch Video Solution

74. The solubility of a saturated solution of calcium fluoride is 2×10^{-4} mol/L. Its solubility product is

A. 12×10^{-2}

B. 14×10^{-4}

C. 22×10^{-11}

D. 32×10^{-12}

Answer: D

Watch Video Solution

75. At infinite dilution, the percentage ionisation of both strong and weak electrolytes is

A. 1 %

B. 0.2

C. 0.5

D. 1

Answer: D

Watch Video Solution

76. In one litre of water 10^{-10} moles of HCl were added. The pH of the solution will be approximately .

A. 7

B. 14

C. 10

D. 4

Answer: A

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77. To an aqueous solution of Ag_2CrO_4 above its own precipitate , CrO_4^{2-} ions are added in the form of solution. This results in

A. increase in concentration of Ag^+ ions

B. decrease in concentration of Ag^+ ions

C. increase in the value of solubility product

D. decrease in the value of solubility product.

Answer: B

Watch Video Solution

78. For every diprotic acid of the type H_2X, how would you relate ionisation constant K_{a1} and K_{a2}

A. $K_{a1} = K_{a2}$

B. $K_{a1} < K_{a2}$

C. $K_{a2} < K_{a1}$

D. Data is insufficient

Answer: C

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79. A buffer solution of $pH = 9$ can be prepared by mixing

A. CH_3COONa and CH_3COOHs

B. NaCl and NaOH

C. NH_4Cl and NH_4OH

D. KH_2PO_4 and K_2HPO_4

Answer: C

Watch Video Solution

80. Which of the following will give maximum ions in solution ?

A. KI_3

B. $CuSO_4$

C. $FeCl_3$

D. K_2HgI_4

Answer: C

Watch Video Solution

81. BF_3 is acid according to

A. Arrhenius concept

B. Bronsted - Lowry concept

C. Lewis concept

D. Ostwald

Answer: C

Watch Video Solution

82. Given that , the solubility product K_{sp} , of AgCl is 1.8×10^{-10} , the concentration of Cl^{-} ions that must just be exceeded before AgCl will precipitate from a solution containing 4×10^{-3} M Ag^{+} ions is

A. $4.5 \times 10^{-8} M$

B. $4 \times 10^{-8} M$

C. $1.8 \times 10^{-8} M$

D. $1 \times 10^{-8} M$

Answer: A

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83. Which of the following can be classified as a Bronsted base ?

A. NO_3^-

B. H_3O^+

C. CH_3COOH

D. NH_4^+

Answer: A

Watch Video Solution

84. pH of a solution produced when an aqueous soution of $pH = 6$ is mixed with an equal volume of an aqueous solution of $pH = 3$ is about :

A. 3.3

B. 4.3

C. 4.0

D. 4.5

Answer: A

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85. Hydrogen ion concentration of an aqueous solution is $1 \times 10^{-8} M$. The solution is diluted with equal volume of water. Hydroxyl ion concentration of the resultant solution in terms of mol dm^{-3} is

A. 1×10^{-8}

B. 1×10^{-6}

C. 2×10^{-10}

D. 0.5×10^{-10}

Answer: D

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86. pK_a values of two acids. A and B are 4 and 5. The strengths of these two acids are related as

A. Acid A is 10 times stronger than acid B

B. Strength of acid A: Strength of acid $B = 4:5$

C. The strength of two acids cannot be compared

D. Acid B is 10 times stronger than acid A.

Answer: A

Watch Video Solution

87. The dissociation constant of water is $1 \times 10^{-14} mol^{-2} litre^{-2}$. What is the pH of 0.001 M KOH soluiton ?

A. 10^{-11}

B. 10^{-3}

C. 3

D. 11

Answer: D

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88. Which buffer solution out of the following will have $pH > 7$?

A. CH_3COOH/CH_3COONa

B. $HCOOH/HCOOK$

C. CH_3COONH_4

D. NH_4OH/NH_4Cl

Answer: D

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89. Ionisation constant of CH_3COOH is 1.7×10^{-5} and concentration fo H^+ in certain acetic acid solution is $3.4 \times 10^{-4}M$. The concentration of acetic acid solution is

A. $3.4 \times 10^{-4}M$

B. $3.4 \times 10^{-3}M$

C. 6.8 xx 10^(-4)M`

D. $6.8 \times 10^{-3}M$

Answer: D

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90. Solubility if M_2S type salt is 3.5×10^{-6}, then find out its solubility product

A. 1.7×10^{-6}

B. 1.7×10^{-16}

C. 1.7×10^{-18}

D. 1.7×10^{-12}

Answer: B

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91. Which of the following is a Bronsted acid as well Bronsted base ?

A. Na_2CO_3

B. H_2O

C. NH_3

D. BF_3

Answer: B

Watch Video Solution

92. A certain buffer solution sontains equal concentration of X^{-} and HX. The K_a for HX is 10^{-8}. The of the buffer is

A. 3

B. 4

C. 11

D. 14

Answer: B

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93. The pH of a buffer containing equal molar concentration of a weak base and its chloride $\left(K_b \text{ weak base } = 2 \times 10^{-5}, \log 2 = 0.3\right)$ is

A. 5

B. 9

C. 4.7

D. 9.3

Answer: D

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94. Solution of $0.1 N NH_4OH$ and $0.1 N NH_4Cl$ has $pH 9.25$, then find out K_b of NH_4OH.

A. 9.25

B. 4.75

C. 3.75

D. 8.25

Answer: B

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95. How do we differentiate between Fe^{3+} and Cr^{3+} in group III?

A. By taking excess of NH_4OH

B. By increasing NH_4^+ ion concentration

C. By decreasing OH^- ion concentration

D. Both (B) and (C)

Answer: D

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96. A solution of an acid has $pH = 4.70$. Find out the concentration of OH^- ions $\left(pK_w = 14\right)$.

A. 5×10^{-10}

B. 4×10^{-10}

C. 2×10^{-5}

D. 9×10^{-4}

Answer: A

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97. Species acting as both Bronsted acid and base is:

A. $(HSO_4)^-$

B. Na_2CO_3

C. NH_3

D. OH^-

Answer: A

Watch Video Solution

98. $1MNaCl$ and $1MHCl$ are present in an aqueous solution. The solution is

A. not a buffer solution with $pH < 7$

B. not a buffer solution with $pH > 7$

C. a buffer solution with $pH < 7$

D. a buffer solution with $pH > 7$

Answer: A

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99. A solution of $MgCl_2$ in water has pH

A. < 7

B. > 7

C. 7

D. 14.2

Answer: A

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100. In the equation $I_2 + I^- \rightarrow , I_3^-$ which is Lewis base

A. I_2

B. I^-

C. I_3^-

D. None of these

Answer: B

Watch Video Solution

101. Among the following the weakest base is

A. H^-

B. CH_3^-

C. CH_3O^-

D. Cl^-

Answer: D

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102. Ammonium ion is

A. a conjugate acid

B. a conjugate base

C. neither an acid nor a base

D. both an acid and a base

Answer: A

Watch Video Solution

103. Water is a

A. photophobic solvent

B. protophilic solvent

C. amphiprotic solvent

D. aprotic solvent

Answer: C

Watch Video Solution

104. An example of salt that will not hydrolyse is

A. NH_4Cl

B. KCl

C. CH_3COONH_4

D. CH_3COOK

Answer: B

Watch Video Solution

105. Which one of the following is the buffer solution of strong acidic nature ?

A. $HCOOH + HCOO^-$

B. $CH_3COOH + CH_3COO^-$

C. $H_2CO_4^- + C_2O_4^{2-}$

D. $H_3BO_3 + BO_3^{3-}$

Answer: A

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

A. CO

B. $SiCl_4$

C. SO_3

D. Zn^{2+}

Answer: A

Watch Video Solution

107. Which of the following solutions has the highest pH?

A. CH_3COOK

B. Na_2CO_3

C. NH_4Cl

D. $NaNO_3$

Answer: B

Watch Video Solution

108. The value of ionic product of water at 393K is

A. less than 1×10^{-14}

B. greater than 1×10^{-14}

C. equal to 1×10^{-14}

D. equal to 1×10^{-7}

Answer: B

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109. The pH value of $N/10$ NaOH is

A. 7

B. 10

C. 12

D. 13

Answer: D

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110. The pH of the solution containing 10 mL of 0.1 N NaOH and 10 mL of 0.05 N H_2SO_4 would be

A. 1

B. 0

C. 7

D. > 7

Answer: D

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111. Phenolphthalein does not act as an indicator for the titration between

A. NaOH and CH_3COOH

B. $H_2C_2O_4$ and $KMnO_4$ sol.

C. $Ba(OH)_2$ and HCl

D. KOH and H_2SO_4

Answer: B

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112. The pH of a solution of H_2SO_4 is 1. Assuming complete ionisation, find the molarity of H_2SO_4 solution :

A. 0.1

B. 0.2

C. 0.005

D. 2.0

Answer: C

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113. If pure water has $pK_w = 13.36$ at $50^\circ C$, the pH pure water will be

A. 7.0

B. 7.13

C. 6.0

D. 6.63

Answer: D

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114. The pH of a solution at $25\,^{\circ}C$ containing $0.10M$ sodium acetate and $0.03M$ acetic acid is (pK_a for $CH_3COOH = 4.57$)

A. 3.24

B. 4.59

C. 5.09

D. 6.67

Answer: C

Watch Video Solution

115. At $80\,^{\circ}C$ distilled water has $\left[H_3O^+\right]$ concentration equal $\left[OH^-\right]1\times10^{-6}\text{mole}/litre$. The value of K_w at this temperature will be

A. 1×10^{-8}

B. 1×10^{-6}

C. 1×10^{-9}

D. 1×10^{-12}

Answer: D

Watch Video Solution

116. The solubility of AgCl in 0.2 M NaCl is $\left[K_{sp}AgCl = 1.8 \times 10^{-10}\right]$

A. $1.8 \times 10^{-11}M$

B. $9.0 \times 10^{-10}M$

C. $6.5 \times 10^{12}M$

D. $5.6 \times 10^{-11}M$

Answer: B

Watch Video Solution

117. The basic character of the transition metal monoxide follows the order

A. $TiO > VO > CrO > FeO$

B. $VO > CrO > TiO > FeO$

C. $TiO > FeO > VO > CrO$

D.

Answer: A

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118. Which one of the following compounds is not a protoric acid?

A. $SO_2(OH)_2$

B. $B(OH)_3$

C. $PO(OH)_3$

D. $SO(OH)_2$

Answer: B

Watch Video Solution

119. The solubility product of AgI at $25^{\circ}C$ is $1.0 \times 10^{-16} mol^2 L^{-2}$. The solubility of AgI in $10^{-4} N$ solution of KI at $25^{\circ}C$ is approximately (in $molL^{-1}$)

A. 1.0×10^{-8}

B. 1.0×10^{-16}

C. 1.0×10^{-12}

D. 1.0×10^{-10}

Answer: C

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120. The solubility of a springly soluble salt AB_2 in water is $1.0 \times 10^{-5} molL^{-1}$. Its solubility product is:

A. 4×10^{-15}

B. 4×10^{-10}

C. 1×10^{-15}

D. 1×10^{-10}

Answer: A

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121. Which one of the following statements is not true ?

A. The conjugate base of $H_2PO_4^-$ is HPO_4^{2-}

B. $pH + pOH = 14$ for all aqueous solutions

C. The pH of 1×10^{-8} M HCl is 8

D. $96,500$ coulombs of electricity when passes through a $CuSO_4$ solution deposits 1 gram equivalent of copper at the cathode.

Answer: C

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122. Which one of the following substances has the highest proton affinity ?

A. H_2O

B. H_2S

C. NH_3

D. PH_3

Answer: C

Watch Video Solution

123. Which one of the following is an amphoteric oxide?

A. ZnO

B. Na_2O

C. SO_2

D. B_2O_3

Answer: A

Watch Video Solution

124. Solubility product of a salt of AB is $1 \times 10^{-8}M^2$ in a solution in which the concentration of A^+ ions is $10^{-3}M$. The salt will precipitate when the concentration of B^- ions is kept

A. $10^{-6}M$

B. $10^{-5}M$

C. $10^{-4}M$

D. $10^{-7}M$

Answer: B

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125. The pH value of gasfric juice in humna stomach is about 1.8 and in intiestine , it is about 7.8. The pk_a value of aspirin is 3.5 Aspirin will be

A. Ionised in the small intestine and almost unionised in the stomach

B. Ionised in the stomach and almost unionised in the small intestine

C. Completely ionised in the small intestine and in the stomach.

D. Unionised in the small intestine and in the stomach.

Answer: A

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126. Which one of the following is not a buffer solution ?

A. 0.8 MH_2S + 0.8 M KHS

B. $2MC_6H_5NH_2 + 2MC_6H_5N^+H_3Br$

C. 3 M $H_2CO_3 + 3MKHCO_3$

D. $0.05MKClO_4 + 0.05MHClO_4$

Answer: D

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127. Bases haven't property of

A. donating OH^-

B. accepting H^+

C. donating H^+

D. donating e^-

Answer: C

Watch Video Solution

128. If pH of a solution decreases from 5 to 2, then it is

A. diluted 1000 times

B. concentrated 1000 times

C. diluted 100 times

D. concentrated 100 times

Answer: B

Watch Video Solution

129. Conjugate acid of SO_4^{2-} is

A. HSO_4^-

B. HSO_4

C. H_2SO_4

D. SO_4^{2-}

Answer: A

Watch Video Solution

130. pH of water is

A. pressure dependent

B. pressure independent

C. temperature dependent

D. temperature independent

Answer: C

Watch Video Solution

131. $CuSO_4$ solution is

A. acidic

B. basic

C. neutral

D. none

Answer: A

Watch Video Solution

132. According to Lewis concept acid is

A. electron pair donor

B. proton donor

C. Electron pair acceptor

D. Proton acceptor

Answer: C

Watch Video Solution

133. An aqueous solution in which the H^{+} ion concentration is greater than $10^{-7}M$ is said to be

A. acidic

B. alkaline

C. neutral

D. None of these

Answer: A

Watch Video Solution

134. Hydrolysis constant for a salt of weak acid and weak base would be

A. $\frac{K_w}{K_b}$

B. $\frac{K_w}{K_a}$

C. $\frac{K_w}{K_a \cdot K_b}$

D. $K_a \cdot K_b$

Answer: C

Watch Video Solution

135. In the following reaction.

$AgCl + KI \Leftrightarrow KCl + AgI$

as KI is added, the equilibrium is shifted towards right giving more AgI precipitate , because

A. both AgCl and AgI are sparingly soluble

B. the K_{sp} of AgI is lower than K_{sp} of AgCl

C. the K_{sp} of AgI is higher than K_{sp} of AgCl

D. both AgCl and AgI have same solubility product

Answer: B

Watch Video Solution

136. Accepting the definition that an acid is a proton donor, the acid in the following reaction

$NH_3 + H_2O \rightarrow NH_4^+ + OH^-$ is

A. NH_3

B. H^+

C. NH_4^+

D. H_2O

Answer: d

Watch Video Solution

137. Which of the following is the buffer solution ?

A. $CH_3COOH + CH_3COONa$

B. $CH_3COOH + CH_3COONH_4$

C. $CH_3COOH + NH_4Cl$

D. $NaOH + NaCl$

Answer: A

Watch Video Solution

138. Which one of the following oxides is amphoteric ?

A. MgO

B. CaO

C. Na_2O

D. ZnO

Answer: D

Watch Video Solution

139. The acid dissociation constant K_a of acetic acid is 1.74×10^{-5} at 298 K. The pH of a solution of 0.1 M acetic acid is

A. 2.88

B. 3.6

C. 4.0

D. 1.0

Answer: A

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140. 0.365g of HCl gas was passed through 100 cm^3 of 0.2 M NaOH solution. The pH of the resulting solution would be

A. 1

B. 5

C. 8

D. 13

Answer: d

Watch Video Solution

141. 40 mg of pure sodium hydroxide is dissolved in 10 L of distilled water. The pH of the solution is

A. 9.0

B. 10

C. 11

D. 12

Answer: B

Watch Video Solution

142. Which one of the following is not an amphoteric substance ?

A. HNO_3

B. HCO_3^-

C. H_2O

D. NH_3

Answer: A

Watch Video Solution

143. The conjugate base of $H_2PO_4^-$ is :

A. PO_4^{3-}

B. HPO_4^{2-}

C. H_3PO_4

D. P_2O_5

Answer: B

Watch Video Solution

144. The molar solubility (in mol L^{-1}) of a sparingly soluble salt MX_4 is $'s'$. The corresponding solubility product K_{sp}, $'s'$ is given in terms of K_{sp} by the relation

A. $s = \left(K_{sp}/128\right)^{\frac{1}{4}}$

B. $s = \left(K_{sp}/256\right)^{\frac{1}{5}}$

C. $s = \left(256K_{sp}\right)^{\frac{1}{5}}$

D. $s = \left(128K_{sp}\right)^{\frac{1}{4}}$

Answer: B

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145. Which is a Lewis base ?

A. B_2H_6

B. $LiAlH_4$

C. AiH_3

D. NH_3

Answer: D

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146. Which is an amphoteric oxide ?

A. CaO

B. BaO

C. SrO

D. ZnO

Answer: D

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147. pK_a of CH_3COOH is 4.74 . The pH of 0.01 M CH_3COONa IS

A. 8.37

B. 4.37

C. 4.74

D. 0.474

Answer: A

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148. K_{sp} for $Cr(OH)_2$ is 2.7×10^{-13} . What is its solubility in moles / litre ?

A. 1.7×10^{-8}

B. 2.7×10^{-8}

C. 1×10^{-8}

D. 1.36×10^{-8}

Answer: C

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149. The rapid change of pH near the stoichiometric point of an acid-base titration is the basic of indicator detection. pH of the solution is related to the ratio of the concentration of conjugate acid ($H \in$) and base $\left(In^{-}\right)$ forms of the indicator by the expression

A. $\log.\dfrac{\left[\text{ln}^{-}\right]}{[H\text{ln}]} = pH - pK_{\text{ln}}$

B. $\log.\dfrac{\left[\text{ln}^{-}\right]}{[H\text{ln}]} = pK_{\text{ln}} - pH$

C. $\log.\dfrac{[H\text{ln}]}{\left[\text{ln}^{-}\right]} = pK_{\text{ln}} - pH$

D. $\log.\frac{[H\ln]}{\left[\ln^{-}\right]} = pH = pK_{\ln}$

Answer: A

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150. The solubility product of a sparingly soluble salt AX_2 is 3.2×10^{-11}. Its solubility (in mo/L) is

A. 4×10^{-4}

B. 5.6×10^{-6}

C. 3.1×10^{-4}

D. 2×10^{-4}

Answer: D

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151. What is the pH of $0.01M$ glycine solution? For glycine, $K_{a_1} = 4.5 \times 10^{-3}$ and $K_{a_2} = 1.7 \times 10^{-10}$ at $298K$

A. 3.0

B. 10.0

C. 6.1

D. 7.2

Answer: C

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152. Which of the following is acidic in nature ?

A. $Be(OH)_2$

B. $Mg(OH)_2$

C. $B(OH)_3$

D. $Al(OH)_3$

Answer: C

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153. At $90^{\circ} C$, pure water has $\left[H_3O^{\oplus}\right] = 10^{-6} M$. What is the value of K_w at $90^{\circ} C$

A. 10^{-6}

B. 10^{-8}

C. 10^{-12}

D. 10^{14}

Answer: C

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154. The pH of a buffer solution of 0.1 M $NH_4OH\left[pK_a = 4.0\right]$ and $0.1 M NH_4Cl$ is

A. 1

B. 4

C. 10

D. 13

Answer: C

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155. 50 mL of 0.1 M HCl and 50 mL of 2.0 M NaOH are mixed. The pH of the resulting solution is

A. 1.30

B. 4.2

C. 12.70

D. 11.70

Answer: C

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156. The solubility product of a salt having general formula MX_2 in water is 4×10^{-12}. The concentration of M^{2+} *ions* in the aqueous solution of the salt is:

A. $2.0 \times 10^{-6} M$

B. $1.0 \times 10^{-4} M$

C. $1.6 \times 10^{-4} M$

D. $4.0 \times 10^{-10} M$

Answer: B

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157. Hydrogen ion concentration in mol/L in a solution of $pH = 5.4$ will be:

A. 3.98×10^{8}

B. 3.88×10^{6}

C. 3.68×10^{-6}

D. 3.98×10^{-6}

Answer: D

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158. The conjugate base of OH^{-} is :

A. O_2

B. H_2O

C. O^{-}

D. O^{2-}

Answer: D

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159. The pH of a solution of H_2O_2 is 6.0. Some chlorine gas is bubbled into this solution. Which of the following is correct ?

A. The pH of the resulting solution becomes 8

B. Hydrogen gas is liberated from the resultant solution.

C. The pH of the resultant solution becomes less than 6.0 and oxygent gas is liberated

D. Cl_2O is formed in the resultant solution

Answer: C

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160. At $25\,^\circ C$, the dissociation constant of a base. BOH is 1.0×10^{-12}. The concentration of hydroxyl ions in 0.01M aqueous solution of the base would be

A. $2.0 \times 10^{-6} mol L^{-1}$

B. $1.0 \times 10^{-5} molL^{-1}$

C. $1.0 \times 10^{-6} molL^{-1}$

D. $1.0 \times 10^{-7} molL^{-1}$

Answer: D

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161. The correct relationship between the pH of isomolar solutions of sodium oxide (pH_1), sodium sulphide (pH_2), sodium selenide (pH_3) and sodium telluride (pH_4) is

A. $pH_1 > pH_2 \approx pH_3 > PH_4$

B. $pH_1 < pH_2 < pH_3 < PH_4$

C. $pH_1 < pH_2 < pH_3 \approx PH_4$

D. $pH_1 > pH_2 > pH_3 > PH_3$

Answer: D

Watch Video Solution

162. When $10ml$ of $0.1M$ acitec acid $\left(pk_a = 5.0\right)$ is titrated against $10ml$ of $0.1M$ ammonia solution $\left(pk_b = 5.0\right)$,the equivalence point occurs at pH

A. 5.0

B. 6.0

C. 7.0

D. 9.0

Answer: C

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163. The K_a value of formic acid and acetic acid are respectively 1.77×10^{-4} and 1.75×10^{-5} . The ratio of the acid strength of 0.1 N acids is

A. 100

B. 3.178

C. 0.3

D. 0.1

Answer: B

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164. Equal volumes of the following Ca^{2+} and F^{-} solutions are mixed. In which of the solutions will precipitations occur ?

$\left[K_{sp}\text{ of } CaF_2 = 1.7 \times 10^{-10}\right]$

1. $10^{-2}MCa^{2+} + 10^{-5}MF^{-}$

2. $10^{-3}MCa^{2} + 10^{-3}MF^{-}$

3. $10^{-4}MCa^{2} + 10^{-2}MF^{-}$

4. $10^{-2}MCa^{2} + 10^{-3}MF^{-}$

Select the correct answer using the codes given below

A. In 4 only

B. In 1 and 2

C. In 3 and 4

D. In 2,3 and 4

Answer: C

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165. If 0.1 M of a weak monobasic acid is taken and its percentage degree of ionisation is $1.34\,\%$, then calculate its ionisation constant.

A. 0.8×10^{-5}

B. 1.79×10^{-5}

C. 0.182×10^{-5}

D. None of these

Answer: B

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166. Dissociation constant of NH_4OH is 1.8×10^{-5} . The hydrolysis constant of NH_4Cl would be

A. 1.8×10^{-5}

B. 1.8×10^{-10}

C. 5.55×10^{-5}

D. 5.55×10^{-5}

Answer: D

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167. Which of the following anions is the weakest base ?

A. $C_2H_5O^-$

B. CN^-

C. CH_3CO^-

D. NO_3^-

Answer: D

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168. H_2S gas when passed through a solution of cations containing HCl precipitates the cations of second group in qualitative analysis but not those belonging to the fourth group. It is because

A. Presence of HCl decreases the sulphide ion concentration

B. Sulphide of group II are unstable in HCl

C. Solubility product of group II sulphides is more than that of group IV sulphides

D. Presence of HCl increases the sulphide ion concentration.

Answer: A

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169. On adding 0.1 M solution each of Ag^{+}, Ba^{2+}, Ca^{2+} ions in a Na_2SO_4 solution, species first precipitated is $\left(K_{sp}BaSO_4 = 10^{-11}, K_{sp}CaSO_4 = 10^{-6}, K_{sp}Ag_2SO_4 = 10^{-5}\right)$

A. Ag_2SO_4

B. $BaSO_4$

C. $CaSO_4$

D. all of these

Answer: B

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170. The K_{sp} of $Mg(OH)_2$ is 1×10^{-12}. $0.01 M Mg(OH)_2$ will precipitate at the limiting pH

A. 3

B. 9

C. 5

D. 8

Answer: B

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171. A solution has $pH = 5$, it is diluted 100 times, then it will become

A. neutral

B. basic

C. unaffected

D. more acidic

Answer: A

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172. A buffer solution has equal volume of 0.20 M NH_4OH and 0.02 MNH_4Cl: The pK_b of the base is 5. The pH is

A. 10

B. 9

C. 4

D. 7

Answer: A

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173. 20mL of 0.5 M HCl and 35 mL of 0.1 N NaOH are mixed. The resulting solution will

A. be neutral

B. be basic

C. turn phenolphthalein

D. turn methyl orange solution red

Answer: D

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174. Solubility product of a salt of AB is $1 \times 10^{-8} M^2$ in a solution in which the concentration of A^+ ions is $10^{-3} M$. The salt will precipitate when the concentration of B^- ions is kept

A. between $10^{-8} M$ to $10^{-7} M$

B. between $10^{-7} M$ to $10^{-6} M$

C. $> 10^{-5} M$

D. $< 10^{-8} M$

Answer: C

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175. For which of the following sparingly soluble salt the solubility (s) and solubility product (K_{sp}) are related by the expression $s = (K_{sp}/4)^{1/3}$

A. $BaSO_4$

B. $Ca_3(PO_4)_2$

C. Hg_2Cl_2

D. Ag_3PO_4

Answer: C

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176. Degree of dissociation of 0.1 N CH_3COOH is (Dissociation constant $= 1 \times 10^{-5})$

A. 10^{-5}

B. 10^{-4}

C. 10^{-3}

D. 10^{-2}

Answer: D

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

A. $AlCl_3.6H_2O$

B. $AlCl_3$

C. $SnCl_4$

D. $FeCl_3$

Answer: A

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178. The pH at the equivalence point of a titration may differ from 7.0 because of

A. the self ionization of water

B. hydrolysis of the salt formed

C. the indicator used

D. the concentration of the standard solutions.

Answer: B

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179. A weak monobasic acid is half neutralized by a strong base. If the Ph of the solution is 5.4 its pK_a is

A. 6.8

B. 2.7

C. 5.4

D. 10.8

Answer: C

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180. ZnS is not precipitated by passing H_2S in acidic medium but CuS is precipitated . The reason for it is

A. $K_{sp}CuS < \; < K_{sp}ZnS$

B. $K_{sp}CuS > \; > K_{sp}ZnS$

C. $K_pCuS = K_{sp}ZnS$

D. None of these

Answer: A

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181. When 30 mL of 5.93 millimolar solution of $AgNO_3$ was added to 2.0 mL of 8.89 millimolar solution of KCl, the mixture turns turbid. The solubility product of AgCl is

A. $1.96 \times 10^{-6} mol^2 L^{-1}$

B. $3.92 \times 10^{-6} mol^2 L^{-1}$

C. $1.96 \times 10^{-6} mol^{-1} L^{-1}$

D. $3.92 \times 10^{-6} mol^{-1} L^{-1}$

Answer: A

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182. Choose the correct order arranged in decreasing order of basicity

A. $CH \equiv C^- > CH_3\bar{O} > OH^-$

B. $OH^- > CH_3O^- > CH \equiv C^-$

C. $CH_3O^- > OH^- > CH \equiv C^-$

D. $CH_3O^- > CH \equiv C^- > OH^-$

Answer: A

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183. HA is a weak acid. The pH of 0.1 M HA solution is 2. What is the degree of dissociation (α) of HA ?

A. 0.5

B. 0.2

C. 0.1

D. 0.301

Answer: C

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184. Which of the following solvents are aprotic ?

$(1) NH_3 \quad (2) SO_2$

$(3) CH_3CN \quad (4) CH_3CO_2H$

A. 1,2,3

B. 1,3,4

C. 2,3

D. 1,3

Answer: C

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185. The aqueous solutions of $HCOONa, C_6H_5NH_3CI,$ and KCN are, respectively,

A. acidic, acidic , basic

B. acidic, basic, neutral

C. basic, neutral, neutral

D. basic, neutral , basic

Answer: D

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186. An example of a Lewis acid is

A. Aluminium chloride

B. Ammonia

C. Pyriding

D. Amines

Answer: A

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187. 100 cc of HCl of pH value 1 is mixed with 100 cc of distilled water. The pH value of the resultant solution is

A. 1.7

B. 1.9

C. 2.5

D. 1.3

Answer: D

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188. The pH of neutral water is 6.5 , then the temperature of water is

A. $25^{\circ}C$

B. more than $25^{\circ}C$

C. can be more or less than $25^{\circ}C$

D. cannot be predicted

Answer: B

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189. For a 'C'M concentarted solution of a weak electrolyte $A_xB_y\alpha$(degree of dissociation) is

A. $\alpha = \sqrt{K_{eq}/(x+y)}$

B. $\alpha = \sqrt{K_{eq}C/(x \times y)}$

C. $\alpha = K_{eq}/C^{x+y-1}X^xY^y$

D. $\alpha = K_{eq}C^{xy}$

Answer: C

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190. The pH of a solution obtained by mixing 50 mL of 1N HCl and 30 mL of 1N NaOH is $[\log 2.5 = 0.3979]$

A. 3.979

B. 0.6021

C. 12.042

D. 1.2042

Answer: B

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191. The number of H^{+} ions present in 250 ml of lemon juice of pH=3 is

A. 1.506×10^{22}

B. 1.506×10^{23}

C. 1.506×10^{20}

D. 3.012×10^{21}

Answer: C

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192. The precipitate of $Ag_2CrO_4\left(K_{sp}\right) = 1.1 \times 10^{-12}$ is obtained when equal volumes of the following mixed

A. $10^{-5}MAg^{+}$ and $10^{-3}MCrO_4^{2-}$

B. $10^{-5}MAg^{+}$ and $10^{-2}MCrO_4^{2-}$

C. $10^{-4}MAg^{+}$ and $10^{-2}MCrO_4^{2-}$

D. $10^{-7}MAg^{+}$ and $10^{-3}CrO_4^{-}$

Answer: C

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193. When solid lead iodide is added to water, the equilibrium concentration of I^{-} becomes $2.6 \times 10^{-3}M$. What is the K_{sp} for PbI_2 ?

A. 2.2×10^{-9}

B. 8.8×10^{-9}

C. 1.8×10^{-8}

D. 3.5×10^{-8}

Answer: B

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194. A 0.010M solution of maleic acid, a monoprotic organic acid is 14% ionised. What is K_a for maleic acid ?

A. 2.3×10^{-3}

B. 2.3×10^{-4}

C. 2.0×10^{-4}

D. 2.0×10^{-6}

Answer: B

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195. The pH of a $0.1M$ solution of NH_4Oh (having dissociation constant $K_b = 1.0 \times 10^{-5}$) is equal to

A. 3

B. 10.5

C. 11

D. 7.5

Answer: C

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196. If 20 mL of 0.4 N NaOH solution completely neutralises 40 mL of a dibasic acid, the molarity of the acid solution is :

A. 0.1 M

B. 0.2 M

C. 0.3 M

D. 0.4 M

Answer: A

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197. How many gram equivalents of NaOH are required to neutralize $25cm^3$ of decinormal HCl solution ?

A. 0.00125

B. 0.0025

C. 0.005

D. 0.025

Answer: B

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198. Ammonium acetate which is 0.01 M , is hydrolysed to 0.001 M concentration . Calculate the change in pH in 0.001 M solution , if initially pH = pK_a

A. 5

B. 10

C. 100

D. 1

Answer: D

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199. In which ratio of volumes 0.4 M HCl and 0.9 M HCl are to be mixed such that the concentration of the resultant solution becomes 0.7 M ?

A. $4:9$

B. $2:3$

C. $3:2$

D. $1:1$

Answer: B

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200. The expression for the solubility product of Ag_2CO_3 will be :

A. $K_{sp} = s^2$

B. $K_{sp} = 4s^3$

C. $K_{sp} = 27s^4$

D. $K_{sp} = s$

Answer: B

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201. The pH of $M/100$ NaOH solution is :

A. 2

B. 10

C. 6

D. 12

Answer: D

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202. $50cm^3$ of 0.2 N HCl is titrated against 0.1 N NaOH solution. The titration is discontinued after adding $50cm^3$ of NaOH solution. The remaining titration is completed by adding 0.5 N KOH solution. What is the volume of KOH required for completing the titration ?

A. $12cm^3$

B. $10cm^3$

C. $25cm^3$

D. $10.5cm^3$

Answer: B

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203. In a titration $20cm^3$ of 0.1 N oxalic acid solution requires $20cm^3$ of sodium hydroxide for complete neutralization. The mass of sodium hydroxide in $250cm^3$ solution is

A. 12.5 g

B. 1.25 g

C. 0.125 g

D. 125 g

Answer: B

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204. Which of the following compound will have the smallest pK_a value ?

A. Benzoic aci

B. Formic acid

C. Acetic acid

D. Phenylacetic acid.

Answer: B

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205. The correct order of increasing basicity of the given conjugate bases $(R = CH_3)$ is

A. $RCOO^- < NH_2^- < HC \equiv \bar{C} < R^-$

B. $RCOO^- < HC \equiv \bar{C} < NH_2^- < R^-$

C. $RCOO^- < HC \equiv \bar{C} < R^- < NH_2^-$

D. $R^{-} < HC \equiv \bar{C} < RCOO^{-} < NH_2^{-}$

Answer: B

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206. Which of the following molecular hydrises acts as a Lewis acid?

A. CH_4

B. NH_3

C. H_2O

D. B_2H_6

Answer: D

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207. In aqueous solution the ionization constants for carbonic acid are:

$K_1 = 4.2 \times 10^{-7}$ and $K_2 = 4.8 \times 10^{-11}$

Select the correct statement for a saturated $0.034M$ solution of the carbonic acid.

A. The concentration of H^+ and HCO_3^- are approximately equal

B. The concentration of H^+ is double that of CO_3^{2-}

C. The concentration of CO_3^{2-} is 0.034M

D. The concentration of CO_3^{2-} is greater than that of HCO_3^-

Answer: A

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208. The correct order of decreasing acidic nature of $H_2O, ROH, HC \equiv CH$ and $NH_{93}\big)$ is

A. $HC \equiv CH > H_2O > ROH > NH_3$

B. $H_2O > ROH > HC \equiv CH > NH_3$

C. $ROH > NH_3 > HC \equiv CH > H_2O$

D. $H_2O > ROH > NH_3 > HC \equiv CH$

Answer: B

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209. The hydrogen ion concentration of a $10^{-8} MHCl$ aqueous soultion at $298K\left(K_w = 10^{-14}\right)$ is

A. $9.525 \times 10^{-8} M$

B. $1.0 \times 10^{-8} M$

C. $1.0 \times 10^{-6} M$

D. $1.0525 \times 10^{-7} M$

Answer: D

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210. 0.023 g of sodium metal is reacted with 100cm^3 of water. The pH of the resulting solution is

A. 10

B. 11

C. 9

D. 12

Answer: D

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211. 0.1M HCl and 0.1 MH_2SO_4, each of volume 2 ml are mixed and the volume is made up to 6 ml by adding 2 ml of 0.01 N NaCl solution. The pH of the resulting mixture is

A. 1.17

B. 1.2

C. 0.3

D. log 2-log 3

Answer: B

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212. The pH of the solutions produced by mixing equal volumes of $2.0 \times 10^{-3} MHClO_4$ and $1.0 \times 10^{-2} MKClO_4$ is

A. 2.7

B. 2.3

C. 3.0

D. 1.0

Answer: C

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213. The solubility product of a sparingly soluble metal hydroxide $\left[M(OH)_2\right]$ is $5 \times 10^{-16} mol^3 dm^{-9}$ at 298 K. Find the pH of its saturated aqueous solution.

A. 5

B. 9

C. 11.5

D. 2.5

Answer: B

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214. Solubility product of silver bromide is 5.0×10^{-13}. The quantity of potassium bromide (molar mass taken as $120 g mol^{-1}$) to be added to $1L$ of $0.05M$ solution of silver nitrate to start the precipitation of $AgBr$ is

A. $6.2 \times 10^{-5} g$

B. $5.0 \times 10^{-8} g$

C. $1.2 \times 10^{-10} g$

D. $1.2 \times 10^{-9} g$

Answer: D

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215. At $25^{\circ} C$, the solubility product of $Mg(OH)_2$ is 1.0×10^{-11}. At which pH, will Mg^{2+} ions start precipitating in the form of $Mg(OH)_2$ from a solution of $0.001 M Mg^{2+}$ ions ?

A. 11

B. 8

C. 9

D. 10

Answer: D

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216. pH of saturated solution of $Ba(OH)_2$ is 12. The value of solubility product (K_{sp}) of $Ba(OH)_2$ is

A. $5.06 \times 10^{-7} M^3$

B. $4.00 \times 10^{-6} M^3$

C. $4.00 \times 10^{-7} M^3$

D. $5.00 \times 10^{-6} M^3$

Answer: B

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217. What is $[H^+]$ in mol/L of a solution that is $0.20M$ in CH_3COONa and $0.1M$ in CH_3COOH? K_a for CH_3COOH is 1.8×10^{-5}?

A. 9.0×10^{-6}

B. 3.5×10^{-4}

C. 1.1×10^{-5}

D. 1.8×10^{-15}

Answer: A

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218. A weak acid of dissociation constant 10^{-5} is being titrated with aqueous NaOH solution . The pH at the point of one third of neutralization of the acid will be

A. $5 + \log - \log 3$

B. $5 - \log 2$

C. $5 - \log 3$

D. $5 - \log 6$

Answer: B

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219. A buffer solution is prepared in which the concentration of NH_3 is $0.30M$ and the concentration of NH_4^+ is $0.20M$. If the equilibrium constant, K_b for NH_3 equals 1.8×10^{-5}, what is the pH of this solution? ($\log 2.7 = 0.43$)

A. 9.08

B. 9.43

C. 11.72

D. 8.73

Answer: B

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220. Which of the following is least likely to behave as Lewis acid?

A. H_2O

B. NH_3

C. BF_3

D. OH^-

Answer: C

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221. The solubility of $Ca_3(PO_4)_2$ in water is y moles / litre. Its solubility product is

A. $6y^2$

B. $36y^4$

C. $64y^5$

D. $108y^5$

Answer: D

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222. pH for the solution of salt undergoing anionic hydrolysis (say CH_3COONa) is given by:

A. $7 - \frac{1}{2}pK_a + \frac{1}{2}\log C$

B. $\frac{1}{2}pK_w + \frac{1}{2}pK_b + \frac{1}{2}\log C$

C. $\frac{1}{2}pK_w - \frac{1}{2}pK_b - \frac{1}{2}\log C$

D. $\frac{1}{2}pK_w + \frac{1}{2}K_a + \frac{1}{2}\log C$

Answer: D

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223. The pH of 10^{-2} M $Ca(OH)_2$ is

A. 12.3010

B. 6.96

C. 7.2

D. 6

Answer: B

Watch Video Solution

224. For a buffer solution which of the following is true ?

A. pH does not change at all on addition of acid or base

B. pH change is very little on addition of acid or base

C. It is a mixture of strong acid and its salt

D. It is a mixture of strong base and its salt.

Answer: B

Watch Video Solution

225. A mono basic weak acid solution has a molarity of 0.005 and pH of 5. What is its percentage ionisation in this solutino ?gt

A. 2.0

B. 0.2

C. 0.5

D. 0.25

Answer: B

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226. pH value of which of the following is not equal to one

A. $0.1 M CH_3COOH$

B. $0.1 M HNO_3$

C. $0.05 M H_2SO_4$

D. 50 $cm^3 0.4 M HCl + 50 cm^3 0.2 M NaOH$

Answer: A

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227. The solubility of product (K_{sp}) of the following compounds are given at $25^{\circ} C$

Compound	K_{sp}	Compound	K_{sp}
$AgCl$	1.1×10^{-10}	$PbCrO_4$	4.0×10^{-4}
AgI	1.0×10^{-16}	Ag_2XO_3	8.0×10^{-12}

The most soluble and least soluble compounds are respectively

A. AgCl and $PbCrO_4$

B. AgI and Ag_2CO_3

C. AgCl and Ag_2CO_3

D. Ag_2CO_3 and $PbCrO_4$

Answer: D

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228. At 25° C, the solubility product of Hg_2CI_2 in water is $3.2 \times 10^{-17} mol^3 dm^{-9}$ what is the solubility of Hg_2CI_2 in water at 25°C ?

A. $1.2 \times 10^{-12} M$

B. $3.0 \times 10^{-6} M$

C. $2 \times 10^{-6} M$

D. $1.2 \times 10^{-16} M$

Answer: C

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229. If the salts $M_2X, QY_2,$ and PZ_3 have the same solubilities $\left(<\frac{4}{27}\right)$, their K_{sp} values are related

A. $k_{sp}\left(M_2x\right) = k_{sp}\left(Qy_2\right) < k_{sp}\left(Pz_3\right)$

B. $k_{sp}\left(M_2x\right) > k_{sp}\left(Qy_2\right) = k_{sp}\left(Pz_3\right)$

C. $k_{sp}\left(M_2x\right) < k_{sp}\left(Qy_2\right) < k_{sp}\left(Pz_3\right)$

D. $k_{sp}\left(M_2x\right) > k_{sp}\left(Qy_2\right) > k_{sp}\left(Pz_3\right)$

Answer: A

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230. Passing H_2S gas into a mixture of $Mn^{2+}, Ni^{2+}, Cu^{2+}$ and Hg^{2+} ions in an acidified aqueous solution precipitates

A. CuS and Hg_2S

B. MnS and CuS

C. MnS and NiS

D. NiS and Hg_2S

Answer: A

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231. Which of the following is the correct statement ?

A. HCO_3^- is the conjugate base of CO_3^{2-}

B. NH_2 is the conjugate acid of NH_3

C. H_2SO_4 is the conjugate acid of HSO_4^-

D. H_2CO_3 is the conjugate base of HCO_3

Answer: C

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232. Which of the following will decrease the pH of a 50 ml solution of $0.01 MHCI$?

A. Addition of 50 mL of 0.01 M HCl

B. Addition of 50 mL of 0.02 M HCl

C. Addition of 150 mL of 0.02 M HCl

D. Addition of 5 mL of 1 M HCl

Answer: D

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233. The pH of a solution obtained by mixing 100mL of a solution pH of $= 3$ with 400mL of a solution of pH $= 4$ is

A. $3 - \log 2.8$

B. $7 - \log 2.8$

C. $4 - \log 2.8$

D. 5 - log2.8

Answer: C

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234. The pK_a of an acid HA is 4.77 and pK_b of a base of BOH is 4.75 . The pH of 0.1 M aqueous solution of the salt AB is

A. 7.02

B. 7.01

C. 6.99

D. 7.00

Answer: B

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235. How many litres of water must be added to $1L$ of an aqueous solution of HCl with a pH of 1 to create an aqueous solution with pH of 2 ?

A. 9.0 L

B. 0.1 L

C. 0.9 L

D. 2.0 L

Answer: A

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236. The K_{sp} of Ag_2CrO_4 is 1.1×10^{-12} at $298K$. The solubility (in mol/L) of Ag_2CrO_4 in a $0.1MAgNO_3$ solution is

A. 1.1×10^{-11}

B. 1.1×10^{-10}

C. 1.1×10^{-12}

D. 1.1×10^{9}

Answer: B

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SELECTED STRAIGHT OBJECTIVE TYPE MCQs

1. A buffer solution can be prepared from a mixture of

A. Sodium acetate and acetic acid in water

B. Sodium acetate and hydrochloride acid in water

C. Ammonia and ammonium chloride in water

D. Ammonia and sodium hydroxide in water

Answer: A,C

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2. Degree of dissociation of weak electrolyte AB is

A. directly proportional to the square root of dilution

B. inversely proportional to the dilution

C. inversely proportional to the square root of concentration

D. directly proportional to concentration

Answer: A::C

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3. Acid strength is proportional to

A. H^{+}

B. pH

C. Poh

D. K_a

Answer: C,D

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4. If the concentration of two monobasic acids are same, their relative strength can be compared by

A. α_1 / α_2

B. K_1 / K_2

C. $\left[H^+\right]_1 / \left[H^+\right]_2$

D. $\sqrt{K_1 / K_2}$

Answer: A,C,D

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5. A weak acid HA has a pH $= 4$. This can be confirmed as

A. $c = 10^{-3}, \alpha = 10\%$

B. $c = 10^{-2}, K_a = 10^{-6}$

C. $[A] = 10^{-4}$

D. $K_a = 10^{-2}, \alpha = 10\%$

Answer: A::B::C

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6. Dissociation of an indicator can be considered as $H\ln \Leftrightarrow H^+ + \ln^-$. Colour of Hln is P and $\ln^-$ is Q. Given the ratio of concentration of Hln to $\ln^-$ ranges from 10 to $1/10$ then which of the following statements are correct.

A. Solution assumes P colour, when $pH \le pK_{\ln - 1}$

B. Solution assumes P colour, when $pH \ge pH_{\ln - 1}$

C. Solution assumes Q colour , when $pH \ge pK_{\ln - 1}$

D. Solution assumes Q colour , when $pH \le pK_{\ln - 1}$

Answer: A,B,C

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7. Which of the following solution will have no effect on Ph on dilution ?

A. 0.1 M NH_4HS

B. 5 M $H_2CO_3 + 5NNaHCO_3$

C. $1MCH_3COONH_4$

D. $1MNH_4Cl$

Answer: A,B,C

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8. Which of the following are not Lewis acids ?

A. Ag^+

B. $ZnCl_2$

C. H_2O

D. Ch_3OH

Answer: C,D

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9. An acid buffer can be prepared by mixing solution of

A. sodiu chloride and hydrochloric acid

B. sodium acetate and acetice

C. sodium hydroxide and boric acid

D. sodium borate and boric acid

Answer: B::D

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10. Which of the following statements is / are not correct ?

A. pH of pure water is always 7

B. Conjugate base of a strong acid is a weak base

C. Conjugate base of HSO_4^- is SO_4^{2-}

D. Degree of dissociation of a weak acid decrease with increas in dilution.

Answer: A,D

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MCQs with only one correct Answer

1. At $90\ ^\circ C$, pure water has $\left[H_3O^+\right]$ as 10^{-6} mol L^{-1}. What is the value of K_w at $90\ ^\circ C$?

A. 10^{-6}

B. 10^{-14}

C. 10^{-12}

D. 10^{-8}

Answer: C

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2. An acidic buffer solution can be prepared by mixing solution of

A. Sodium acetate and acetic acid

B. Ammonium chloride and ammonium hydroxide

C. Sulphuric acid and sodium sulphate

D. Sodium chloride and sodium hydroxide.

Answer: A

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3. Which of the following salts undergoes anionic hydrolysis ?

A. $CuSO_4$

B. Na_2CO_3

C. NH_4Cl

D. $FeCl_3$

Answer: B

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4. Precipitation takes place when the ionic product

A. equals the solubility product

B. exceeds the solubility product

C. is less than the solubility product

D. is almost zero

Answer: B

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5. The compound whose $0.1M$ solution is basic is

A. ammonium acetate

B. ammonium chloride

C. ammonium sulphate

D. sodium acetate

Answer: D

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6. The pK_a of acteylsalicylic acid (aspirin) is 3.5. The pH of gastric juice in human stomach is about 2 - 3 and the pH in the small intestine is about 8. Aspirin will be:

A. unionised in the small intestine and in the stomach.

B. Complete ionised in the small intestine and in the stomach

C. ionised in the stomach and almost unionised in the small intestine

D. ionised in the small intestine and almost unionised in the stomach.

Answer: D

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7. At $25^{\circ}C$, the dissociation constants of CH_3COOH and $NH(4)OH$ in aqueous solution are almost same $\left(10^{-5}\right)$. If pH of same acetic acid solution is 3. The pH solution of NH_4OH of same conc. At the same temperature would be

A. 3.0

B. 4.0

C. 10.0

D. 11.0

Answer: D

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8. When equal volumes of the following solutions are mixed, precipitation of $AgCI\left(K_{sp} = 1.8 \times 10^{-10}\right)$ will occur only wity

A. $10^{-4}M\left(Ag^{+}\right)$ and $10^{-4}M\left(Cl^{-}\right)$

B. $10^{-5}M\left(Ag^{+}\right)$ and $10^{-5}M\left(Cl^{-}\right)$

C. $10^{-5}M\left(Ag^{+}\right)$ and $10^{-6}M\left(Cl^{-}\right)$

D. $10^{-10}M\left(Ag^{+}\right)$ and $10^{-10}M\left(Cl^{-}\right)$

Answer: A

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9. Which of the following mixture solution has $pH \approx 1.0$?

A. $100mL\frac{M}{10}HCl + 100mL\frac{M}{10}NaOH$

B. $55mL\frac{M}{10}HCl + 45mL\frac{M}{10}NaOH$

C. $10mL\frac{M}{10}HCl + 90mL\frac{M}{10}NaOH$

D. $75mL\frac{M}{5}HCl + 25mL\frac{M}{5}NaOH$

Answer: D

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10. The following equilibrium is established when hydrogen chloride is dissolved in acetic acid

$HCl(aq) + CH_3COOH(aq) \Leftrightarrow Cl^-(aq) + CH_3COOH_2^+(aq)$

The set that characterises the conjugate acid-base pairs is :

A. $\left(HCl, CH_3COOH\right)\left(CH_3COOH_2^+, Cl^-\right)$

B. $\left(HCl, CH_3COOH_2^+\right)$ and $\left(CH_3COOH, Cl^-\right)$

C. $\left(CH_3COOH_2^+, HCl\right)$ and $\left(Cl^-, CH_3COOH\right)$

D. $\left(HCl, Cl^-\right)$ and $\left(CH_3COOH_2^+, CH_3COOH\right)$

Answer: D

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11. The pK_a of HCN is 9.30. The pH of a solutin prepared by mixing 2.5 moles of KCN and 2.5 moles of HCN in water and making up the total volume to $500mL$ is

A. 9.30

B. 7.30

C. 10.30

D. 8.30

Answer: A

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12. If pK_b for fluoride ion at $25\,^{\circ}C$ is 10.83, the ionisation constant of hydrofluoric acid in water at this temperature is

A. 1.74×10^{-5}

B. 3.52×10^{-3}

C. 6.75×10^{-4}

D. 5.38×10^{-2}

Answer: C

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13. The solubility of A_2X_2 is x mole dm^{-3}. Its solubility product is

A. $6y^4$

B. $64y^4$

C. $36y^5$

D. $108y^5$

Answer: D

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14. The pH of $0.1M$ solution of the following salts increases in the order

A. $NaCl < NH_4Cl < NaCN < HCl$

B. $HCl < NH_4Cl < NaCl < NaCN$

C. $NaCN < NH_4Cl < NaCl < HCl$

D. $HCl < NaCl < NaCN < NH_4Cl$

Answer: B

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15. H_3BO_3 is :

A. monobasic and weak Lewis acid

B. monobasic and weak Bronsted acid

C. monobasic and strong Lewis acid

D. tribasic and weak Bronsted acid.

Answer: A

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16. A solution is 10^{-3} M each in $Mn^{2+}, Fe^{2+}, Zn^{2+}$ and Hg^{2+} is treated with 10^{-16} M sulphide ion, If K_{sp} values of MnS, FeS, ZnS and HgS are $10^{-15}, 10^{-23}, 10^{-20}$ and 10^{-54} respectively, which one will precipitate first?

A. FeS

B. MnS

C. HgS

D. ZnS

Answer: C

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17. A weak acid HX has the dissociation constant $1 \times 10^{-5}M$. It forms a salt NaX on reaction with alkali. The percentage hydrolysis of $0.1M$ solution of NaX is

A. 0.0001%

B. 0.01%

C. 0.1%

D. 0.15%

Answer: B

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18. 0.1 mole of $CH_3NH_2\left(K_b = 5 \times 10^{-4}\right)$ is mixed with 0.08 mole of HCl and diluted to one litre. The $\left[H^+\right]$ in solution is

A. 8×10^{-2}

B. 2×10^{-11}

C. 1.23×10^{-4}

D. 8×10^{-11}

Answer: D

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19. The hydrogen ion concentration of a $10^{-8} MHCl$ aqueous soultion at $298K\left(K_w = 10^{-14}\right)$ is

A. $9.525 \times 10^{-8} M$

B. $1.0 \times 10^{-8} M$

C. $1.0 \times 10^{-6} M$

D. $1.0525 \times 10^{-7} M$

Answer: D

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20. 40 ml of 0.1 M ammonia is mixed with 20 ml of $0.1 MHCI$. What is the pH of the mixture ? (pK_b of ammonia solution is 4.74.)

A. 4.74

B. 2.26

C. 9.26

D. 5.00

Answer: C

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21. A weak acid, HA, has a K_a of 1.00×10^{-5}. If 0.100 mol of the acid is dissolved in 1 L of water, the percentage of the acid dissociated at equilibrium is the closed to

A. 0.100 %

B. 99.0 %

C. 1.00 %

D. 99.9 %

Answer: C

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22. Which one of the following ionic species has the greatest proton affinity to form stable compound ?

A. I^-

B. HS^-

C. NH_2^-

D. F^-

Answer: C

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23. The pK_a of a weak acid (HA) is 4.5. The pOH of an aqueous buffered solution of HA in which 50% of the acid is ionized is:

A. 7.0

B. 4.5

C. 2.5

D. 9.5

Answer: D

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24. In a saturated solution of the spatingly soluble strong electrolyte $AgIO_3$ (molecular mass $= 283$) the equilibrium which sets in is

$AgIO_3(s) \Leftrightarrow Ag^+(aq) + IO_3^-(aq)$

If the solubility product constant K_{SP} of $AgIO_3$ at a given temperature is

1.0×10^{-8}, what is the mass of $AgIO_3$ cotained in $100mL$ of its saturated solution?

A. $1.0 \times 10^{-4}g$

B. $28.3 \times 10^{-2}g$

C. $2.83 \times 10^{-3}g$

D. $1.0 \times 10^{-7}g$

Answer: C

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25. When $2.5mL$ of $2/5M$ weak monoacidic base $\left(K_b = 1 \times 10^{-12} at 25^\circ C\right)$ is titrated with $2/15MHCI$ in water at $25^\circ C$ the concentration of $H^{\oplus}$ at equivalence point is $\left(K_w = 1 \times 10^{-14} at 25^\circ C\right)$

A. $3.7 \times 10^{-13}M$

B. $3.2 \times 10^{-7}M$

C. $3.2 \times 10^{-2} M$

D. $2.7 \times 10^{-2} M$

Answer: C

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26. The solubility product constant $\left(K_{sp}\right)$ of salts of types MX, MX_2, and M_3X at temperature T are 4.0×10^{-8}, 3.2×10^{-14}, and 2.7×10^{-15}, respectively. The solubilities of the salts at temperature T are in the order

A. $MX > MX_2 > M_3X$

B. $M_3 > MX_2 > MX$

C. $MX_2 > M_3X > MX$

D. $MX > M_3X > MX_2$

Answer: D

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27. The ionization constant of ammonium hydroxide is 1.77×10^{-5} at $298K$. Hydrolysis constant of ammonium chloride is

A. 5.65×10^{-12}

B. 5.65×10^{-10}

C. 5.65×10^{-12}

D. 5.65×10^{-13}

Answer: B

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28. The dissociation constants for acetic acid and HCN at $25^{\circ}C$ are 1.5×10^{-5} and 4.5×10^{-10}, respectively. The equilibrium constant for the equilibirum $CN^{-} + CH_3COOH \Leftrightarrow HCN + CH_3COO^{-}$ would be

A. 3.0×10^{4}

B. 3.0×10^{5}

C. 3.0×10^{-5}

D. 3.0×10^{-4}

Answer: A

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29. Three reactions involving $H_2PO_4^-$ are given below

$I.\ H_3PO_4 + H_2O \rightarrow H_3O^+ + H_2PO_4^-$

$II.\ H_2PO_4^- + H_2O \rightarrow HPO_4^{2-} + H_3O^+$

$III.\ H_2PO_4^- + OH^- \rightarrow H_3PO_4 + O^{2+}$

In which of the above does $H_2PO_4^-$ act as an acid?

A. (i) only

B. (ii) only

C. (i) and (ii)

D. (iii) only

Answer: B

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LINKED COMPREHENSION TYPE MCQs

1. The process in which solution containing more than one typeof ions (either cation or anion) and in which one ion undergoes almst complete precipitation followed by the second ion and similarly second ion undergoes complete precipitation followed by the third ion is known as preferential precipitation. It is the solubility of the salt,not the solubility product of the salt, by means of which one can predict the preferential precipitation of the salt or ion among the lot of ions in the solution. For example , in a solution containing Cl^-, Br^- and I^- ions, if Ag^+ ions are added, then out of three , the less soluble salt is precipitated first . If the addition of Ag^+ ions is continued, eventually , a stage is reached when the next lesser soluble salt starts precipitating along with the least soluble salt and so on.

If the stiochiometry of the salt is same, then the salt with the minimum K_{sp} (solubility product) will have minimum solubility and will precipitate first, followed by the salt of next higher solubility product and so on. If the stiochiometry of teh salt is not same, then from the solubility product data alone, we cannot predict which ions will precipitate first. For example, a solution containing Cl^- and CrO_4^{2-}. In order to predict which ion will precipitate first, we have to calculate the amount of Ag^+ ions needed to start precipitation through the solubility product data given. When $AgNO_{93})$ is added to the solution, the minimum of the two concentrations needed to start the precipitation will be reached and thus corresponding $[Ag^+]$ to start the precipitation increases. Its concentration eventually becomes equal to the value required for CrO_4^{2-} . At this stage, practically almost the whole of Cl^- ions get precipitated . Addition of more $AgNO_3$ causes simultaneous precipitation of both the ions together.

Suppose a student of chemistry performs the following two sets of experiments in order to known the preferential precipitation of ions as well as its precipitated percentage amount.

Experiment 1. He prepare a solution of anions composed of 0.1 M each of

Cl^-, Br^- and I^-. Further he adds gradually solid $AgNO_3$ to this solution. He assumes that volume of the solution does not change after the addition of solid $AgNO_3\left(K_{sp}AgCl = 1.0 \times 10^{-9}M^2, K_{sp}AgBr = 10^{-10}M^2\right.$ and $\left.K_{sp}AgI = 10^{-12}M^2\right)$

Experiment -2. He prepares a solution of cations $Cd^{2+}(0.2M)$ and $Bi^{3+}(0.3m)$. Now he adds S^{2-} ions into the solution of cations in order to separate them by selective precipitation Cd^{2+} forms yellow precipitate of CdS and Bi^{3+} forms black precipitate of Bi_2S_3 with S^{2-} ions respectively. $\left(K_{sp}Bi_2S_3 = 9 \times 10^{-25}M^5\right.$ and $\left.K_{sp}CdS = 2 \times 10^{-20}M^2\right)$.Answer the following questions ont he basis of the above write up.

Which of the following will precipitate first in experiment -1 ?

A. I^- ion

B. Br^- ion

C. Cl^- ion

D. cannot be predicted

Answer: A

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2. The process in which solution containing more than one typeof ions (either cation or anion) and in which one ion undergoes almst complete precipitation followed by the second ion and similarly second ion undergoes complete precipitation followed by the third ion is known as preferential precipitation. It is the solubility of the salt,not the solubility product of the salt, by means of which one can predict the preferential precipitation of the salt or ion among the lot of ions in the solution. For example , in a solution containing Cl^-, Br^- and I^- ions, if Ag^+ ions are added, then out of three , the less soluble salt is precipitated first . If the addition of Ag^+ ions is continued, eventually , a stage is reached when the next lesser soluble salt starts precipitating along with the least soluble salt and so on.

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Which of the following is the correct order of appearance of coloour of the precipitate in experiment ?

A. yellow $>$ pale yellow $>$ curdy white

B. yellow $<$ pale yellow $<$ curdy white

C. pale yellow $>$ yellow $<$ curdy white

D. pale yellow $>$ yellow $>$ curdy white

Answer: A

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What % of the (ion) will get precipitate when the second ion start precipitating in experiment -1 ?

A. 10 %

B. 90 %

C. 1 %

D. 99 %

Answer: D

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What percent of the anions Br^- and I^- get precipitated respectively when the third ion starts precipitating in experiment -1 ?

A. 90 % , 99.9 %

B. 99.9 % , 90 %

C. 80 % , 90 %

D. 90 % , 80 %

Answer: A

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5. The process in which solution containing more than one typeof ions (either cation or anion) and in which one ion undergoes almst complete precipitation followed by the second ion and similarly second ion undergoes complete precipitation followed by the third ion is known as preferential precipitation. It is the solubility of the salt,not the solubility product of the salt, by means of which one can predict the preferential precipitation of the salt or ion among the lot of ions in the solution. For example , in a solution containing Cl^-, Br^- and I^- ions, if Ag^+ ions are added, then out of three , the less soluble salt is precipitated first . If the addition of Ag^{+} ions is continued, eventually , a stage is reached when the next lesser soluble salt starts precipitating along with the least soluble salt and so on.

If the stiochiometry of the salt is same, then the salt with the minimum K_{sp} (solubility product) will have minimum solubility and will precipitate first, followed by the salt of next higher solubility product and so on. If the stiochiometry of teh salt is not same, then from the solubility product data alone, we cannot predict which ions will precipitate first. For example, a solution containing Cl^{-} and CrO_4^{2-}. In order to predict which ion will precipitate first, we have to calculate the amount of Ag^{+} ions needed to start precipitation through the solubility product data given. When $AgNO_{93})$ is added to the solution, the minimum of the two concentrations needed to start the precipitation will be reached and thus corresponding $\left[Ag^{+}\right]$ to start the precipitation increases. Its concentration eventually becomes equal to the value required for CrO_4^{2-} . At this stage, practically almost the whole of Cl^{-} ions get precipitated . Addition of more $AgNO_3$ causes simultaneous precipitation of both the ions together.

Suppose a student of chemistry performs the following two sets of experiments in order to known the preferential precipitation of ions as well as its precipitated percentage amount.

Experiment 1. He prepare a solution of anions composed of 0.1 M each of Cl^-, Br^- and I^- . Further he adds gradually solid $AgNO_3$ to this solution. He assumes that volume of the solution does not change after the addition of solid $AgNO_3\left(K_{sp}AgCl = 1.0 \times 10^{-9}M^2, K_{sp}AgBr = 10^{-10}M^2\right.$ and $\left.K_{sp}AgI = 10^{-12}M^2\right)$

Experiment -2. He prepares a solution of cations $Cd^{2+}(0.2M)$ and $Bi^{3+}(0.3m)$. Now he adds S^{2-} ions into the solution of cations in order to separate them by selective precipitation Cd^{2+} forms yellow precipitate of CdS and Bi^{3+} forms black precipitate of Bi_2S_3 with S^{2-} ions respectively. $\left(K_{sp}Bi_2S_3 = 9 \times 10^{-25}M^5\right.$ and $\left.K_{sp}CdS = 2 \times 10^{-20}M^2\right)$.Answer the following questions ont he basis of the above write up.

In experiment 02, what is the maximum concentration of S^{2-} ion at which one of the two metal ions gets maximum precipitation ?

A. 10^{-8} M

B. $2 \times 10^{-7}M$

C. $2 \times 10^{-9}M$

D. None

Answer: A

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In experiment -2 what % of the metal ions get precipitated at which S^{2-} get saturated with another ion ?

A. 10 %

B. 80 %

C. 20 %

D. 90 %

Answer: A

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Which one of the following statements is correct regarding the experiment ?

A. First of all yellow ppt. will appear

B. First of all black ppt. will appear

C. Appearance of yellow ppt. and black ppt. will occu simultaneously

D. Cannot be predicted

Answer: A

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8. The concentration of hydrogen ion is a measure of acidity or alkalinity of a solution. A convenient way of expressing the hydrogen ion

concentration of a solution is, in terms of the pH scale devised by Sorenson's . The pH of a solution is defined as the negative logarithm of active concentration of H^+ ions to the base 10 i.e.,

$pH = -\log_{10}\left[HI^+\right]$ or $\left[H^+\right] = 10^{-pH}$

At $25\,^\circ C$

(i) if $pH < 1$, then solution is acidic

(ii) if $pH = 7$, then solution is neutral

(iii) if $pH > 7$, then the solution is basic

Total $\left[H^+\right]$ and $\left[OH^-\right]$ in a mixture of strong acids or bases are represented in terms normality, which is equal to final number of milliequivalents of H^+ or OH^- present in millilitre of solution Since H_2O ionizes as

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At $T_1K = T_2K, K_{w_2} = K_{w1}$

(i) pH mixture of monoprotic weak acid is calculated as under : pH of monoprotic weak acid $i.e.,\ CH_3COOH$

	CH_3COOH	$\Leftrightarrow$	CH_3COO^-	+	H^+
at $t = 0$	C		0		0
at $t = t$	$C - \alpha$		$C\alpha$		$C\alpha$

$$\therefore K_a = \frac{C\alpha \times C\alpha}{C - C\alpha} = \frac{\alpha^2 C}{1 - \alpha}$$

When $a \le 0.1, 100\alpha = 1 - \alpha = 1$

$$\therefore K_a = \frac{\alpha^2 C}{1} \text{ [When } (1 - \alpha) = 1]$$

$$\alpha = \sqrt{\frac{K_a}{C}} \therefore \left[H^+\right] = \alpha C = \sqrt{K_a \times C}$$

(ii) pH of a mixture of monoprotic weak acids is calculated as follows

$$\left[H^+\right] = \sqrt{K_{a1}C_1 + K_{a2}C_2}.$$

where K_{a1} and K_{a2} are dissociation constants of monoprotic weak acids HA and HB acid C_1 and C_2 are their concentrations respectively.

(ii) pH of polyprotic weak acid, say $H_3A - a$ triprotic weak acid having dissociation constants $K_{a1}.K_{a2}$ and K_{a3} where $K_{a1} > > K_{a2} > > K_{a3}$.

Then in that case , maximum $\left[H^+\right]$ will be contributed from step I, and neglibily small from concentration of species producing from step III will be negligible with respect to steop II and similarly concentration of species producig from step II will be negligible with respect to step I. Based upon the above discussion, answer the following questions.

On decreasing the temperature , the pH of the solution

A. will increase

B. will decrease

C. first pH will increase, then it will decrease

D. None of these

Answer: A

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$$CH_3COOH \Leftrightarrow CH_3COO^- + H^+$$

at $t = 0$	C	0	0
at $t = t$	$C - \alpha$	$C\alpha$	$C\alpha$

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At temperature $150\,^{\circ}C$, for $pH = 7$, the nature of the solution will be

A. basic

B. acidic

C. stll neutral

D. first it will be acidic, after sometimes it will be neutral

Answer: A

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2g NaOH is added to 100mL of $M/20H_2SO_4$ solution and the resulting solution is obtained by additino of 900 mL of wter, then what will be the pH of the solution ?

A. 12.6

B. 1.4

C. 10.6

D. 2.4

Answer: A

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How much volume of 10^{-2} M HCl should be added to 100mL of 10^{-2} M NaOH solution so that its pH changes by one unit ?

A. 9.9 mL

B. 1.5 mL

C. 7 mL

D. 8 mL

Answer: A

View Text Solution

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Then in that case , maximum $\left[H^{+}\right]$ will be contributed from step I, and neglibily small from concentration of species producing from step III will be negligible with respect to steop II and similarly concentration of species producig from step II will be negligible with respect to step I. Based upon the above discussion, answer the following questions.

A basic mixture of 100mL of $M/20$ NaOH and 200mL of $M/10Ca(OH)_2$ is mixed with 200 mL of $M/10H_{92}\big)SO_{94}\big)$ and finally the whole mixture is diluted to 100mL then the pH of the resulting solution will be

A. 12.0

B. 10.5

C. 8

D. None

Answer: A

View Text Solution

13. The concentration of hydrogen ion is a measure of acidity or alkalinity of a solution. A convenient way of expressing the hydrogen ion concentration of a solution is, in terms of the pH scale devised by Sorenson's . The pH of a solution is defined as the negative logarithm of active concentration of H^+ ions to the base 10 i.e.,

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$$\alpha = \sqrt{\frac{K_a}{C}} \therefore \left[H^+\right] = \alpha C = \sqrt{K_a \times C}$$

(ii) pH of a mixture of monoprotic weak acids is calculated as follows

$$\left[H^+\right] = \sqrt{K_{a1}C_1 + K_{a2}C_2}.$$

where K_{a1} and K_{a2} are dissociation constants of monoprotic weak acids HA and HB acid C_1 and C_2 are their concentrations respectively.

(ii) pH of polyprotic weak acid, say H_3A - a triprotic weak acid having dissociation constants $K_{a1}.K_{a2}$ and K_{a3} where $K_{a1} > > K_{a2} > > K_{a3}$. Then in that case , maximum $\left[H^+\right]$ will be contributed from step I, and neglibily small from concentration of species producing from step III will be negligible with respect to steop II and similarly concentration of species producig from step II will be negligible with respect to step I. Based upon the above discussion, answer the following questions.

What will be the $\left[S^{2-}\right]$ and pH for 0.1 M H_2S solution respectively ? (Given that for $H_2S, K_{a1} = 1.0 \times 10^{-7}, K_{a2} = 1.3 \times 10^{-13}$)

A. $1.1 \times 10^{-11}, 5$

B. $1.3 \times 10^{-13}, 5$

C. $1.1 \times 10^{-20}, 4$

D. $1.3 \times 10^{-13}, 4$

Answer: D

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14. The concentration of hydrogen ion is a measure of acidity or alkalinity of a solution. A convenient way of expressing the hydrogen ion concentration of a solution is, in terms of the pH scale devised by Sorenson's . The pH of a solution is defined as the negative logarithm of active concentration of H^+ ions to the base 10 i.e.,

$pH = -\log_{10}\left[HI^+\right]$ or $\left[H^+\right] = 10^{-pH}$

At $25^\circ C$

(i) if $pH < 1$, then solution is acidic

(ii) if $pH = 7$, then solution is neutral

(iii) if $pH > 7$, then the solution is basic

Total $\left[H^+\right]$ and $\left[OH^-\right]$ in a mixture of strong acids or bases are represented in terms normality, which is equal to final number of milliequivalents of H^+ or OH^- present in millilitre of solution Since H_2O ionizes as

$H_2O \Leftrightarrow H^+ + OH^-$

Ionic product of water , $K_w = \left[H^+\right]\left[OH^-\right]...(i)$

Taking log on both sides in equation (i), we find $pH + pOH = pK_w$

For neutral solution, $pH = pOH \therefore 2pH = pK_w$

$\therefore pH = 1.2pK_w$

Since dissociation of water is an endothermic process, so temperature will have great effect on K_w as well as on the pH of solution i.e., the nature of the soluiton . K_w at different temperature are related as under.

$$\ln \frac{K_{w2}}{K_{w1}} = \frac{\Delta H}{R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$$

At $T_1K = T_2K, K_{w_2} = K_{w1}$

(i) pH mixture of monoprotic weak acid is calculated as under : pH of monoprotic weak acid $i.e.,\ CH_3COOH$

$$CH_3COOH \Leftrightarrow CH_3COO^- + H^+$$

at $t = 0$	C	0	0
at $t = t$	$C - \alpha$	$C\alpha$	$C\alpha$

$$\therefore K_a = \frac{C\alpha \times C\alpha}{C - C\alpha} = \frac{\alpha^2 C}{1 - \alpha}$$

When $a \leq 0.1, 100\alpha = 1 - \alpha = 1$

$$\therefore K_a = \frac{\alpha^2 C}{1} \text{ [When } (1 - \alpha) = 1]$$

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What will be the value of $\left[H^{+}\right]$ of a $5 \times 10^{-6} MCH_3COOH$ solution $\left(K_a = 1.8 \times 10^{-5}\right)$?

A. $\sqrt{1.8 \times 10^{-5} \times 10^{-6}}$

B. $10^{-6} M$

C. 9.5×10^{-6}

D. None of these

Answer: C

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100mL $M/10$ HA $\left(K_{a1} = 8 \times 10^{-5}\right)$ and 200 mL of HB $\left(K_{a2} = 10^{-5}\right)$ acid mixture is diluted to one litre, then what will be the pH of the resulting solution ?

A. 3

B. 5

C. 6.5

D. None of these

Answer: A

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What is the sulphide ion concentration of a dilute solution that has been saturated with 0.1 M of H_2S, If pH of the solution is 3 ?

$\left(K_{a1} = 1.0 \times 10^{-7}, K_{a2} = 1.3 \times 10^{-13}\right)$

A. 1.25×10^{-17}

B. 1.3×10^{-13}

C. 1.45×10^{19}

D. 1.30×10^{-15}

Answer: A

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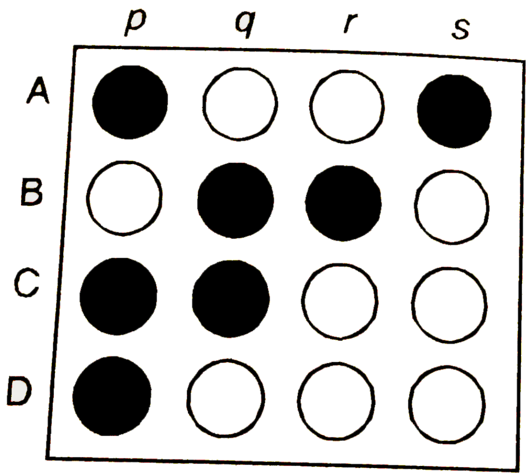
MATRIX MATCH TYPE MCQs

1. Here each question contains statements given in two columns which have to be matched. statements in Column I are labelled as A,B,C and D whereas the statements in Column II are labelled as p,q,r and s. the answer to these questions are to be appropriatly bubbled as illustrated in the following example

if the correct matches are A-p , A-s, B-q, B-r , C-p , C-q and C-p their correctly labelled 4 x 4 matrix should look like the following



	Column I	Column II
(A)	Degree of dissociation	(p) $\frac{\text{No. of molecules dissociated}}{\text{No. of molecules taken}}$
(B)	Oswald's dilution law	(q) $\alpha = \sqrt{K \times C}$
(C)	Catalyst	(r) $\left[H_3O\right]^+\left[OH^-\right]$
(D)	Ionic product of water	(s) Helps in attaining equilibrium in appropriate ti

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2. Here each question contains statements given in two columns which have to be matched. statements in Column I are labelled as A,B,C and D whereas the statements in Column II are labelled as p,q,r and s. the answer to these questions are to be appropriatly bubbled as illustrated in the following example

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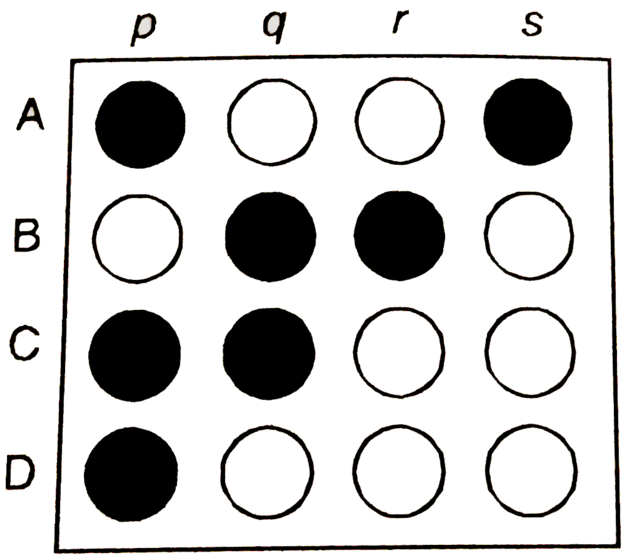

	Column I	Column II
(A)	Acid	(p)pH less than 7
(B)	Basic	(q)pH more than 7
(C)	Acidic	(r)Acidic Acid + Sodium acetate
(D)	Basic buffer	(s)Ammonium hydroxide + Ammonium chloride

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3. Here each question contains statements given in two columns which have to be matched. statements in Column I are labelled as A,B,C and D whereas the statements in Column II are labelled as p,q,r and s. the answer to these questions are to be appropriatly bubbled as illustrated in the following example

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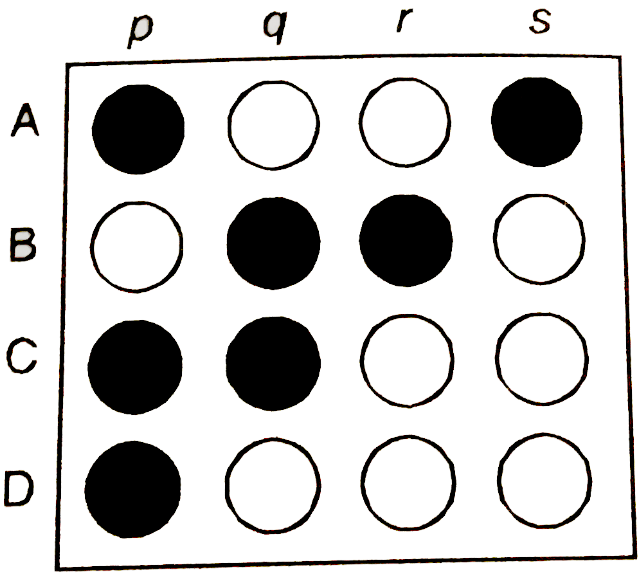

Column I

(A) pK_b of X^- $\left(K_b \text{ of } HX = 10^{-6}\right)$

(B) pH of $10^{-2} MHCl$

(C) pH of $10^{-2} M$acetic acid solution $\left(K_a \text{ of acetic acid } = 1.0 \times 10^{-5}\right)$

(D) pH of a solution obtained by mixing equal volumes of solution of pH =3 and

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REASON ASSERTION TYPE MCQs

1. Assertion (A) : The degree of ionization of water is small at $25\,^{\circ}C$, only about one of every 10^7 molecules in pure water is ionized at any instant

Reason (R) : In pure water at $25\,^{\circ}C$ the molar concentration of water is essentially constant.

A. Both A and R true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: B

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2. Assertion (A): pK_a of a weak acid become equal of the pH of the solution at the mid-point of titration.

Reason (R) : The molar concentration of the proton donor an proton acceptor beomes equal at the mid-point.

A. Both A and R true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A

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3. Assertion (A): pH of HCI solution is less than that of acetic acid of the some concentartion.

Reason (R) : In equimolar solution, the number of titrable protons present in HCI is less than that present in acetic acid.

A. Both A and R true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: C

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4. Assertion (A): When an acid or a base is added o water at constant temperature , the pH changes.

Reason (R): This is due to the change in ionic product of water.

A. Both A and R true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: C

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5. Assertion (A) : pH of aqueous solutin decreases when NaCN is added to it .

Reason (R) : NaCN provides a common ion to HCN.

A. Both A and R true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: D

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6. Assertion (A): pH of water increases with an increase in temperature.

Reason (R) : K_w or water increases with increase in temperature.

A. Both A and R true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: D

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7. Assertion (A): pH value of 0.1 M CH_3COOH is more than one.

Reason (R): CH_3COOH is weakly ionised.

A. Both A and R true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A

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8. Assertion (A): Acetic acid is a weak acid

Reason (R): Its conjugate base is weak

A. Both A and R true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: C

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9. Assertion (A): At $25^\circ C$, the pH of 1×10^{-8} M solution of hydrochloric acid is 8

Reason (R) : Ph of acidic solution is always below 7 at $25^\circ C$

A. Both A and R true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: D

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10. Assertion (A): A buffer solution has a capacity to resist the change in pH value on addition is small amount of acid or base to it.

Reason (R): An aqueous solution of ammonium acetate can act as a buffer.

A. Both A and R true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: B

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11. Assertion (A): Sb^{3+} is not precipitated as sulphide when $H_2S(g)$ is passed in alkaline solution.

Reason (R) : $\left[S^{2-}\right]$ ion in basic medium is inadequate for precipitation.

A. Both A and R true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: C

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12. Assertion: Addition of silver ions to a mixture of aqueous sodium chloride and sodium bromide solution will first precipitate $AgBr$ rather than $AgCl$.

Reason : K_{sp} of $AgCl < K_{sp}$ of $AgBr$.

A. Both A and R true and R is the correct explanation of A

B. Both A and R are true but R is not a correct explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: C

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INTEGER TYPE QUESTIONS

1. If pK_a of a weak acid is 5, then pK_b of the conjugate base will

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2. The total number of diprotic acids among the following is

$H_3PO_4, H_2SO_4, H_3PO_3$

$H_2CO_3, H_2S_2O_7, H_3BO_3$

$H_3PO_2, H_2CrO_4, H_2SO_3$

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3. The dissociation constant of a substituted benzoic acid at $25^\circ C$ is 1.0×10^{-4}. The pH of $0.01M$ solution of its salt is :

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4. Amongst the following, the total number of compounds whose aqueous solution turns red litmus paper blue is:

KCN K_2SO_4 $(NH_4)_2C_2O_4$ $NaCI$

$ZN(NO_3)_2$ $FeCI_3$ K_2CO_3 NH_4NO_3

$LiCN$

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5. In 1L saturated solution of $AgCI\left[K_{sp}(AgCI) = 1.6 \times 10^{-10}\right]$, $0.1mol$ of $CuCI\left[K_{sp}(CuCI) = 1.0 \times 10^{-6}\right]$ is added. The resultant concentration of Ag^+ in the solution is 1.6×10^{-x}. The value of "x" is.

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ULTIMATE PREPARATORY PACKAGE

1. For pure water $(pH = 7)$, K_w at 298 is 10^{-14}. On adding some acid to it, its pH changes to 3. The value of K_w for this acidicfied water will be

A. 10^{-11}

B. 10^{-14}

C. 10^{-6}

D. None of these

Answer: B

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2. Our of $HClO_4$ and H_2SO_4, which is a stronger acid in an aqueous solution

A. $HClO_4$

B. H_2SO_4

C. Both are equally strong

D. Strength depends on concentration

Answer: C

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3. Solubilities or relative concentrations of I_2 in an aqueosu solution of KI are compared at a constant temperature of $25^{\circ}C$

A. Solubility of I_2 in water is more than in an aqueous solution of KI

B. Solubility of I_2 in water is less than in an aqueous solution of KI

C. Solubility of I_2 is same in both the cases

D. Solubility of I_2 depends upon the external pressure.

Answer: B

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4. The Ph of boiling water $\left(100^{\circ}C\right)$ is 6.5625. The boiling water

A. is more acidic than water $(pH = 7)$ at 298 K

B. is more basic than water $(pH = 7)$ at 298K

C. is neutral

D. none of these

Answer: C

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5. Which of the following can act as a buffer in aqueous solution ?

A. A mixture of NaOH and CH_3COONa

B. CH_3COONH_4

C. NaCl

D. CH_3COONa

Answer: B

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6. Which of the following can act as a buffer in aqueous solution ?

A. H_2SO_4 and $\left(NH_4\right)_2SO_4$

B. Na_2HPO_4 and Na_3PO_4

C. HCl and NaCl

D. NaOH and CH_3COONa

Answer: B

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7. The $\left[H^+\right]$ of 0.10 MH_2S solution is (given $K_1 = 1.0 \times 10^{-7}, K_2 = 1.0 \times 10^{-14}\big)$

A. $1.0 \times 10^{-7} M$

B. $1.0 \times 10^{-4} M$

C. $1.0x10^{-8} M$

D. $1.0 \times 10^{-22} M$

Answer: B

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8. Pick out the incorrect statement

A. When a sample of H_2SO_4 is treated with an equal number of mol of NaOH, then entire sample of acid is half neutralised

B. When a sample of $Ba(OH)_2$ is treated with an equal number o mol of HCl entire sample of base is neutralised.

C. When a given number of mole of H_2SO_4 is treated with half of the number of mol of $Ba(OH)_2$, half of the acid is completely neutralised.

D. When a sample of NaOH is treated with half the number of mol of HCl, half of the base is completely neutralised.

Answer: B

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9. pH of 1 M H_2SO_4 solution in water is

A. 0

B. 1

C. between 0 and -1

D. none of these

Answer: C

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10. Which of the following reagents can be added to water to make 0.1 M solution of $NH_{94})^{+}$ ions

A. NH_3

B. NH_4Cl

C. NH_2Cl

D. CH_3CNH_2

Answer: B

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11. Autoionisation of NH_3 is

A. $NH_3 + H_2O \Leftrightarrow NH_4^+ + OH^-$

B. $2NH_3 + 2Na \Leftrightarrow 2NaNH_2 + H_2$

C. $NH_3 + NH_3 \Leftrightarrow NH_4^+ + NH_4^+$

D. None of these

Answer: C

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12. In the reaction

$$\left[A\left(H_2O\right)_6\right]^{3+} + H_2O \Leftrightarrow \left[Al\left(H_2O\right)_5OH\right]^{2+} + H_3O^+$$

A. $\left[Al\left(H_2O\right)^6\right]^{3+}$ is an acid

B. $\left[Al\left(H_2O\right)^6\right]^{3+}$ is a base

C. Both (A) and (B)

D. None

Answer: A

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13. What is true about zwitter ion.

$H_3N^+CH_2COO?$

A. $NH_2CH_2COO^-$ is its conjugate base

B. $H_3N^+CH_2COOH$ is its conjugate acid

C. Both (A) and (B)

D. None of these

Answer: C

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14. Which of the following is a set of amphiprotic species ?

A. $H_3O^+, HPO_4^{2-}, HCO_3^-$

B. $H_2O, HPO_3^{2-}, H_2PO_2^-$

C. $HSO_4^-, H_2PO_4^-, H_2PO_3^-$

D. Both (B) and (C)

Answer: C

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15. Which compound will liberate CO_2 from $NaHCO_3$?

A. CH_3OH

B. CH_3NH_2

C. $\left(CH_3\right)_4N^+OH^-$

D. $CH_3\overset{+}{N}H_3Cl^-$

Answer: D

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16. pH of the NaCl solution after electrolysis will

A. increase

B. decrease

C. remain constant

D. can't be determined

Answer: A

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17. H_3BO_3 in water acts as a

A. Lewis acid

B. Bronsted acid

C. Arrhenius acid

D. Both (B) and (C)

Answer: A

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18. pH of the following solution is not affected by dilution

A. 0.01M $NaHCO_3^-$

B. 0.01 M NaH_2PO_4

C. 0.01 M CH_3COONH_4

D. All of these

Answer: D

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19. Which is not amphoteric ?

A. HSO_4^-

B. $H_2PO_2^-$

C. H_2O

D. NH_2

Answer: B

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BRAIN TEASERS -3

1. If α is the fraction of HI dissociated at equilibrium in the reaction, $2HI(g) \Leftrightarrow H_2(g) + I_2(g)$ starting with the 2 moles of HI. Then the total number of moles of reactants and products at equilibrium are

A. 1.0

B. $1+\alpha$

C. 2.0

D. $2+2\alpha$

Answer: C

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2. In a closed vessel of volume v, a moles of nitrogen and b moles of oxygen are made to react to given nitric oxide, according to reaction , $N_2+O_2 \Leftrightarrow 2NO$. If at equilibrium , 2x moles of NO are obtained , then

A. $K_c = \frac{x^2}{(a-x)(b-x)}.v$

B. $K_c = \frac{4x^2}{(a-x)(b-x)}.v$

C. $K_c = \frac{4x^2}{(a-x)(b-x)}.\frac{1}{v}$

D. $K_c = \frac{4x^2}{(a-x)(b-x)}$

Answer: D

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3. K_p / K_c for the reaction

$CO(g) + \frac{1}{2}O_2(g) \Leftrightarrow CO_2(g)$ is

A. 1.0

B. RT

C. $1/\sqrt{RT}$

D. $(RT)^{1/2}$

Answer: C

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4. For which of the following equilibria does decrease in pressure not favour the forward reaction ?

A. $CaCO_3(s) \Leftrightarrow CaO(s) + CO_2(g)$

B. $CO(g) + 2H_2(g) \Leftrightarrow CH_3OH(g)$

C. $NH_4Cl(s) \Leftrightarrow NH_3(g) + HCl(g)$

D. $2NH_3(g) \Leftrightarrow N_2(g) + 3H_2(g)$

Answer: B

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5. For the reaction

$C(s) + CO_2(g) \rightarrow 2CO(g)$

an equilibrium mixture has parital pressure, for CO_2 and CO, of 4.0 and 8.0 atm respectively . K_p for the reaction is

A. 0.5

B. 2.0

C. 16.0

D. 32.0

Answer: C

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6. 8 mol of gas AB_3 are introduced into a $1.0dm^3$ vessel. It dissociates as

$2AB_3(g) \Leftrightarrow A_2(g) + 3B_2(g)$

At equilibrium, 2 mol of A_2 is found to be present. The equilibrium constant for the reaction is

A. $72mol^2L^{-2}$

B. $36mol^2L^{-2}$

C. $3mol^3L^{-2}$

D. $27mol^2L^{-2}$

Answer: D

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7. In the two gaseous equilibria (i) and (ii) , at a certain temperature,

$(i) SO_2(g) + 1/2 O_2(g) \Leftrightarrow SO_3(g) .... K_1$

$(ii) 2SO_3(g) \Leftrightarrow 2SO_2(g) + O_2(g) .... . K_2$

If K_1 is 4×10^{-3} then K_2 will be

A. 8.0×10^{-3}

B. 16.0×10^{-6}

C. 6.25×10^{4}

D. 6.25×10^{8}

Answer: C

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8. Initially, 0.8 mole of PCl_5 and 0.2 mol of PCl_{30} are mixed in one litre vessel. At equilibrium, 0.4 mol of PCl_3 is present. The value of K_c for the reaction

$PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g)$

would be

A. $0.1 mol L^{-1}$

B. $0.05 mol L^{-1}$

C. $0.013 mol L^{-1}$

D. $0.66 mol L^{-1}$

Answer: A

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9. If the solubility of MX_2 (a sparingly soluble salt is $2.5 \times 10^{-4} mol^{-1}$. The value of K_{sp} of the salt would be

A. 6.25×10^{-11}

B. 12.5×10^{-8}

C. 6.25×10^{-8}

D. 3.125×10^{-11}

Answer: A

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10. The reaction

$HCN + H_2O \Leftrightarrow H_3O^+ + CN^-$, the conjugate acid base pair is

A. HCN, H_3O^+

B. H_2O, CN^-

C. CN^-, H_3O^+

D. HCN, CN^-

Answer: D

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11. The sum of pH and pOH in aqueous solution is equal to

A. 7.0

B. pK_w

C. zero

D. > 14

Answer: B

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12. Which of the following solutions has $pH = 11$?

A. `10^(-11) M NaOH

B. $10^{-3} M$HCl

C. 10^{-3} M NaOH

D. 10^3 M NaOH

Answer: C

Watch Video Solution

13. Which of the followin will have the largest , pH ?

A. 0.1 N HCl

B. 0.1 N CH_3COOH

C. 0.1 N NaOH

D. 0.01 N NaOH

Answer: C

Watch Video Solution

14. If x mol L^{-1} is the solubility of $KAl(SO_4)_2$, then K_{sp} is equal to

A. x^3

B. $4x^4$

C. x^4

D. $4x^3$

Answer: B

Watch Video Solution

15. The dissociation constant of monobasic acids A, B, C and D are $6 \times 10^{-4}, 5 \times 10^{-5}, 3.6 \times 10^{-6}$, and 7×10^{-10}, respectively. The pH values of their $0.1M$ aqueous solutions are in the order.

A. $A < B < C$

B. $A > B > C$

C. $A = B = C$

D. $A > B < C$

Answer: A

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16. If P° and P_s, the V.P. of solvent and solution respectively and N_1 and N_2 are the mole fraction of solvent then :

A. $p = p^\circ n_1$

B. $p^\circ - p = n$

C. $p = p^\circ n_1$

D. $p = p^\circ \left(n_1 / n_2\right)$

Answer: A

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17. 20 mL of C_2H_5OH when mixed with 20ml of water,the volume of the resulting solution is

A. 40 mL

B. $< 40mL$

C. $> 40mL$

D. none of these

Answer: C

Watch Video Solution

18. The pH of a solution obtaine by mixing $50mL$ of $0.4NHCl$ and $50mL$ of $0.2NNaOH$ is

A. log 2

B. 1.0

C. -log(0.05)

D. 2.0

Answer: B

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19. The pH of a 0.1 M CH_3COOH which is 2% ionised in aqueous solution is

A. 2.0

B. 1.0

C. $\log\left(\frac{0.1}{0.001}\right)$

D. 2.7

Answer: D

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20. The difference between ΔH and ΔE at constant voluem is equal to

A. $V\Delta P$

B. R

C. P Delta V

D. (3)/(2)R

Answer: A

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21. In which of the following neutralisation reaction will the enthalpy of neutralisation be the smallest ?

A. NaOH with HCl

B. HCl with NH_4OH

C. NaOH with CH_3COOH

D. H_3PO_4 with NaOH

Answer: B

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22. In which of the following reactions is ΔH not equal to ΔE ?

A. $HCl(aq) + NaOH(aq) \rightarrow NaCl(aq) + H_2O(l)$

B. $C(s) + O_2(g) \rightarrow CO_2(g)$

C. $H_2(g) + I_2(g) \rightarrow 2HI(g)$

D. $N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$

Answer: D

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23. The enthalpies of combustions are

$(i)\Delta H_c\left(C_2H_6\right) = -1560kJ$

$(ii)\Delta H_c\left(C_2H_4\right) = -1411kJ$

$(ii)\Delta H_c\left(C_4H_{10}\right) = -2877kJ$

$(iv)\Delta H_c\left(CH_4\right) = -890.4kJ$

Which of these has the lowest efficiency as fuel ?

A. C_2H_6

B. C_2H_4

C. C_4H_{10}

D. CH_4

Answer: C

View Text Solution

24. Consider the reaction :

$SO_2(g) + \frac{1}{2}O_2(g) \rightarrow SO_3(g), \Delta H = -98.3kJ$

If the enthalpy of formationof $SO_3(g)$ is -$395.4kJ$, then the enthalpy of formation of $SO_{92}\Big)(g)$ is

A. $297.1kJ$

B. $493.7kJ$

C. -$493.7kJ$

D. -$297.1kJ$

Answer: D

Watch Video Solution

25. The enthalpy changes at 298 kJ in successive breaking of $O - H$ bonds of water, are

$H_2O(g) \rightarrow H(g) + OH(g), \Delta H = 498 kJmol^{-1}$

$OH(g) \rightarrow H(g) + O(g), \Delta H = 428 kJmol^{-1}$

The bond energy of the O-H bond is

A. $498 kJmol^{-1}$

B. $463 kJmol^{-1}$

C. $428 kJmol^{-1}$

D. $70 kJmol^{-1}$

Answer: B

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26. The enthalpy of neutralisation of HCl by NaOH IS $-55.9kJ$ and that of HCN by NaOH is $-12.1kJmol^{-1}$. The enthalpy of ionisation of HCN is

A. $-68.0kJ$

B. $-43.8kJ$

C. $68.0kJ$

D. $43.8kJ$.

Answer: D

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27. Which of the following is not expected to be correct

A. $\Delta Hf^{\circ}\left(CO_2\right)$ = negative

B. $\Delta H_{\text{comb}}(NO)$ = positive

C. ΔH_{neut} = negative

D. $\Delta H_{\text{hyd}}\left(BaCl_2\right)$ = negative

Answer: B

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28. If a gas absorbs $200J$ of heat and expands by $500cm^3$ against a constant pressure of $2 \times 10^5 Nm^{-2}$, then the change in internal energy is

A. $-800J$

B. $-300J$

C. $+100J$

D. $+190J$

Answer: C

Watch Video Solution

29. For a hypothetical reaction,

$2A + B \Leftrightarrow C +$ energy , the activeation energy of forward reaction $\left(E_{af}\right)$

and backward reaction (E_{ab}) are related as

A. $E_{af} = E_{ab}$

B. $E_{af} > E_{ab}$

C. $E_{af} + E_{ab} = 0$

D. $E_{af} = E_{ab} + \Delta H$

Answer: D

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30. ΔH_{fus} is the latent heat of melting and T_{fus} is the melting point, then entropy of melting is

A. $\Delta H_{\text{fus}} / T_{\text{fus}}$

B. $\Delta H_{\text{fus}} \times T_{\text{fus}}$

C. $T_{\text{fus}} / \Delta H_{\text{fus}}$

D. ΔH_{fus} - T_{fus}

Answer: A

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31. Which of the following reactions is ΔH less than ΔE ?

A. $C_6H_{12}O_6(s) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l)$

B. $N_2O_4(g) \rightarrow 2NO_2(g)$

C. $N_2(g) + O_2(g) \rightarrow 2NO(g)$

D. $2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$

Answer: D

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32. A chemical reaction with $\Delta H > 0$ carried out at constant temperature and pressure will necessarily be spontaneous if

A. $\Delta G > 0$

B. $\Delta S < 0$

C. $\Delta H > TDetlaS$

D. $\Delta H < T\Delta S$

Answer: D

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33. The occurrence of a reaction is impossible if

A. $\Delta H > 0, \Delta S > 0$

B. $\Delta H > 0, DetlaS < 0$

C. $\Delta H < 0, \Delta S < 0$

D. $\Delta h < 0, \Delta S > 0$

Answer: B

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34. Which of the following relatiosn is correct ?

A. $\Delta S = \frac{1}{T}[\Delta G - \Delta H]$

B. $\Delta V = \frac{1}{P}[q + \Delta E]$

C. $\Delta H_{\text{fus}} = \Delta H_{\text{sub}} - \Delta H_{\text{vap}}$

D. $\Delta E = \Delta H + \Delta nRT.$

Answer: C

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35. For reversible process at equilibrium, the change in entropy may be expressed as

A. $\Delta S = T.\, q_{\text{rev}}$

B. $\Delta S = \Delta H / T$

C. $\Delta S = T\Delta H$

D. $\Delta S = q_{\text{rev}}/T$

Answer: D

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36. The enthalpy of formation (ΔH_f) of a compound from its elements is

A. $\Delta H_f < 0$

B. $\Delta H_f > 0$

C. $\Delta H_f =$ infinite

D. ΔH_f may be < 0 or > 0

Answer: D

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37. The work done in an isothermal reversible expansion of n moles of a gas is

A. $\int nPdV$

B. $\int \frac{RT}{np} dV$

C. $\int \frac{nRT}{V} dV$

D. $\int nRTdV$

Answer: C

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38. Which of the following statements do not require the assumption of a perfect gas in order to be true ?

A. $\Delta E = Q - W$

B. $C_p = C_v + R$

C. $\Delta H = \Delta E + RT. \Delta n$

D. $PV^{y} =$ constant

Answer: A

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39. The work done in an isothermal reversible change involving an ideal gas is given by

A. $Q = -W$

B. $Q = E$

C. $Q = \Delta E + W$

D. $Q = PV^{y}$

Answer: A

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BRAIN TEASERS -4

1. Two moles of an ideal gas at 2 atm and $27^{\circ}C$ is compressed isothermally to half of its volume by external pressure of 4 atm. The work doen is

A. 4.985kJ

B. 49.2kJ

C. 98.4 kJ

D. 101.32 kJ

Answer: A

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2. For an adiabatic process

A. $q = +W$

B. $\Delta E < W$

C. $\Delta E \geq W$

D. $q = 0$

Answer: D

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3. 140 grams of nitrogen absorbs 60 calories of heat without change in volume. If the temperature increases from $27^{\circ}C$ to $30^{\circ}C$ while doing so then what is the value of molar heat capacity ?

A. $2calK^{-1}mol^{-1}$

B. $4calK^{-1}mol^{-1}$

C. $5calK^{-1}mol^{-1}$

D. $20calK^{-1}mol^{-1}$

Answer: B

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4. Which of the following is not a state function ?

A. $q + W$

B. $\frac{H}{T}$

C. q / W

D. $E + pW$

Answer: C

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5. One mole of an ideal gas is expanded freely and isothermally at 300K from 5L to 10L volume. If $\Delta E = 0$, then ΔH is

A. zero

B. 5×300 cal

C. 5 cal

D. $-2 \times 5 \times 300$ cal

Answer: A

Watch Video Solution

6. A gas absorbs 400J of heat and expands by $2 \times 10^{-3} m^3$ against a constant pressure of $10^5 Nm^{-2}$. The cahnge in internal energy of gas is

A. zero

B. $197.4J$

C. $-600J$

D. $+200J$

Answer: D

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7. What is the value of ΔH for a reversible isothermal evaporation of 180g of water at $100^{\circ} C$? Latent ehat of evaporation of water

$= 539.7 cal K^{-1} g^{-1}$?

A. 5.397kcal

B. 97.146 kcal

C. $\frac{539.7 \times 373}{1000} kcal$

D. $\frac{10 \times 373 \times 539.7}{1000} kcal$

Answer: B

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8. What is the work done when 1.0 mole of an ideal gas expands from 10 atmosphere to 2 atmosphere in one step at 300K ?

A. $-2.303 nRT \log P_1/P_2$

B. $-60R$

C. $-2 \times 1.0 \times 300R \times \frac{2}{5}$

D. $-120R$

Answer: C

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9. One mole of a gas absorbs 500J of heat at constant volume. If its temperature is raised from $25^{\circ}C$ to $35^{\circ}C$, the q,W and ΔE are

A. $\Delta E = 0, q = W = 500J$

B. $\Delta E = q = 500J, W = 0$

C. $\Delta E = W = 500J, q = 0$

D. $\Delta E = 0, q = 500J, W = -500J$

Answer: B

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10. The molar specific heat of air at room temperature and 1 atm pressure is $25JK^{-1}mol^{-1}$. How much heat is required to heat the room through 10 kelvin at room temperature if 144g of air is present in room ? Vapour density of air $= 14.4$

A. 1250kJ`

B. 25J

C. 50J

D. 1250J

Answer: D

View Text Solution

11. The maximum effificiency of a heat engine operating between $125\,^{\circ}C$ and $25\,^{\circ}C$ is

A. 0.25

B. 0.6

C. 0.75

D. 0.8

Answer: A

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12. What is the entropy that takes place in conversion of 1 mol of α - tin to 1 mol β - tin at $17^{\circ}C$, 1 atm pressure if enthalpy of transition is 2.90 kJ mol^{-1} ?

A. $1.0kJmol^{-1}$

B. $7.32JK^{-1}mol^{-1}$

C. $10JK^{-1}mol^{-1}$

D. $100JKmol^{-1}$

Answer: C

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13. In a reversible process,

$\Delta S_{sys} + \Delta S_{surr}$ is

A. > 0

B. < 0

C. $= 0$

D. ≥ 0

Answer: C

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14. For which of the following shall the ratio of K_p / K_c is unity at 300K and 1 atm. Pressure

A. $N_2(g) + 3H_2(g) \Leftrightarrow 2NH_3(g)$

B. $N_2(g) + O_2(g) \Leftrightarrow 2NO(g)$

C. $NH_4(g) \Leftrightarrow HCl(g) + NH_3(g)$

D. $PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g)$

Answer: B

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15. If K_a for formic acid is 2.0×10^{-4} mol L^{-1} then K_h for $HCOO^-$ is

A. 2.0×10^{-10}

B. 1.414×10^{-12}

C. 10^{-13}

D. 5×10^{-11}

Answer: D

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16. The solubility of AgCl in 0.2 M NaCl is $\left[K_{sp}AgCl = 1.8 \times 10^{-10}\right]$

A. $9 \times 10^{-10} M$

B. $3.6 \times 10^{-10} M$

C. $1.8 \times 10^{-11} M$

D. $7.2 \times 10^{-10} M$

Answer: A

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17. What is the pH of 10^{-3} M ammonia cyanide solution, if $K_{HCN} = 7.2 \times 10^{-11}$ and $K_{NH_3} = 1.8 \times 10^{-5} molL^{-1}$?

A. 14

B. 9.7

C. 12.0

D. 7.5

Answer: B

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18. If the dissociation constants of two weak acids HA_1 and HA_2 are K_1 and K_2, then the relative strengths of HA_1 and HA_2 are given by

A. $\frac{K_1}{K_2}$

B. $\frac{K_1+\sqrt{K_2}}{K_2+\sqrt{K_1}}$

C. $\left(\frac{K_1}{K_2}\right)^{1/2}$

D. $\left(\frac{K_1}{K_2}\right)^{3/2}$

Answer: C

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19. The $pK_a ofanacidhav \in gionisationconstant$1 xx 10^(-3)` is

A. 5

B. -5

C. -9

D. 9

Answer: A

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20. In a mixture of weak acid and its salt, the ratio of concentration of salt to acid is increased ten fold. The pH of the solution

A. decrease ten fold

B. increases ten fold

C. increases by one

D. decreases by one.

Answer: C

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21. If the solubility of lithium sodium hexafluorido aluminate, $Li_3Na_3(AIF_6)_2$ is 's' " mol lt"^(-1)` , its solubility product is equal to :

A. $12x^3$

B. $18x^8$

C. x^8

D. $2916x^8$

Answer: D

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22. What will be the hydrogen ion concentration of a solution obtained by mixing 500ml of 0.2 M acetic acid and 500ml of 0.4 M sodium acetate ?

$\left(K_aCH_3COOH\right) = 1.8 \times 10^{-5}\right)$

A. 1.8×10^{-5}

B. 0.9×10^{-6}

C. 9×10^{-6}

D. 1.6×10^{-4}

Answer: C

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23. The pH of $10^{-8}M$ NaOH will be

A. 8

B. 6.96

C. 12.0

D. 7.02

Answer: D

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24. The pH of a buffer solution of 0.1 M CH_3COOH and 0.1 MCH_3COONa is

$\left(pK_aCH_3COOH = 4.745\right)$

A. 4.745

B. 3.745

C. 5.745

D. 6.745

Answer: A

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25. If the equilibrium concentration of the components in a reaction $A + B \Leftrightarrow C + D$ are 3,5,10 and 15 mol L^{-1} respectively then what is $\Delta G°$ for the reactiona at 300K ?

A. $-1.381 kcal$

B. $-600 cal$

C. $-1140 cal$

D. $-300 cal$

Answer: A

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26. Which of the following when added to 35 mL of the 1.0 M solution of KOH would cause largest change in pH ?

A. 25 mL of 1.0 M HCl

B. 25 mL of 0.2 M HCl

C. 25 mL of 0.5 M HCl

D. 25 mL distilled water.

Answer: A

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27. The concentration of acetic acid $\left(K_a = 1.8 \times 10^{-5}\right)$ required to give 3.5×10^{-4} moles / litres of H_3O^+ ions is

A. $6.8 \times 10^{-3} molL^{-1}$

B. $6.8 molL^{-1}$

C. $1.94 molL^{-1}$

D. $0.194 molL^{-1}$

Answer: A

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28. If 20 cc. of HCl solution is exactly neutralised by 40 cc of 0.05 N NaOH, then pH of HCl is

A. 3.0

B. 1.5

C. 2.0

D. 1.0

Answer: D

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29. If, $H_2(g) + Cl_2(g) \rightarrow 2HCl(g), \Delta H^\circ = -44$ Kcal

$2Na(s) + 2HCl(g) \rightarrow 2NaCl(s) + H_2(g), \Delta H = -152$ Kcal Then,

$Na(s) + 0.5Cl_2(g) \rightarrow NaCl(s), \Delta H^\circ = ?$

A. $-108kcal$

B. $-196kcal$

C. $-98kcal$

D. $-54kcal.$

Answer: C

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30. For the reaction

$C_6H_{12}(l) + 9O_2(g) \rightarrow 6H_2O(L) + 6CO_2(g)$ DeltaH_(298)=936kcal` which of the following is true

A. $-936.9 = \Delta E - \left(2 \times 10^{-3} \times 298 \times 3\right)kcal$

B. $-936.9 = \Delta E - \left(2 \times 10^{-3} \times 298 \times 2\right)kcal$

C. $-936.9 = \Delta E + \left(2 \times 10^{-3} \times 298 \times 2\right)kcal$

D. $-936.9 = \Delta E - \left(0.0821 \times 10^{-3} \times 298 \times 3\right)kcal$

Answer: A

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31. Which causes a largest change in pH on addition to 20ml 0.1 M acetic acid solution ?

A. Additon of 20 mol of 0.01 MCH_3COOH

B. Additon of 20 mL of 0.1 HCl

C. Additoin of 20 Ml of 0.1 M HCl

D. Additon of 20 mL of 0.1 M NaOH

Answer: D

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32. The equation

C (graphite) $+O_2(g)CO_2(g)$

$\Delta H = - 395.5kJ$

can be reversed as

$CO_2(g) \rightarrow$ C ("graphite")+O_(2)gasDeltaH= +395.5 kJ`

This is called as

A. Law of conservation of energy

B. Hess's Law

C. Reversal of Reaction

D. None of the above.

Answer: D

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33. pH of 10^{-9} M HCl is

A. 8

B. 7

C. < 7

D. > 7

Answer: C

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34. The pH of gastric juice in our stomach is

A. 0.01

B. 2

C. 7

D. 14

Answer: B

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35. The equation for Van't Hoff Reaction isotherm is

A. $-\Delta G = 2.303RT\log K_p$

B. $-\Delta G = RT\log K_p$

C. $\Delta G = RT\log K_p$

D. None of these

Answer: A

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36. The correct decreasing order of calorific values is

A. $C_2H_2 > C_4H_{10} > C_3H_8 > C_2H_4$

B. $C_4H_{10} > C_3H_8 > C_2H_4 > C_2H_2$

C. $C_2H_4 > C_3H_8 > C_4H_{10} > C_2H_2$

D. $C_3H_8 > C_2H_4 > C_4H_{10} > C_2H_2$

Answer: D

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37. Entrolpy change in isothermal expansion work of one mole of an ideal gas from volume V_1 and V_2 is given by

A. $R\ln.\dfrac{V_1}{V_2}$

B. $R\ln(V_1 \times V_2)$

C. $\dfrac{R}{V_1}\ln V_2$

D. $\dfrac{R}{V_2}\ln V_1$

Answer: A

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UNIT TEST -2

1. $[Cl^-]$ in a mixture of 200mL of 0.01 M HCl and 100 mL of 0.01 M $BaCl_2$ is

A. 0.01M $NaHCO_3^-$

B. 0.0133M

C. 0.03M

D. 0.02M

Answer: B

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2. Blue litmus turns red in the following mixture of acid and base

A. 100 mL of $1 \times 10^{-2} MH_2SO_4 +$ 100mL of $1 \times 10^{-2} MCa(OH)_2$

B. 100 mL of $1 \times 10^{-2} MHCl +$ 100 mL of $1 \times 10^{-2} MBa(OH)_2$

C. 100 mL of 1×10^{-2} M $H_2SO_4 +$ 100 mL of 1×10^{-2} M NaOH

D. 100 mL of 1×10^{-2} M HCl $+$ 100 mL of 1×10^{-2} M NaOH

Answer: C

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3. pH of 10^{-8} N NaOH is

A. 8.0

B. 6.0

C. 6.98

D. 7.02

Answer: D

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4. Milli equivalents of $Ba(OH)_2$ present in 100 mL solution to have pH $= 13$ is

A. 10^{-2}

B. 10

C. 0.1

D. 0.01`

Answer: B

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5. At a temperature under high pressure

$K_w(H_2O) = 1 \times 10^{-10}$

A solution of pH 5.4 under these conditions is sait to be :

A. acidic

B. basic

C. neutral

D. amphoteric

Answer: B

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6. pH of a mixture which is 0. 1 M in CH_3COOH and 0.05 M in $(CH_3COOH)_2Ba$ is $[pK_a$ of $CH_3COOH = 4.74]$

A. 4.74

B. 5.04

C. 4.44

D. 7.00

Answer: A

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7. In what volume ratio should you mix $1.00M$ solution NH_4Cl and 1.00 M NH_3 to produce a buffer solution of pH 9.80 ? $\left[pK_b\left(NH_3\right) = 4.74\right]$

A. $1:1.35$

B. $3.5:1$

C. $2:1$

D. $1:2$

Answer: B

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8. K_a of AcOH is 1.8×10^{-5}. What is $\left[H_3O^+\right]$ in a solution which is 0.01 M AcOH and 0.005 M calcium acetate ?

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

B. $3.6 \times 10^{-5} M$

C. $0.9 \times 10^{-5} M$

D. $0.005 M$

Answer: A

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9. K_{sp} pf CdS os 8.0×10^{-27} and that of H_2S is 1×10^{-22}. A 1×10^{-14} M $CdCl_2$ solution is precipitated on passing H_2S when pH is about

A. 4

B. 6

C. 5

D. 7

Answer: C

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10. K_{sp} of $Mg(OH)_2$ is 1.8×10^{-11} at $30\ ^\circ C$. Its molar solubility is â€¦.........

at pH $= 5$

A. $1.8 \times 10^{-11} M$

B. $1.8 \times 10^{-9} M$

C. $1.34 \times 10^{-54} M$

D. $1.8 \times 10^{-7} M$

Answer: D

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11. For any weak acid indicator (Hln) colour change is observed when

A. $\frac{[\ln^{-}]}{[H\ln]} = \frac{1}{10}$

B. $pH = pK_a - 1$

C. Both (A) and (B)

D. None of these

Answer: C

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12. For the following equilibrium

$N_2O_4(g) \Leftrightarrow 2NO_2(g)$

K_p is found to be equal to K_c. This is attained when :

A. $T = 1K$

B. $T = 12.18K$

C. $T = 27.3K$

D. $= 273K$

Answer: B

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13. For the following equilibrium

$PCl_5(g) \Leftrightarrow PCl_3(g) + Cl_2(g)$

K_p is formed to be equal to K_x. This is attained at

A. 1 atm

B. 0.5 atm

C. 2 atm

D. 4 atm

Answer: A

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14. The pH of a 0.1 M aqueous solution of a weak acid (HA) is 3. What is its degree of dissociation ?

A. $10\ \%$

B. $25\ \%$

C. $50\ \%$

D. None of these

Answer: D

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15. For the reversible reaction, net rate is

$2NO(g) + O_2(g) \Leftrightarrow 2NO_2(g)$

$$\left(\frac{dx}{dt}\right)_{\text{net}} = 2.6 \times 10^3[NO]^2\left[O_2\right] - 4.1\left[NO_2\right]^2$$

If a reaction mixture contains 0.01 mol each of NO and O_2 and 0.1 mol of NO_2 in 1L closed flask, then above reaction is

A. shifted in forward reaction

B. shifted in backward reaction

C. in equilibrium

D. given values are incomplete

Answer: B

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16. Without knowing the value of reaction quotient which of the following reaction can be predicted to go to completion at $25^\circ C$?

A. $CH_3OCH_3(l) \Leftrightarrow CH_3OCH_3(g)$

B. $H_2O(l) \Leftrightarrow H_2O(l)$

C. $H_2(g) \Leftrightarrow 2H(g)$

D. Sulphur (s) $\Leftrightarrow$ Sulphur (g)

Answer: A

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17. For the following equilibrium reaction $N_2O_4(g) \Leftrightarrow 2NO_2(g), NO_2$ is 50% of the total volume at a given temperature. Hence, vapour density of the equilibrium mixture is :

A. 34.5

B. 25.0

C. 23.0

D. 20.0

Answer: A

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18. In the equilibrium , $PCl_5 \Leftrightarrow PCl_3 + Cl_2$ starting with 2 mol of PCl_5 in 5 L flask at $350K$, there is 80% dissociation. Hence the equilibrium pressure is

A. 1150 atm

B. 132. 2 atm

C. 20.7 atm

D. 13.8 atm

Answer: C

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19. Which of the following on addition will cause deep red colour to disappear ?

$(A)Fe^{3+}(aq)\text{Pale yellow} + SCN^{-}(aq)\text{Colourless} \Leftrightarrow \left[Fe(CNS)^{2}\right](aq)\text{Deep red}$

$I.\ AgNO_3 \quad II.\ HgCl_2 \quad III.\ H_2C_2O_4$ (oxalic acid)

A. I,II

B. II,III

C. I,III

D. I,II,III

Answer: D

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20. In the followin equilibrium amount of $CO(g)$ can be decreased by

$CO(g) + O_2(g) \Leftrightarrow 2CO_2(g)$

A. decreasing volume at constant temperature

B. adding argon gas at constant volume

C. adding O_2 gas

D. all of the above.

Answer: C

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21. Pressure is doubled in each of the following equilibrium . In which case yield is maximum ?

A. $C(s) + H_2O(g) \Leftrightarrow CO(g) + H_2(g)$

B. $2H_2(g) + O_2(g) \Leftrightarrow 2H_2O(g)$

C. $2Fe(s) + 3H_2O(g) \Leftrightarrow Fe_2O_3(s) + 3H_2(g)$

D. $N_2O_4(g) \Leftrightarrow 2NO_2(g)$

Answer: B

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22. Which of the following is a state function ?

A. Temperature of an ice cube

B. The amount of work in expansion

C. Both (A) and (B)

D. None of the above

Answer: A

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23. $1gH_2$ gas STP is expanded so that the volume is doubled. Hence, work done is

A. - $22.4L$ atm

B. - 11.2L atm

C. - 144.8 L atm

D. - $1.12L$ atm

Answer: B

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24. A mol of $Al_3C_4(s)$ reacts with water in a closed vessel at $27\,^\circ C$ against atmospheric pressure, work is doens

A. - 1800 cal

B. - 600 cal

C. $+1800$ cal

D. zero

Answer: D

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25. If the above system is an open vessel the work done is

A. -1800 cal

B. -600 cal

C. $+1800$ cal

D. $+600$ cal.

Answer: A

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26. The temperature of 1 mole helium gas is increased by $1^\circ C$. Find the increase in internal energy.

A. 7 cal

B. 5 cal

C. 3.5 cal

D. 3 cal

Answer: D

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27. When 1 mol of $CO_2(g)$ occupying volume $1^\circ C$ AT $27^\circ C$ is expanded under adiabatic condition, temperature falls to 150 K, Hence, final volume is

A. 20L

B. 52

C. 80L

D. 40L

Answer: C

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28. Select the correct alternative for the endothermic change.

A. $\Delta H < 0, \Delta S(\text{system}) < 0$

B. $\Delta H > 0, \Delta S(\text{ system }) < 0$

C. $\Delta H < 0, \Delta S(\text{ surroundings }) < 0$

D. $\Delta H > 0, \Delta S(\text{ surroundings}) < 0$

Answer: D

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29. A process which is unfavourable with respect to entropy

A. could occur at low temperature , but not at high temperature

B. could occur at high temperature , but not at low temperature

C. could not occur regardless of temperature

D. could not occur at any temperature

Answer: A

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30. All the statements regarding the symbol ΔG are true except

A. If refers to the change in free energy of the reaction

B. It allows us to predict th espontaneity of the reaction

C. It allows us to predict an exothermic reaction

D. It allows us to identify an endergonic reaction.

Answer: C

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