



## CHEMISTRY

### BOOKS - MBD CHEMISTRY (ODIA ENGLISH)

## EQUILIBRIUM

#### QUESTION BANK

1. If  $K_e$  of the reaction,  $2HI \rightarrow H_2 + I_2$  is 0.25, the equilibrium constant of the reaction  $H_2 + I_2 \rightarrow 2HI$  would be :

- A. 1
- B. 2
- C. 3
- D. 4

**Answer: D**



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2. HI heated in a sealed tube at  $440^{\circ}C$  till the equilibrium was reached. HI was found to be 22% decomposed. The equilibrium constant for dissociation is:

- A. 0.282
- B. 0.0796
- C. 0.0199
- D. 1.99

**Answer: C**



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3. For a reversible reaction the rate constant for the forward reaction is  $2.38 \times 10^{-4}$  and for the backward reaction is  $8.15 \times 10^{-5}$ . The  $k_c$  of the reaction is:

A. 0.342

B. 2.92

C. 0.292

D. 3.42

**Answer: B**



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4.  $2 SO_3 \rightarrow 2SO_2 + O_2$  is at equilibrium. The  $SO_2$  concentration is 0.6

M. Initial concentration of  $SO_3$  is 1M. The equilibrium constant is:

A. 2.7

B. 1.36

C. 0.34

D. 0.675

**Answer: D**

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5. Which one favours the backward reaction in a comical equilibrium ?

- A. Increasing the concentration of one of the reactants.
- B. Removal of at least one of the products at regular interval.
- C. Increasing the concentration of one or more of the products.
- D. None of the above.

**Answer: C**

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6. The concentration of pure solid and liquid phase is not included in the expression of equilibrium constant because:

- A. solid and liquid conc. are independent of their quarries.
- B. solid and liquid react slowly.

C. solid and liquid at equilibrium don't interact with gaseous phase

D. the molecules of solid and liquid cannot migrate to the gaseous phase.

**Answer: A**

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7. 4 moles of A are mixed with 4 moles of B. When 2 moles of C are formed at equilibrium accordingly to the reaction  $A + B \rightarrow C + D$ .  $K_c$  is:

A. 4

B. 1

C. sqrt4

D. sqrt2

**Answer: B**

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8. The unit of equilibrium constant  $K$ ,  $N_2 + 3H_2 \rightarrow 2NH_3$  will be:

A.  $\text{lit}^2 \text{mole}^{-2}$

B.  $\text{mole}^2 \text{lit}^{-2}$

C. mole/lit

D. it has no unit

**Answer: A**



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9. When acetic acid and ethanol are mixed in equimolar proportions, equilibrium is attained when  $\frac{2}{3}$ rd of the acid and alcohol are consumed.

The value of  $K_c$  is:

A. 0.4

B. 4

C. 40

D.  $4.0 \times 10^2$

**Answer: B**



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10. If  $N_2 + 3H_2 \rightleftharpoons 2NH_3$  has equilibrium constant  $K$  and  $2N_2 + 6H_2 \rightleftharpoons 4NH_3$  has equilibrium constant  $k'$ , then  $k' =$

A.  $K^2$

B.  $\sqrt{K}$

C.  $1/\sqrt{K}$

D.  $1/K^2$

**Answer: A**



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11. Irreversible reaction is one which:

- A. proceeds in one direction only
- B. proceeds in both the direction
- C. is an instantaneous reaction
- D. is aslow reaction

**Answer: A**



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12. When rate of forward reaction is equal and opposite to the rate of backward reaction, the state is said to be:

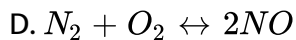
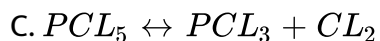
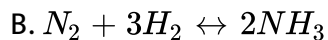
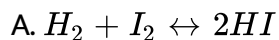
- A. reversible state
- B. Equilibrium
- C. Chemical equilibrium
- D. None of the above



**Answer: C**

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**13.** Which of the following reaction will be favoured by low pressure ?



**Answer: C**

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**14.** Which of the following factor will be usefuk in manufacture of ammonia by Haber's process ?

- A. High pressure
- B. Low pressure
- C. High temperature
- D. Increase in the concentration of ammonia

**Answer: A**

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**15.** The reaction in which heat is absorbed is known as:

- A. Exothermic
- B. Endothermic
- C. Reversible
- D. None of the above

**Answer: B**

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16. The rate at which a substance reacts is proportional to its active mass. This statement is :

- A. Le-Chatelier's principle
- B. Faraday's Law
- C. Law of multiple proportion
- D. Law of mass action

**Answer: D**



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17. When chemical equilibrium is reached the :

- A. reaction stops
- B. rate of forward reaction is equal to the rate of backward reaction
- C. rate of forward reaction is more than that of backward reaction

D. none of the above

**Answer: B**



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**18.** In a reversible reaction if there is no change in total number of molecules , the reaction will be favoured by

A. high pressure

B. low pressure

C. high temperature

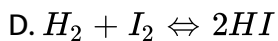
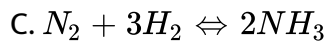
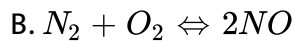
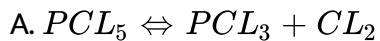
D. higher concentration of a reactant

**Answer: D**



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19. Which of the following will be favoured by high pressure?



Answer: C



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20. Chemical equilibrium is:

A. stationary

B. dynamic

C. interness

D. state of rest

**Answer: B**

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21. For the reaction,  $H_2 + I_2 \rightleftharpoons 2HI$  the  $K_p$  and  $K_c$  are related as :

A.  $K_p = K_c(RT)^2$

B.  $K_p = K_c(RT)^0$

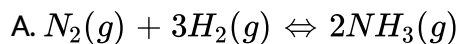
C.  $K_p = K_c(RT)^{-2}$

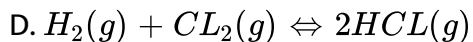
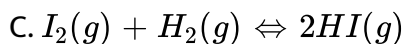
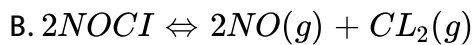
D.  $K_p = K_c(RT)^{-1}$

**Answer: B**

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22. In which of the following reactions  $K_p = K_c$  ?





**Answer: D**

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23. The partial pressure of  $PCl_3$ ,  $Cl_2$  and  $PCl_5$  are 0.1, 0.2 and 0.008 atmosphere respectively for reaction ,  
 $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ . The value of  $K_p$  is :

A. 2.5

B. 5

C. 0.25

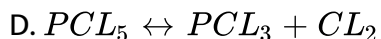
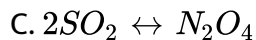
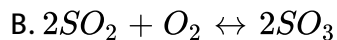
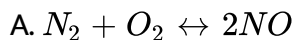
D. 25

**Answer: A**



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24. For which of the following reactions the value of  $K_p$  is greater than  $K_c$  ?



Answer: D



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25. For the reaction  $PCL_5 \rightleftharpoons PCL_3 + CL_2$ , the forward reaction at constant temperature is favoured by :

A. introducing an inert gas at constant volume



- B. introducing chlorine gas at constant volume
- C. introducing an inert gas at constant pressure
- D. increasing the volume of the container

**Answer: D**

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**26.** According to law of mass action, the rate of reaction is directly proportional to:

- A. volume of the container
- B. equilibrium constant
- C. nature of reactants
- D. molar concentration of reactants

**Answer: D**

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27. For a reversible reaction if the concentration of the reactants are doubled, the equilibrium constant will be :

- A. halved
- B. doubled
- C. the same
- D. one fourth

**Answer: C**



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28. In of the following case does the reaction go farthest to completion ?

- A.  $K = 10_2$
- B.  $K = 10^{-2}$
- C.  $K = 10$

D.  $K=1$

**Answer: A**



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**29.** In a reversible reaction two substances are in equilibrium. If the concentration of each is double the equilibrium is:

- A. reduced to half of its original value
- B. reduced to 1/4th of its original value
- C. doubled
- D. constant

**Answer: D**



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30.  $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ ,  $\Delta H = -93.5 \text{ kJ}$  what will happen when helium gas is added to the vessel at constant volume:

- A. more  $NH_3$  is formed
- B. less  $NH_3$  is formed
- C. no effect
- D. none of these

**Answer: C**



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31. 1 mol of A and 0.5 mol of B were enclosed in a three litre vessel. The following equilibrium was established under suitable conditions:

$A + 2B \rightleftharpoons C$  At equilibrium the amount of B was found to be 0.3 mol. The equilibrium constant  $K_c$  at the experimental temperature will be

:

A. 11.1

B. 1.11

C. 0.01

D. 2.5

**Answer: A**

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32.  $\frac{K_p}{K_c}$  for the reaction:  $\text{CO(g)} + \frac{1}{2}\text{O}_2\text{(g)} \rightleftharpoons \text{CO}_2\text{(g)}$  is :

A. 1

B. RT

C.  $1/(\text{sqrt}RT)$

D.  $RT^{(1/2)}$

**Answer: C**

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33. The equilibrium constant,  $K_c$  for the reaction:  $H_2 + I_2 \rightleftharpoons 2HI$  at 700

K is 49. what is the equilibrium constant for the reaction ?

$HI \rightleftharpoons \frac{1}{2}H_2 + \frac{1}{2}I_2$  at the same temperature

A. 49

B. 0.02

C. 1.43

D. 0.143

**Answer: D**



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34. An equilibrium mixture for the reaction  $2H_2S(g) \rightleftharpoons 2H_2(g) + S_2(g)$

had 1 mole of hydrogen sulphide, 0.2 mole of  $H_2$  and 0.8 mole of  $S_2$  in 2

litre vessel. The value of  $K_c$  is:

A. 0.004

B. 0.08

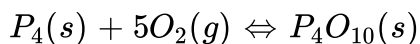
C. 0.016

D. 0.16

**Answer: C**

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**35.** What is the equilibrium expression for the reaction:



A.  $K = [O_2]^5$

B.  $K_c = \frac{[P_4O_{10}]}{5[P_4][O_2]}$

C.  $K_c = \frac{[P_4O_{10}]}{[P_4][O_2]^5}$

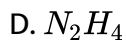
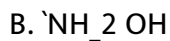
D.  $K_c = \frac{1}{[O_2]^5}$

**Answer: D**



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36. The conjugate acid of  $NH_2$  is

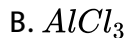
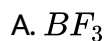


Answer: A

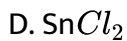


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37. Which of the following is not a lewis acid ?







**Answer: A**



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**38.** The strongest bronsted base is:



**Answer: A**



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**39.** An aqueous solution of acetic acid contains:

A.  $CH_3COOH$  and  $H^+$

B.  $CH_3COO^-$ ,  $H_3O^+$  and  $CH_3COOH$

C.  $CH_3COO^-$ ,  $H_3O^+$  and  $H^+$

D.  $CH_3COOH$ ,  $CH_3COO^-$  and  $H^+$

**Answer: D**

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**40.** Aqueous solution of copper sulphate changes blue litmus to red because:

A.  $Cu^{-2}$  is present

B.  $SO_4^{-2}$

C. Hydrolysis take place

D. Reduction takes place

**Answer: C**

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41. An aqueous solution of salt is alkaline. This show that the salt is made from as:

- A. strong acid and strong base
- B. strong acid and week base
- C. weak acid and week base
- D. weak acid and strong base

**Answer: D**

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42. Which of the following statement is incorrect for a weak acid ?

- A. It is partially dissociated.
- B. Its dissociation constant is low.

C. Its  $K_2$  is very low.

D. solution of its sodium salt in water is alkaline.

**Answer: C**

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**43.** Which of the following is not conjugate pair of acid base ?

A. HS and  $S^{-2}$

B.  $H_3O^+$  and  $OH^-$

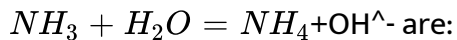
C. HONO and  $NO_2$

D.  $C_6H_5COOH$  and  $C_6H_5COO^-$

**Answer: A**

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44. According to bronstedconcept, the acids in the reaction :



A.  $NH_3$  and  $NH_4^+$

B.  $H_2O$  and  $OH^-$

C.  $H_2$  and  $NH_4^+$

D.  $NH_3$  and  $OH^-$

**Answer: B**



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45. Ammonium hydroxide is a weaker base because it is :

A. unstable

B. covalent compound

C. only slightly ionises

D. none of these.

**Answer: C**

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**46.** Lewis acids are

- A. electron acceptors
- B. proton acceptors
- C. electron donors
- D. proton donors

**Answer: A**

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**47.** The pH of a solution containing 0.4 gm NaOH per litre is :

- A. 2

B. 12

C. 10

D. 11

**Answer: B**



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48. conjugate base of  $\text{HCO}_3^-$  ion is :

A.  $\text{CO}_2$

B.  $\text{CO}_3^{2-}$

C.  $\text{H}_2\text{CO}_3$

D.  $\text{HCO}_3^-$

**Answer: C**



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49. Aqueous solution of  $FeCl_3$  is :

- A. acidic
- B. basic
- C. amphoteric
- D. netural

**Answer: A**



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50. When 1.0 ml of dil  $H_2SO_4$  is added to 100 ml of a buffer solution of pH :

- A. becomes 7.0
- B. is less than 7.0
- C. is more than 7.0
- D. docs not change



**Answer: D**

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**51.** What is the pH of 0.01 M NaOH assuming complete ionisation ?

A. 0.01

B. 2

C. 12

D. 14

**Answer: C**

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**52.** The pH of the solution is 3.0 if its pH is changed to 6.0 then the  $[H^+]$  of the original solution has to be :

- A. doubled
- B. halved
- C. increased 1000 times
- D. decreased 1000 times

**Answer: D**

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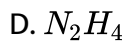
**53.** The compound that is not a lewis acid is:

- A.  $BF_3$
- B.  $AlCl_3$
- C.  $BeCl_2$
- D.  $SnCl_4$

**Answer: C**

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54. The conjugate acid of  $NH_2$  is

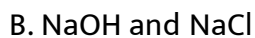


**Answer: A**



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55. An acidic buffer can be prepared by making solution of :



D.  $NH_4Cl$  and  $NH_4OH$

**Answer: C**

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**56.** A compound is precipitated when its:

- A. ionic product exceeds the solubility product
- B. ionic product is less than its solubility product
- C. ionic product is equal to the solubility product
- D. none of the above

**Answer: A**

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**57.** A basic buffer can be prepared by mixing

A.  $CH_3COONa$  and  $CH_3COOH$

B.  $Na_2SO_4$  and  $H_2SO_4$

C. NaOH and NaCl

D.  $NH_4Cl$  and  $NH_4OH$

**Answer: D**

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**58.** Which of the following solutions has the maximum pH value ?

A. solution of caustic soda

B. Pure water

C. Water saturated with  $CO_2$  gas

D. Solution of sodium chloride

**Answer: A**

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59. Hydrolysis is regarded as an interaction between :

- A.  $H^+$  ,  $OH^-$  ions
- B. ions of acid with ions of base
- C. ions of salt with ions of water
- D. acid and base

Answer: C



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60. Which of the following solutions have PH close to 1.0 ?

- A. 100 ml of M/10 HCl + 100 ml of M/10 NaOH
- B. 55 ml of M/10 HCl + 45 ml of N/10 NaOH
- C. 10 ml of M/10 HCl + 90 ml of M/10 NaOH

D. 75 ml of M/10 HCl + 25 ml of M/5 NaOH

**Answer: D**

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61. The decrease in the ionisation of  $H_2S$  in the presence of HCl is due to :

- A. solubility product
- B. Dilution
- C. Common ion effect
- D. saturation

**Answer: C**

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62. An aqueous solution of ammonia acetate is :

- A. faintly acidic
- B. faintly alkaline
- C. fairly neutral
- D. fairly acidic

**Answer: C**

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63. Ammonia gas dissolves in water to give  $NH_4OH$  In this reaction water act as :

- A. a base
- B. an acid
- C. a salt
- D. a conjugate base



**Answer: B**

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**64.** 4 gm of NaOH are added in 1 litre. The PH value of the solution will be :

A. 1

B. 0

C. 7

D. 13

**Answer: D**

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**65.** Which of the following is a lewis base ?

A.  $AlCl_3$

B. Ag

C.  $Ag(OH)_3$

D.  $NH_3$

**Answer: D**



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66. The PH of a solution obtained by mixing 50 ml of 0.4 M HCl and 50 ml of 0.2 M NaoH IS :

A.  $-\log 2$

B.  $-\log \times 10^{-1}$

C. 1

D. 2

**Answer: C**



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67.  $pH$  of  $10^{-8}$  M solution of HCl in water is:

- A. 8
- B. 6
- C. Between 6 and 7
- D. between 7 and 8

**Answer: C**

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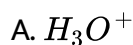
68. Which of the following will have highest PH in water solution :

- A. NaCl
- B.  $Na_2CO_3$
- C. KCl
- D.  $CuSO_4$

**Answer: B**

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**69.** Which of the following species is amphoteric in nature ?



**Answer: C**

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**70.** For a sparingly soluble salt  $A_pB_q$  the relationship between its solubility product ( $L_s$ ) and its solubility (S) is :

A.  $L_S = S^{p+q}p^p q^q$

B.  $L_S = S^{p+q}p^q q^p$

C.  $L_S = S^{pq}p^p q^q$

D.  $L_S = s^{pq}pq^{q+p}$

**Answer: A**



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71. When a salt of strong base and Weak acid is hydrolysed the resulting solution has :

A. PH=7

B. PH=0

C. PHlt 7

D. PHgt7

**Answer: D**

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72. 1 c.c. of 0.01 M HCl is added to 99.9 cc of NaCl solution . PH of resulting solution will be :

- A. 7
- B. 4
- C. 2
- D. 1

**Answer: B**

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73. Precipitation takes place when the product of concentration of ions :

- A. equals the solubility product
- B. Exceeds the solubility product

C. is less than the solubility product

D. is negligible

**Answer: B**

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**74.** A sulphuric acid solutions has PH =2 its molarity is :

A. 1/100

B. 1/50

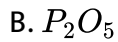
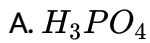
C. 1/2

D. 1/200

**Answer: D**

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75. The conjugate base of  $H_3PO_4$  is :



**Answer: D**



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76. What is common ion effect ?



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77. Define 'active mass'.



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78. Define 'law of mass action'.

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79. Define solubility product. ( $K_{sp}$ ).

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80. What is the approximate PH value of blood ?

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81. What is the PH OF 0.1 M HCl.

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82. write conjugate acid of  $NH_3$ .

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83. What is buffer solution ?

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84. Can PH value of any solution be less than zero ?

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85. What is acid buffer with some examples ?

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86. Explain basic buffer with some example ?



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87. What is relation between  $K_p$  and  $K_c$ ?



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88. Give an example of buffer solution ?



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89. What is PH value of 0.1 N HCl?



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90. What is necessary to add dilute HCl before passing  $H_2S$  for precipitation group of II cations ?



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91. Calculate the PH of 0.001 M HCl.

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92. Acetic acid is less acidic in sodium acetate solution than in sodium chloride solution .

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93. Which catalyst is used in contact process for manufacture of  $H_2SO_4$  ?

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94. What is the effect of pressure on the solubility of a solid ?

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95. What is the PH of 1M HCl ?

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96. An aqueous solution of ferric chloride is acidic. Explain.

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97. Discuss Lewis theory of acids and bases.

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98. what is conjugate base Of  $HSO_4^-$  ?

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99. What is the value of ionic product of water at  $25^\circ C$  ?

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100. How  $K_w$  varies with temperature ?

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101. How does PH of a solution vary with  $H^+$  ion concentration ?

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102. How does PH of a solution vary with temperature ?

 [Watch Video Solution](#)

103. Define reaction quotient ?

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104. Which catalyst is used for synthesis of  $NH_3$  by haber's process ?

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105. Find the solubility product If solubility of  $A_2B_3$  is  $10^{-4}$ .

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106. what is the value of  $PH + POH$  for any aqueous solution at  $25^\circ C$ ?

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107. Why  $AlCl_3$  is lewis acid ?

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108.  $SO_2$  is lewis acid ?

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**109.** Write some application of buffer ?

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**110.** Write two factors which influence the solubility of solid in a liquid .

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**111.** An equilibrium reaction between hydrogen and iodine to give hydrogen iodide at 670 K in a 5 litre flask contains 0.4 mole of hydrogen 0.4 mole of iodine and 2.4 mole of hydrogen iodide. Calculate the equilibrium constants.

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**112.** Calculate the value of equilibrium constant,  $\text{N}_2\text{O}_4(\text{g}) \rightarrow 2\text{NO}_2(\text{g})$ , the concentration of  $\text{N}_2\text{O}_4(\text{g})$  and  $\text{NO}_2$  at equilibrium are  $4.8 \times 10^{-2}$  and  $1.2 \times 10^{-2}$  mol/L respectively.

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**113.** State Le-chatelier's principle.

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**114.** What is equilibrium constant ? Explain

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**115.** Define law of mass action or state guldberg-Wagge's law.

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116. What is the effect of catalyst on equilibrium ?

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117. Write the expression that shows the dependence of equilibrium constant on temperature.

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118. Two moles of  $NH_3$  are introduced into one litre flask in which it dissociates at high temperature as  $2NH_3(g) \rightleftharpoons N_2(g) + 3H_2(g)$  Find the value of  $K_C$ .

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119. 1 mole of  $N_2O_4$  is heated in a flask with a volume of  $10 \text{ dm}^3$ . At equilibrium 1.708 mole of  $NO_2$  and 0.146 mole of  $N_2O_4$  were found at

134° c calculate the equilibrium constant .

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120. Write properties of chemical equilibrium.

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121. Write some characteristics of equilibrium constants .

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122. Derive relationship between  $K_C$  and  $K_P$ .

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123. At a certain temperature the dissociation constant of 0.25 M  $NH_4OH$  is  $1.8 \times 10^{-5}$  calculate its degree of ionisation at the same

temperature.

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**124.** Calculate the PH of KOH solution 5.6 gm of which is dissolved in 10 litre solution .

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**125.** Calculate the PH Of 0.005 M  $H_2SO_4$ .

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**126.** Calculate the PH of 0.004 M KOH.

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127. Calculate the PH of a buffer solution which is formed by mixing 0.04 M sodium acetate and 0.08 acetic acid at 298 K. ( $Pk_a = 4.74$ )

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128. What is the pH of 0.01 M NaOH assuming complete ionisation ?

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129. Calculate PH Of 0.01 M acetic acid .  $K_a = 1.8 \times 10^{-5}$  at 298 K.

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130. How much sodium acetate should be added to 1 litre of 0.1 M  $CH_3COOH$  to make a buffer of PH = 4.0 ( $K_a = 3$ )

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**131.** Discuss Arrhenius theory of acids and bases with examples .

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**132.** Discuss about PH of a solution.

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**133.** Write the application of PH.

 [Watch Video Solution](#)

**134.** what is the effect of temperature on PH value ? Explain

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**135.** What is buffer solution ?

 [Watch Video Solution](#)

136. How many types of buffer do u know ? explain with example.

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137. Discuss about the relationship between solubility(S) and solubility product( $K_{sp}$ ).

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138. What is common ion effect ?

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139. What is the PH of 0.001(N) HCl ?

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140. What is normal salt ? Give some example.

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141. Why sodium carbonate solution is alkaline ?

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142. Calculate the  $H^+$  ion and  $OH^-$  ion conc of NaOH solution , 0.01 gm of which are dissolved in 250 cc solution .

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143. Calculate the PH of 0.01 M aqueous solution of  $NH_4CN$ . Given dissociation constants Of HCN is  $6.2 \times 10^{-10}$  and of  $NH_3$  is  $1.6 \times 10^{-5}$

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144. Determine the degree of hydrolysis and PH of 0.02 M of sodium acetate. (Given  $k_a = 1.8 \times 10^{-5}$ ,  $K_w = 1 \times 10^{-14}$ )

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145. Discuss Lowry -Bronsted theory of acids and bases .

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146. Discuss Lewis theory of acids and bases.

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147. What are the limitations of this theory ?

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148. Define solubility product. ( $K_{sp}$ ).

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149. Write some application of common ion effect.

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150. What is the pH of 0.01 M NaOH assuming complete ionisation ?

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151. What is relation between  $K_p$  and  $K_c$ ?

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152. If  $K_p < K_c$  and  $K_p = K_c$  then  $\delta n$  are \_\_\_\_ and \_\_\_\_ respectively.



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153. The value of equilibrium constants depends on \_\_\_\_ and \_\_\_\_.

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154. The value of  $K_p$  for the reaction  $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$  is \_\_\_\_ than  $K_c$ .

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155. In reaction  $H_2(g) + Cl_2(g) = 2HCl(g)$  relation between  $K_p$  and  $K_c$  is \_\_\_\_.

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156. The reaction  $N_2 + 3H_2 \rightleftharpoons 2NH_3$  favoured at \_\_\_\_.

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157. The effect of concentration or pressure on the rate of a reversible reaction is given by \_\_\_\_.

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158. Henderson's equation for the POH of a basic buffer is \_\_\_\_.

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159. What is buffer solution ?

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160. The buffer action of acidic buffer is maximum when its pH is equal to:

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161. Acetic acid mixing with \_\_\_\_\_ gives buffer solution.

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162. what is conjugate base Of  $HSO_4^-$  ?

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163. A mixture of sodium acetate and acetic acid acts as a \_\_\_\_\_.

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164. PH of 0.01 M HCl solution is \_\_\_\_\_.

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165. The conjugate acid of  $HCO_3^-$  is \_\_\_\_\_.



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166. How does PH of a solution vary with temperature ?



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167. The conjugate base of  $\text{H}_3\text{O}^+$  is \_\_\_\_\_.



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168. solubility of calcium acetate \_\_\_\_\_ with increase in temperature.



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169. What is the PH OF 0.1 M HCl.



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170. PH of pure water is \_\_\_\_\_ at  $22^{\circ}C$ .

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171. 40 % of a mixture of 0.2 mole of  $N_2$  and 0.6 mole of  $H_2$  react to give  $NH_3$  according to the equation:  $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$  at constant temperature and pressure. Then what is the ratio of the final volume to the initial volume of gases ?

A. 4:5

B. 5:4

C. 7:10

D. 8:5

**Answer: A**

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172. At temperature T, a compound  $AB_2(g)$  dissociates according to the reaction  $2AB_2(g) \rightleftharpoons 2AB(g) + B_2(g)$  with a degree of dissociation  $x$ , which is small compared with unity. Predict the expression for  $K_p$  in terms of  $x$  and the total pressure P.

A.  $Px^3/2$

B.  $Px^2/3$

C.  $Px^3/3$

D.  $Px^2/2$

**Answer: A**



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173. What is the amount of  $PCl_5$  (in mole) need to be added to one litre vessel at  $250^\circ\text{C}$  in order to obtain a concentration of 0.1 moles of  $Cl_2$  ?

$K_c$  for  $PCl_5 \rightleftharpoons PCl_3 + Cl_2$  is 0.0414 mol/litre



A. 0.3415

B. 0.0341

C. 3.415

D. 0.3415

**Answer: A**



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**174.** For  $NH_4HS(s) \rightleftharpoons NH_3(g) + H_2S$ , The observed pressure for reaction mixture in equilibrium is 1.12 atm at  $160^\circ C$ . Calculate the value of  $K_p$  for the reaction:

A.  $3.136 \text{ atm}^2$

B.  $0.3136 \text{ atm}^2$

C.  $3.415 \text{ atm}^2$

D.  $0.3415 \text{ atm}^2$

**Answer: B**

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**175.** In a reaction at equilibrium  $X$  mole of the reactant A decompose to give 1 mole each of C and D. if the fraction of A decomposed at equilibrium is independent of initial concentration of A then what will be the value of  $X$  ?

A. 1

B. 3

C. 2

D. 4

**Answer: C**

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176. In a system :  $A(s) \rightleftharpoons 2B(g) + 3C(g)$  If the concentration of C at equilibrium is increased by factor 2 then predict the equilibrium concentration of B in terms of original value .

- A. Two times of its original value
- B. One half of its original value
- C.  $2\sqrt{2}$  times of its original value
- D.  $\frac{1}{2}\sqrt{2}$  times of its original value

**Answer: D**



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177. Eight mole of a gas  $AB_3$  attain equilibrium in a closed container of volume  $1 \text{ dm}^3$  as  $2 AB_3 \rightleftharpoons A_2(g) + 3B_2(g)$  if at equilibrium 2 mole of  $A_2$  are present then calculate the equilibrium constant.

- A.  $72 \text{ mol}^2 \text{ L}^{-2}$

B.  $36\text{mol}^2\text{L}^{-2}$

C.  $3\text{mol}^2\text{L}^{-2}$

D.  $27\text{mol}^2\text{L}^{-2}$

**Answer: D**

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**178.** In the reaction  $\text{C}(s) + \text{CO}_2(g) \rightleftharpoons 2\text{CO}(g)$  the equilibrium pressure is 12 atm. If 50 % OF  $\text{CO}_2$  reacts. Calculate the  $K_P$  for the change:

A. 12 atm

B. 16 atm

C. 20 atm

D. 6 atm

**Answer: B**

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179. When 20 g of  $\text{CaCO}_3$  were put into 10 litre flask and heated to  $800^\circ\text{C}$  35 %  $\text{CaCO}_3$  remained unreacted at equilibrium . Predict  $k_p$  for decomposition of  $\text{CaCO}_3$  .

- A. 1.145 atm
- B. 0.145 atm
- C. 2.145 atm
- D. 3.145 atm

**Answer: A**



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180. Sulphides ions in alkaline solution react with solid sulphur to form polyvalent sulphide ions. The equilibrium constant for the formation of  $\text{S}_2^{2-}$  and  $\text{S}_3^{2-}$  from S and  $\text{S}^{2-}$  ions are 1.7 and 5.3 respectively. What is the equilibrium constant for the formation of  $\text{S}_3^{2-}$  from  $\text{S}_2^{2-}$  and S ?

A. 1.33

B. 3.11

C. 4.21

D. 1.63

**Answer: B**

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**181.** At equilibrium if  $K_p = 1$  then :

A.  $\Delta G^o = 0$

B.  $\Delta G^o > 1$

C.  $\Delta G^o < 1$

D. None

**Answer: A**

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182. For  $N_2 + 3H_2 \rightleftharpoons 2NH_3$   $\Delta H^\circ = -VE$  then :

A.  $K_P = K_C$

B.  $K_p = K_{CRT}$

C.  $K_P = K_c(RT)^{-2}$

D.  $K_p = K_c(RT)^{-1}$

Answer: C



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183. On applying pressure to the equilibrium,  $ice \rightleftharpoons water$  which phenomenon will happen:

A. More ice will be formed

B. More water will be formed

C. Equilibrium will not be disturbed

D. Water will equilibrium

**Answer: B**

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**184.** For the equilibrium  $2NO_2(g) \rightleftharpoons N_2O_4(g) + 14.6kcal$  An increase of temperature will:

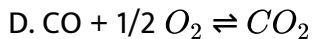
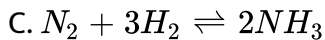
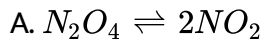
- A. Favour the formation of  $N_2O_4$
- B. Favour the decomposition of  $N_2O_4$
- C. Not affect the equilibrium
- D. Stop the reaction

**Answer: B**

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185. Which equilibrium in gaseous phase would be unaffected by an increase in pressure:



Answer: B



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186. For the reaction,  $H_2 + I_2 \rightleftharpoons 2HI$  the  $K_p$  and  $K_c$  are related as :

A.  $K_C = 2K_P$

B.  $K_C > K_P$

C.  $K_C = K_P$

D.  $K_C < K_P$

**Answer: C**



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**187.** The vapour density of completely dissociated  $NH_4Cl$  would be :

- A. Slightly less than half of that of ammonium chloride
- B. Half of that of ammonium chloride
- C. Double that of ammonium chloride
- D. Determined by the amount of solid ammonium chloride used in the experiment

**Answer: B**



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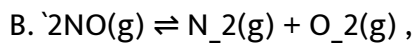
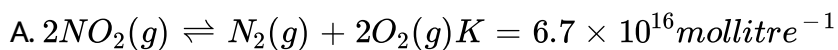
**188.** For the chemical reaction,  $3X(g) + y(g) \rightarrow X_3Y(g)$ : the amount of  $X_3Y$  at equilibrium is affected by:

- A. Temperature and pressure
- B. Temperature only
- C. pressure only
- D. Temperature, pressure and catalyst

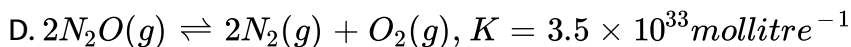
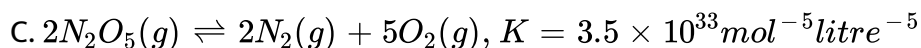
**Answer: A**

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**189.** Which oxide of nitrogen is the most stable:



$$K = 2.2 \times 10^{30} \text{ mol litre}^{-1}$$



**Answer: A**



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190. The equilibrium constant for equilibria  $SO_2(g) + \frac{1}{2}O_2(g) \rightleftharpoons SO_3(g)$  and  $2SO_3(g) \rightleftharpoons 2SO_2(g) + O_2(g)$  are  $K_1$  and  $K_2$  respectively Then:

A.  $K_2 = K_1$

B.  $K_2 = K_1^2$

C.  $K_2 = \frac{1}{K_1}$

D.  $K_2 = \frac{1}{K_1^2}$

Answer: D



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191. For  $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ ,  $\Delta H = 22$  kcal the dissociation of  $PCl_5$  will be more on:

- A. Increasing temperature
- B. Decreasing pressure
- C. Increasing pressure
- D. Increasing the concentration of chlorine

**Answer: A**

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**192.** An increase in temperature on the reaction  $N_2 + O_2 \rightleftharpoons 2NO$ ,  $\Delta H = 43.2$  kcal will :

- A. Increase the yield of NO
- B. Decrease the yield of NO
- C. Not effect the yield of NO
- D. Not help the reaction to proceed in forward direction

**Answer: A**

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**193.** The volume of the reaction vessel containing an equilibrium mixture in the reaction ,  $SO_2Cl_2(g) \rightleftharpoons SO_2(g) + Cl_2(g)$  is increased. When equilibrium is reestablished:

- A. The amount  $SO_2(g)$  will decrease
- B. The amount of  $SO_2Cl_2(g)$  will increase
- C. The amount of  $Cl_2(g)$  will increase
- D. The amount of  $Cl_2(g)$  will remain unchanged

**Answer: C**

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**194.** The correct relationship between  $K_c$  and  $K_p$  is gaseous equilibrium is:

$$A. K_C = K_P(RT)^{\Delta n(b)}$$

$$B. K_p = K_C(RT)^{\Delta n}$$

$$C. \frac{k_c}{RT} (K_P)^{\Delta n}$$

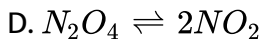
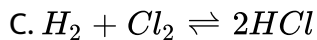
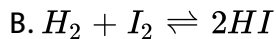
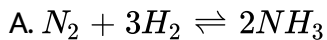
$$D. (K_P)/(RT) = (K_C)^{\Delta n}$$

**Answer: B**



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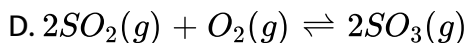
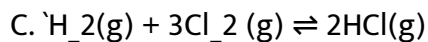
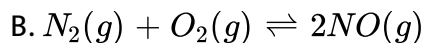
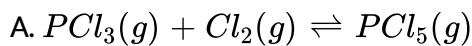
**195.** In which equilibrium reaction the equilibrium would shift to the right, if the total pressure is increased:



**Answer: A**

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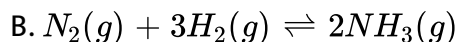
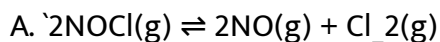
196. The chemical reaction in which the yield of the product cannot be increased by the application of high pressure is:



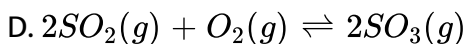
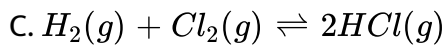
Answer: B

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197. For which reaction is  $K_p = K_c$  :







**Answer: C**

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**198.** In a flask colourless  $N_2O_4$  is in equilibrium with brown colourless  $NO_2$ . At equilibrium when the flask is heated at  $100^\circ C$  the brown colour deepens and on cooling it becomes less coloured. The change in enthalpy  $\Delta H$ , for the system is:

A. Negative

B. Positive

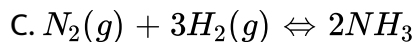
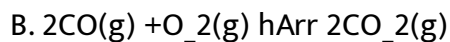
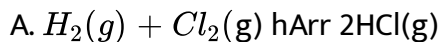
C. Zero

D. Undefined

**Answer: B**

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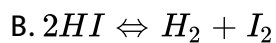
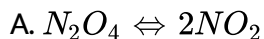
199. For which system at equilibrium, at constant temperature, will the doubling of the volume cause a shift to the right:

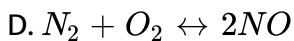
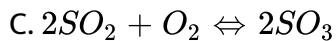


Answer: D

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200. For which reaction  $K_p$  is less than  $K_c$ :





**Answer: C**

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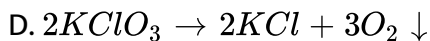
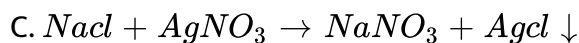
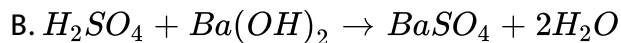
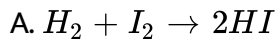
**201.** When  $NaCl_3$  is heated in a closed vessel, oxygen is liberated and  $NaNO_2$  is left behind. At equilibrium:

- A. Addition of  $NaNO_2$  favours reverse reaction
- B. Addition of  $NaNO_2$  favours forward reaction
- C. Increasing temperature favours forward reaction
- D. Decreasing pressure favour reverse reaction

**Answer: C**

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202. Which is a reversible reaction:



Answer: A



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203. In lime kiln, the reversible reaction,

$CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$  proceeds to completion because:

A. of high temperature

B.  $CO_2$  escapes out

C.  $CaO$  is removed

D. of low temperature

**Answer: B**

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**204.** In the reaction,  $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$  increase in  $H_2$  concentration equilibrium:

- A. Favours the dissociation of  $NH_3$
- B. Does not effect the reaction
- C. Increases the equilibrium constant
- D. Favours the formation of  $NH_3$

**Answer: D**

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**205.** For the reaction,  $CuSO_{4.5}H_2O(s) \rightleftharpoons CuSO_{4.3}H_2O(s) + 2H_2O(v)$ .

Which one is correct representation ?

A.  $K_p = (p_{H_2O}^2)$

B.  $K_c = [H_2O]^2$

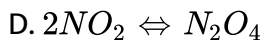
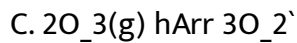
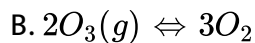
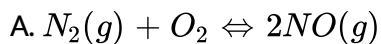
C.  $K_P = K_c(RT)^{-2}$

D. All of the above

**Answer: D**

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**206.** The equilibrium which remains unaffected by pressure change is :



**Answer: A**

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207. In an equilibrium reaction if  $\Delta G^\circ = 0$  the equilibrium constant, K should be equal to:

A. Zero

B. 1

C. 2

D. 10

**Answer: B**



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208. Solubility of a substance which dissolves with a decrease in volume and absorption of heat will be favoured by:

A. High P and High T

B. low P and low T

C. High P and low T

D. Low P and high T

**Answer: A**

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**209.** A chemical system is in equilibrium. Addition of a catalyst would result in:

A. Increase in the rate of forward reaction

B. increase in the rate of reverse reaction

C. A new reaction path way to reaction

D. Increase the amount of heat evolved in the reaction

**Answer: C**

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210. In a vessel containing  $SO_3$ ,  $SO_2$  and  $O_2$  at equilibrium, some helium gas is introduced so that the total pressure increases while temperature and volume remain constant. According to Le Chatelier's principle the dissociation of  $SO_3$  :

- A. Increases
- B. decreases
- C. Remains unaltered
- D. Changes unpredictably

**Answer: C**



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211. Concentration of reaction and products at equilibrium for  $A + 2B \rightleftharpoons C + D$  are,  $[A] = 0.20$ ,  $[B] = 0.10$ ,  $[C] = 0.30$ ,  $[D] = 0.50$ . The value of equilibrium constant is:

- A. 75

B. 150

C. 2.5

D. 750

**Answer: A**



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**212.** For a gaseous equilibrium,  $A + 2B \rightleftharpoons C + 3D$  the partial pressures of A, B, C and D are found to be 0.20, 0.10, 0.30 and 0.50 atm respectively. Predict the value of equilibrium constant.

A. 11.25

B. 18.75

C. 5

D. 3.75

**Answer: B**

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213. HI was heated in a sealed tube at  $440^{\circ}\text{C}$  till the equilibrium was reached. HI was found to be 22 % decomposed. Calculate the equilibrium constant for dissociation.

- A. 0.282
- B. 0.0796
- C. 0.0199
- D. 1.99

Answer: C

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214. The equilibrium constant for,  $\text{H}_2(\text{g}) + \text{CO}_2(\text{g}) \rightleftharpoons \text{H}_2\text{O}(\text{g}) + \text{CO}(\text{g})$  is 1.80 at  $1000^{\circ}\text{C}$ . If 1.0 mole of  $\text{H}_2$  and 1.0 mole of  $\text{CO}_2$  are placed in one

litre flask. What will be the final equilibrium concentration of CO at  $1000^{\circ}\text{C}$ ?

A. 0.573 M

B. 0.385 M

C. 5.73M

D. 0.295 M

**Answer: A**



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**215.** An equilibrium mixture for the reaction,  $2\text{H}_2\text{S}(g) \rightleftharpoons 2\text{H}_2(g) + \text{S}_2(g)$  had 0.5 mole  $\text{H}_2\text{S}$ , 0.10 mole  $\text{H}_2$  and 0.4 mole  $\text{S}_2$  in one litre vessel.  $K_c$  for the reaction is :

A. 0.004 mol /lit

B. 0.016 mol/lit

C. 0.008 mol/lit

D. 0.160 mol/lit

**Answer: B**

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**216.** The equilibrium constant for the reaction ,  $3C_2H_2 \rightleftharpoons C_6H_6$  is 4.0 at T K. If the equilibrium concentration of  $C_2H_2$  is 0.5 mole/litre the concentration of  $C_6H_6$ .

A. 0.5 M

B. 1.5 M

C.  $5 \times 10^{-2}$

D. 0.25 M

**Answer: A**

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217. For the reaction  $C(s) + CO_2(g) \rightleftharpoons 2CO(g)$  the partial pressure of  $CO_2$  and CO are 4 and 8 atm respectively  $K_p$  For the reaction is :

A. 16 atm

B. 2 atm

C. 5 atm

D. 4 atm

Answer: A



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218. If one third HI decomposes at a particular temperature:  $K_c$  for  $2HI \rightleftharpoons H_2 + I_2$  is :

A. 1/16

B. 1/4

C. 1/6

D. 1/2

**Answer: A**



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**219.** For a reversible reaction the rate constant for the forward reaction is  $2.38 \times 10^{-4}$  and for the backward reaction is  $8.15 \times 10^{-5}$ . The  $k_c$  of the reaction is:

A. 0.342

B. 2.92

C. 0.292

D. 3.42

**Answer: B**



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220. 28 g  $N_2$  and 6 g  $H_2$  were mixed .At equilibrium 17 g  $NH_3$  was formed. The weight of  $N_2$  and  $H_2$  of equilibrium are respectively:

A. 11 g zero

B. 1g , 3 g

C. 14 g , 3g

D. 11g , 3g

Answer: C



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221. At  $25^\circ c$  the equilibrium constant  $K_1$  and  $K_2$  of two reaction are :

$2NH_3 \Leftrightarrow N_2 + 3H_2$  :  $\frac{1}{2}N_2 + \frac{3}{2}H_2 \Leftrightarrow NH_3$  the relation between two

equilibrium constant is :

A.  $K_1 = K_2$

B.  $K_2 = \frac{1}{K_1^2}$



C.  $K_1 = \frac{1}{K_2^2}$

D.  $K_1 = \frac{1}{K_2}$

**Answer: C**



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**222.** The function of an enzyme in a reaction of the type  $A+B \rightleftharpoons C+D$  is to decrease:

- A. Equilibrium constant
- B. Rate of forward reaction
- C. Rate of backward reaction
- D. Activation energy

**Answer: D**



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223. The numerical value of  $K_p$  and  $K_c$  for the equilibrium  $2\text{NH}_3 \rightleftharpoons \text{N}_2 + 3\text{H}_2$  are related as :

A.  $K_p = K_c \times (RT)^3$

B.  $K_p = K_c \times (RT)^{-2}$

C.  $K_p = K_c \times (RT)^2$

D. None of these

Answer: C



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224. The variation of equilibrium constant with temperature is called :

A. van't Hoff isotherm

B. Kirchoff's equation

C. van't Hoff isochore

D. None of these

**Answer: C**

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**225.** Which statement is correct about Henry's law ?

- A. The amount of gas dissolved per unit volume of solvent is directly proportional to pressure of gas.
- B. The amount of gas dissolved per unit volume of solvent is directly independent to pressure of gas.
- C. The law is valid only when the gas dissolved neither dissociates nor associates in solvent
- D. All of the above

**Answer: D**

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226. For the reaction  $N_2 + 3H_2 \rightleftharpoons 2NH_3$  in a vessel after the addition of equal number of mole of  $N_2$  and  $H_2$  equilibrium state is formed. Which of the following is correct ?

- A.  $[H_2] = [N_2]$
- B.  $[H_2] < [N_2]$
- C.  $[H_2] > [N_2]$
- D.  $[H_2] > [NH_3]$

**Answer: B**



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227. For a reaction in gaseous state to reach an equilibrium state the reaction should be carried out in

- A. An open vessel
- B. Closed vessel

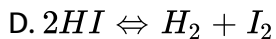
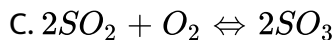
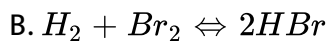
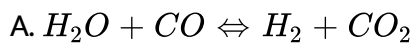
C. Glass vessel

D. Iron vessel

**Answer: B**

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**228.** Which reaction gives more products as a result of increase in pressure :



**Answer: C**

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229. On addition of an inert gas at constant volume to the reaction :



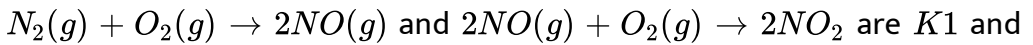
- A. The reaction halts
- B. forward reaction is favoured
- C. The reaction remains unaffected
- D. Backward reaction is favoured

Answer: C

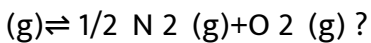


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230. The equilibrium constant for the reaction :



$K_2$  respectively. Then the equilibrium constant for the equilibrium 'NO 2



A.  $\frac{K_1}{K_2}$

B.  $\left[ \frac{1}{K} 1K2 \right] \frac{1}{2}$

C.  $K_1 K_2^2$

D.  $K_1^2 K_2$

**Answer: C**



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**231.** In the reversible gaseous reaction ,  $A + 2B \rightleftharpoons C + 3D$  The partial pressure of A B C and D are 0.20 , 0.10 , 0.30 ,0.50 atm respectively at equilibrium. The numerical value of  $K_p$  is :

A. 11.25

B. 18.75

C. 5

D. 3.75

**Answer: B**

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**232.** The formation of phosgene is represented as ,  $\text{CO} + \text{Cl}_2 \rightleftharpoons \text{COCl}_2$   
The reaction is carried out in 500 ml flask. At equilibrium 0.3 mole of phosgene, 0.1 mole of CO and 0.1 mole of  $\text{Cl}_2$  are present. What is the equilibrium constant of the reaction ?

A. 30

B. 15

C. 5

D. 3

**Answer: B**

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**233.** In the reaction,  $A + B \rightleftharpoons 2C$ , at equilibrium, the concentration of A and B is  $0.20 \text{ mol litre}^{-1}$  each and that of C was found to be  $0.60 \text{ mol}$



$\text{litre}^{-1}$ . The equilibrium constant of the reaction ?

- A. 9
- B. 4.8
- C. 18
- D. 2.4

**Answer: A**

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**234.** The equilibrium constants for the reaction,  $\text{Br}_2 \rightleftharpoons 2\text{Br}$  at 500 K and  $1 \times 10^{-10}$  and  $1 \times 10^{-5}$  respectively. The reaction is:

- A. Endothermic
- B. Exothermic
- C. Fast
- D. Slow

**Answer: A**

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**235.**  $\Delta G^\circ$  for the reaction  $X + Y \rightleftharpoons Z$  is  $-4.606$  kcal. The equilibrium constant for the reaction at  $227^\circ\text{C}$  is:

A. 100

B. 10

C. 2

D. 0.01

**Answer: A**

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**236.** The partial pressure of  $\text{CH}_3\text{OH}(g)$ ,  $\text{CO}(g)$  and  $\text{H}_2(g)$  in equilibrium mixture for the reaction,  $\text{CO}(g) + 2\text{H}_2(g) \rightleftharpoons \text{CH}_3\text{OH}(g)$  are 2.0, 1.0 and

0.1 atm respectively at  $427^{\circ}\text{C}$ . The value of  $K_{\text{pf}}$  or the decomposition of

$\text{CH}_3\text{OH} \rightarrow \text{CO}$  and  $\text{H}_2$  is :

A.  $10^2$  atm

B.  $2 \times 10^2 \text{ atm}^{-1}$

C.  $50 \text{ atm}^2$

D.  $5 \times 10^{-3} \text{ atm}^2$

**Answer: D**



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**237.** The equilibrium constant of a reaction is 20.0. At equilibrium, the rate constant of forward reaction is 10.0. The rate constant for backward reaction is:

A. 0.5

B. 2

C. 10

D. 200

Answer: A

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**238.** For the reaction  $aC(s) + CO_2(g) \rightleftharpoons 2CO(g)$ , the partial pressure of  $CO_2$  and CO are 2.0 and 4.0 atm respectively at equilibrium. The  $K_p$  for reaction is:

A. 0.5

B. 4

C. 8

D. 32

Answer: C

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239. In the reaction,  $PCl_5 \rightleftharpoons PCl_3 + Cl_2$ , the amounts of  $PCl_5$ ,  $PCl_3$  and  $Cl_2$  at equilibrium are 2 mole each and the total pressure is 3 atm.

The equilibrium constant  $K_p$  is:

- A. 1 atm
- B. 2 atm
- C. 3 atm
- D. 6 atm

Answer: A



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240. If 340 g of mixture  $N_2$  and  $H_2$  in the correct ratio gave a 20% yield of  $NH_3$ . The mass produced would be:

- A. 16 g
- B. 17 g

C. 20 g

D. 68g

**Answer: D**

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**241.** In a chemical equilibrium, the rate constants of the forward and backward reactions are respectively  $3.2 \times 10^{-4}$  and  $1.2 \times 10^{-5}$ , the equilibrium constant is :

A. 0.37

B. 26.7

C. 0.25

D. 3.7

**Answer: B**

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**242.** one mole of hydrogen iodide is heated in a closed container of 2 litre. At equilibrium half mole of hydrogen iodide has dissociated. What is the value of the equilibrium constant ?

- A. 1
- B. 5
- C. 0.25
- D. 0.75

**Answer: C**

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**243.** For the reaction  $2NO_2(g) \rightleftharpoons 2NO(g) + O_2(g)$ ,  $K_c = 1.8 \times 10^{-6}$  at  $185^\circ C$ . At  $185^\circ C$ , What is the value of  $K_c$  for  $NO(g) + \frac{1}{2}O_2(g) \rightleftharpoons NO_2(g)$  ?

- A.  $0.9 \times 10^{-6}$

B.  $7.5 \times 10^2$

C.  $1.95 \times 10^{-3}$

D.  $1.95 \times 10^3$

**Answer: B**



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**244.** 4 moles of A are mixed with 4 moles of B. When 2 moles of C are formed at equilibrium accordingly to the reaction  $A + B \rightarrow C + D$ .  $K_c$  is:

A. 4

B. 1

C.  $\sqrt{2}$

D.  $\sqrt{4}$

**Answer: B**



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**245.** 3.2 mole of hydrogen iodide were heated in a sealed bulb at  $444^{\circ}\text{C}$  till the equilibrium was reached. The degree of dissociation of HI at this temperature was found to be 22% calculate the number of mole of hydrogen iodide present at equilibrium.

A. 2.496

B. 1.87

C. 2

D. 4

**Answer: A**

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**246.** For the reaction  $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$  at 720 K the value of equilibrium constant is 50. When equilibrium concentration of  $\text{H}_2$  and  $\text{I}_2$

IS 0.5 M.  $K_p$  under the same conditions will be :

A. 0.02

B. 0.2

C. 50

D. 50RT

**Answer: C**



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**247.** A quantity of  $PCl_5$  was heated in a 10 litre vessel at  $250^\circ C$  to show  $PCl_5(g) \rightleftharpoons PCl_3 + Cl_2$  AT equilibrium the vessel contains 0.1 mole of  $PCl_5$  0.20 mole of  $PCl_3$  and 0.20 mole od  $cl_2$  The equilibrium constant of the reaction is :

A. 0.02

B. 0.05

C. 0.04

D. 0.025

**Answer: C**



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**248.** If  $\Delta G^\circ$  for the reaction given below is 1.7KJ : The equilibrium constant of the reaction  $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$  at  $25^\circ\text{C}$  is :

A. 24

B. 3.9

C. 2

D. 0.5

**Answer: D**



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249. At a given temperature the  $K_c$  for the reaction  $PCL_5(g) \rightleftharpoons PCl_3 + Cl_2$  is  $2.4 \times 10^{-3}$  At the same temperature the  $K_c$  for the reaction  $PCl_3 + Cl_2 \rightleftharpoons PCL_5(g)$  is :

- A.  $2.4 \times 10^{-3}$
- B.  $-2.4 \times 10^{-3}$
- C.  $4.2 \times 10^2$
- D.  $4.8 \times 10^{-2}$

**Answer: C**

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250. For a reaction  $2A + B \rightleftharpoons C$  where initial concentration of  $A=2M$   $B=1M$  and  $C=0$  the concentration of  $B$  at equilibrium is  $0.5 M$  calculate the value of equilibrium constant for the reaction .

- A. 0.5

B. 2

C. 1

D. 1.5

**Answer: C**

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251.  $\frac{K_p}{K_c}$  for the reaction:  $\text{CO(g)} + \frac{1}{2}\text{O}_2\text{(g)} \rightleftharpoons \text{CO}_2\text{(g)}$  is :

A.  $RT$

B.  $1/\sqrt{RT}$

C.  $\sqrt{RT}$

D. 1

**Answer: B**

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252. If the concentration of  $N_2$ ,  $H_2$  and  $NH_3$  are 1,2,3, respectively, their concentration at equilibrium will be :  $N_2 + 3H_2 \rightleftharpoons 2NH_3$ .

A.  $(1-x) (2-3x) (2x)$

B.  $(1-x/3) (2-x) (2x/3)$

C.  $(1-x) (2-x) (3+x)$

D.  $(1-x) (2-3x) (3+2x)$

Answer: D



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253. For the equilibrium,  $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$  which of the following expression is correct :

A.  $K_p = [CaO] \frac{CO_2}{CaCO_3}$

B.  $K_p = \frac{p(CaO) + p(CO_2)}{p_{CaCO_2}}$

C.  $K_p = p(CO_3)$

$$D. K_p = \frac{p_{\text{cao}} + p_{\text{co}_2}}{p_{\text{caco}_3}}$$

**Answer: C**



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**254.** For the reaction,  $A \rightleftharpoons B : K_c = 2$ ,  $B \rightleftharpoons C : K_c = 4$ ,  $C \rightleftharpoons D : K_c = 6$   $K_c$

for the reaction  $A \rightleftharpoons D$  is :

A.  $(2 \div 4 \div 6)$

B.  $\frac{2 \times 4}{6}$

C.  $\frac{4 \times 6}{2}$

D.  $2 \times 4 \times 6$

**Answer: D**



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255. For the reversible reaction  $N_2(g) + 3H_2(g) = 2NH_3(g)$  at  $500^\circ C$  the value of  $K_p$  is

$1.44 \times 10^{-5}$  when  $\partial$  pressure measured  $\in$  atmosphere The corresponding

$K_c$  with concentration is mole/lit. IS :

A.  $\frac{1.44 \times 10^{-5}}{(0.082 \times 500)^{-2}}$

B.  $\frac{1.44 \times 10^{-5}}{(8.314 \times 773)^{-2}}$

C.  $\frac{1.44 \times 10^{-5}}{(0.082 \times 773)^{-2}}$

D.  $\frac{1.44 \times 10^{-5}}{(0.082 \times 773)^{-2}}$

Answer: D

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256. 2 MOLE of  $PCl_5$  were heated in a closed vessel of 2 litre capacity. At equilibrium 40 % of  $PCl_5$  dissociated into  $PCl_3$  and  $Cl_2$ . Find the value of equilibrium constant.



A. 0.267

B. 0.53

C. 2.63

D. 5.3

**Answer: A**



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257. If  $K_e$  of the reaction,  $2HI \rightarrow H_2 + I_2$  is 0.25, the equilibrium constant of the reaction  $H_2 + I_2 \rightarrow 2HI$  would be :

A. 1

B. 2

C. 3

D. 4

**Answer: D**

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**258.** One mole of ethyl alcohol was treated with one mole of acetic acid at  $25^{\circ}\text{C}$ .  $\frac{2}{3}$  of the acid changes into ester at equilibrium Calculate the equilibrium constant for the reaction :

- A. 1
- B. 2
- C. 3
- D. 4

**Answer: D**

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**259.** If in the reaction  $N_2O_4 \rightleftharpoons 2NO_2$ ,  $\alpha$  is degree of dissociation of  $N_2O_4$

Then the number of molecules at equilibrium will be :

A. 3

B. 1

C.  $(1 - \alpha)^2$

D.  $(1 + \alpha)$

**Answer: D**

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260.  $K_c$  for  $A + B \rightleftharpoons C + D$  at  $25^\circ\text{C}$  is 100. If the initial concentrations of A, B, C, and D are 1, 2, 3, and 4 moles per litre respectively, the reaction shall :

A. Proceed from right to left

B. Proceed from left to right

C. Be at equilibrium

D. None of these

**Answer: A**

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**261.** For a system in equilibrium,  $\Delta G = 0$  under conditions of constant :

- A. Temperature and pressure
- B. temperature and volume
- C. Energy and volume
- D. Pressure and volume

**Answer: A**

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**262.** Dissolution of sugar being an endothermic reaction is favoured by :

- A. Low T

B. High T

C. High P

D. Low P

**Answer: B**

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**263.** For the reaction  $\text{PCl}_5 \rightleftharpoons \text{PCl}_3 + \text{Cl}_2$ , the forward reaction at constant temperature is favoured by :

A. Introduction an inert gas at constant volume

B. Introduction chlorine gas at constant volume

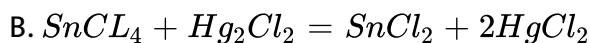
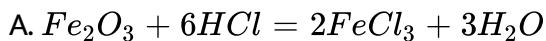
C. Introduction an inert gas at constant pressure

D. None of these

**Answer: C**

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264. The reaction which proceed in the forward direction is :



Answer: A



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265. For reaction  $PCl_3(g) + Cl_2(g) \rightleftharpoons PCl_5(g)$  the value of  $K_c$  at  $250^\circ C$  is  $26 \text{ mol}^{-1} \text{ litre}^{-1}$ . The value of  $K_p$  at this temperature will be

:

A.  $0.61 \text{ atm}^{-1}$

B.  $0.57 \text{ atm}^{-1}$

C.  $0.83 \text{ atm}^{-1}$

D.  $0.46 \text{ atm}^{-1}$

**Answer: A**

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**266.** For the gaseous phase reaction,

$2NO \rightleftharpoons N_2 + O_2$ ,  $\Delta H^\circ = -43.5 \text{ Kcal mol}^{-1}$ , Which statement is correct or incorrect?

$N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$ :

- A. K is independent of temperature
- B. K increases as temperature decreases
- C. K decreases as temperature decreases
- D. K varies with addition of NO

**Answer: C**

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267. In which of the following cases, does the reaction go farthest to completion :

A.  $K = 10^3$

B.  $K = 10^{-2}$

C.  $K = 10$

D.  $K = 1$

**Answer: A**



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268. The solubility of  $CO_2$  in water increases with :

A. Increases in temperature

B. Increases in pressure

C. Decreases in pressure

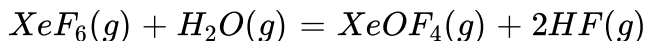


D. None of these

Answer: B

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269. If  $K_1$  and  $K_2$  are the respective equilibrium constant for the two reactions



$XeO_4(g) + XeF_6(g) \rightleftharpoons XeOF_4(g)XeO_3F_2(g)$  , The equilibrium constant for the reaction,  $XeO_4(g) + 2HF(g) \rightleftharpoons XeO_3F_2 + H_2O(g)$  is

:

A.  $K_1K_2$

B.  $\frac{K_1}{K_2^2}$

C.  $\frac{K_2}{K_1}$

D.  $\frac{K_1}{K_2}$

Answer: C



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270. A cylinder fitted with a movable piston contains liquid water in equilibrium with water vapour at  $25^{\circ}\text{C}$ . Which operation result in a decrease in the equilibrium vapour pressure ?

- A. Moving the piston downward a short distance
- B. removing a small amount of vapour
- C. Removing a small amount of the liquid water
- D. Dissolving salt in the water

**Answer: D**



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271. The equilibrium constant for the reaction,  $2\text{X}(\text{g}) + \text{Y}(\text{g}) \rightleftharpoons 2\text{Z}(\text{g})$  is  $2.25 \text{ litre mol}^{-1}$ . What would be the concentration of Y at equilibrium with 2.0 mole of X and 3.0 mole of Z in one litre vessel :

A. 1.0 M

B. 2.25 M

C. 2.0 M

D. 4.0 M

**Answer: A**



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**272.** At constant temperature in one litre vessel when the reaction  $2SO_2(g) \rightleftharpoons 2SO_2(g) + O_2(g)$  is at equilibrium the  $SO_2$  concentration is 6.0 M, initial concentration of  $SO_3$  is 1 M. calculate the equilibrium constant.

A. 2.7

B. 1.36

C. 0.34

D. 0.675

**Answer: D**



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**273.** For a reaction

$2A + B \rightleftharpoons C + D$ , the  $\partial$  pressure of  $A$ ,  $B$ ,  $C$  and  $D$  at equilibrium are 0.5,

$k_p$  for this reaction is :

A. 4.2

B. 2.4

C. 0.42

D. 0.24

**Answer: A**



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274. The decomposition of  $N_2O_4 \rightarrow NO_2$  is carried out at 280 K in chloroform. When equilibrium has been established, 0.2 mole of  $N_2O_4$  and  $2 \times 10^{-3}$  mole of  $NO_2$  are present in a 2 litre solution. THE equilibrium constant for the reaction,  $N_2O_4 \rightleftharpoons 2NO_2$  is :

A.  $1 \times 10^{-2}$

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

C.  $1 \times 10^{-5}$

D.  $2 \times 10^{-5}$

**Answer: C**

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275. In the equilibrium

$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3$ , the partial pressure of  $SO_2$ ,  $O_2$  AND  $SO_3$  are 0.662, 0.101 and 0.331 atm respectively. *Wshod beth e partial pressure*  $SO_2$  and  $SO_3$  are equal ?

A. 0.4 atm

B. 1.0 atm

C. 0.8 atm

D. 0.25 atm

**Answer: A**



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**276.** For reaction  $PCl_3(g) + Cl_2(g) \rightleftharpoons PCl_5(g)$  the value of  $K_c$  at  $250^\circ C$  is  $26 \text{ mol}^{-1} \text{ litre}^{-1}$ . The value of  $K_P$  at this temperature will be :

A. 0.605

B. 0.57

C. 0.83

D. 0.46

**Answer: A**

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**277.** At equilibrium , the amount of HI in a 3 litre vessel was 12.8 g. Its equilibrium concentration is :

- A. 4.267 M
- B. 0.033 M
- C. 0.1 M
- D. 0.2 M

**Answer: B**

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**278.** One mole of nitrogen is mixed with 3 mole of hydrogen in a closed 3 litre vessel 20 % of nitrogen is converted into  $NH_3$  .Then what is the  $K_C$

for  $\frac{1}{2}(N_2) + \frac{3}{2}(H_2) \rightleftharpoons NH_3$

A. 0.36 litre  $mol^{-1}$

B. 0.46 litre  $mol^{-1}$

C. 0.5 litre  $mol^{-1}$

D. 0.2 litre  $mol^{-1}$

**Answer: A**



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**279.** 1.1 mole of A are mixed with 2.2 mole of B and the mixture is then kept in one litre flask till the equilibrium is attained  $A + 2B \rightleftharpoons 2C + D$ . At the equilibrium, 0.2 mole of C are formed. The equilibrium constant of the reaction is :

A. 0.001

B. 0.002

C. 0.003



D. 0.004

**Answer: A**

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**280.** For the reaction  $A + B \rightleftharpoons C + D$  the initial concentration of A and B are equal but the equilibrium concentration of C is twice that of equilibrium concentration of A. Find the value of the equilibrium constant .

A. 4

B. 9

C. 1/4

D. 1/9

**Answer: A**

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281. The degree of dissociation of  $PCl_5(\alpha)$  obeying the equilibrium,

$PCl_5 \rightleftharpoons PCl_3 + Cl_2$  is approximately related to the pressure at equilibrium by :

A.  $\alpha \propto P$

B.  $\alpha \propto \frac{1}{\sqrt{P}}$

C.  $\alpha \propto \frac{1}{P^2}$

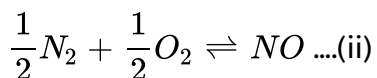
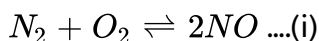
D.  $\alpha \propto \frac{1}{P^4}$

**Answer: B**



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282. If  $K_1$  and  $K_2$  are equilibrium constant for reactions (I) and (II) respectively for ,



then :

A.  $K_2 = K_1$

B.  $K_2 = \sqrt{K_1}$

C.  $K_1 = 2K_2$

D.  $K_1 = \left(\frac{1}{2}\right)K_2$

**Answer: B**

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**283.** The most favourable condition of temperature and pressure for the oxidation of  $SO_2$  to  $SO_3$  are :

A. Low temperature and high pressure

B. low temperature and low pressure

C. High temperature and high pressure

D. High temperature and low pressure

**Answer: A**

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**284.** When KOH is dissolved in water, Heat is evolved. If the temperature is raised, the solubility of KOH:

- A. Increases
- B. Decreases
- C. Remains the same
- D. Cannot be predicted

**Answer: B**

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**285.** Solubility of a gas in liquid increases on :

- A. Addition of a catalyst
- B. Increasing the pressure

C. Decreasing the pressure

D. Increasing the temperature

**Answer: B**

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**286.** A reversible chemical reaction having two reactant is in equilibrium.

If the concentrations of the reactants are doubled then the equilibrium constant will :

A. Also be doubled

B. Be halved

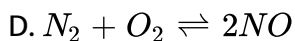
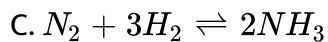
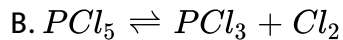
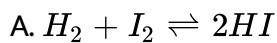
C. Become one fourth

D. Remains the same

**Answer: D**

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287. Reaction favoured by low pressure is :



Answer: B



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288. van't Hoff' equation giving the effect of temperature on chemical equilibrium is represented a :

A.  $\frac{d \ln F}{dT} = \frac{\Delta H}{RT^2}$

B.  $\frac{d \ln K_P}{dT} = \frac{\Delta H T^2}{R}$

C.  $\frac{d \ln K_P}{dT} = \frac{\Delta H}{RT^2}$

$$D. \frac{d \ln K_P}{dT} = \frac{RT^2}{\Delta H}$$

Answer: C

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289. The unit of equilibrium constant for the reaction ,  $H_2 + I_2 \rightleftharpoons 2HI$

IS :

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290. the equilibrium constant K for the reaction  $2HI(g) \rightleftharpoons H_2(g) + I_2(g)$  at room temperature 300 K is 2.85 and at 698 K is  $1.84 \times 10^{-2}$  . Hence the reason that HI exists as a stable compound at room temperature is because :

A. It decomposes so slowly that equilibrium is not readily achieved

B. The HI bond has a large covalent contribution

C. The heat of reaction at room temperature is  $-5.31 \text{ kcal}$

D. It is uncatalyzed reaction

**Answer: C**

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**291.** The equilibrium constant for a reaction is  $1 \times 10^{20}$  at 300 K. Find the standard free energy change for this reaction.

A.  $-115 \text{ kJ}$

B.  $+115 \text{ kJ}$

C.  $+16 \text{ kJ}$

D.  $-166 \text{ kJ}$

**Answer: A**

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292.  $A(g) + B(g) \rightleftharpoons AB(g)$  is a reversible reaction. At equilibrium 0.4 mole of AB is formed when each A and B are taken one mole. How much of A change into AB?

A. 20 %

B. 40 %

C. 60 %

D. 4 %

**Answer: B**



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293. 8 mole of a gas  $AB_3$  are introduced into a  $1.0 \text{ dm}^3$  vessel. It dissociates as,  $2AB_3(g) \rightleftharpoons A_2(g) + 3B_2(g)$  At equilibrium, 2 mole of  $A_2$  are found to be present. What is the equilibrium constant of reaction?

A. 2

B. 3

C. 27

D. 36

**Answer: C**



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**294.** At a certain temperature ,  $2\text{HI} \rightleftharpoons \text{H}_2 + \text{I}_2$  on 50 % HI is dissolved at equilibrium .What the value of equilibrium constant ?

A. 1

B. 3

C. 0.5

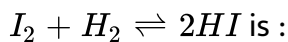
D. 0.25

**Answer: D**



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295. Equilibrium concentration of  $HI$ ,  $I_2$  and  $H_2$  are 0.7, 0.1 and 0.1 M respectively. The equilibrium constant for the reaction,



A. 0.36

B. 36

C. 49

D. 0.49

Answer: C

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296. An equilibrium mixture of the reaction  $2NO(g) + O_2(g) \rightleftharpoons 2NO_2(g)$  contains 0.120 mole of  $NO_2$ , 0.080 mole of 0.640 mole of  $O_2$  in a 4 litre flask at a constant temperature. The value  $K_c$  for the reaction at this temperature is :

A. 14

B. 24

C. 7

D. 8

**Answer: A**



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**297.** The equilibrium concentration of X , Y and  $YX_2$  are 4,2,2 respectively for the equilibrium  $2X + Y \rightleftharpoons YX_2$  The equilibrium constant  $K_c$  is :

A. 0.0625

B. 0,625

C. 0.0628

D. None of these

**Answer: D**

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**298.** The reaction  $A + 2B \rightleftharpoons 2C + D$  was situated using an initial concentration of B which was 1.5 times that of A. But the equilibrium concentration of A and C were found to be equal. Then what is the  $K_c$  for the equilibrium?

A. 4

B. 8

C. 6

D. 0.632

**Answer: A**

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**299.** The vapour density of undecomposed  $N_2O_4$  is 46. When heated vapour density decreases to 24.5 due to its dissociation to  $NO_2$ . WHAT is

the percent dissociation of  $N_2O_4$  at the final stage ?

A. 88

B. 60

C. 40

D. 70

**Answer: A**



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300. For a system

$A + 2B \rightleftharpoons 2C$  the equilibrium concentrations are  $[A] = 0.06$ ,  $[B] = 0.12$  and

$K_c$  for the reaction is :

A. 54

B. 415

C.  $4 \times 10^{-5}$

Answer: A

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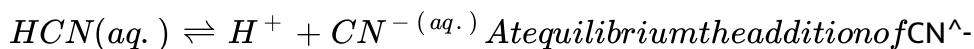
**301.** An aqueous solution of hydrogen sulphide shows the equilibrium,  $H_2S \rightleftharpoons H^+ + HS^-$  if dilute hydrochloric acid is added to an aqueous solution of hydrogen sulphide without any change in temperature:

- A. The equilibrium constant will change
- B. The concentration  $HS^-$  will increase
- C. The concentration of undissociated hydrogen sulphide will decrease
- D. The concentration of  $HS^-$  will decrease.

Answer: D

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302. Consider the reversible reaction,



(aq.) would:

- A. Reduce  $\text{HCN}(\text{aq.})$  concentration
- B. Decrease the  $\text{H}^+$  (aq.) ion concentration
- C. Increase the equilibrium constant
- D. Decrease the equilibrium constant

**Answer: B**

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303. Which can be explained as applications of Le Chatelier 's principle :

- A. Transport of oxygen by haemoglobin in blood
- B. Removal of  $\text{CO}_2$  from tissues by blood



C. Tooth decay due to use of sweet substances

D. All of these

**Answer: D**

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**304.** The following equilibrium exist in aqueous solution,  $CH_3COOH \rightleftharpoons CH_3COO^- + H^+$  If dilute HCl is added without a change in temperature then :

A. Concentration of  $CH_3COO^-$  will decrease

B. Concentration of  $CH_3COO^-$  will increase

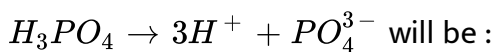
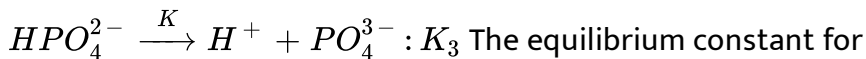
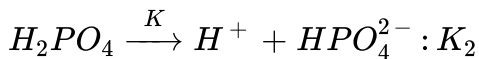
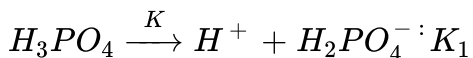
C. The equilibrium constant will increase

D. The equilibrium constant will decrease

**Answer: A**

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305. The equilibrium constant for the reactions are :



A.  $K_1/K_2 K_3$

B.  $K_1 \times K_2 \times K_3$

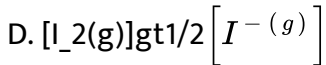
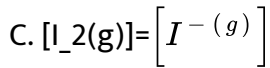
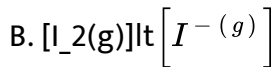
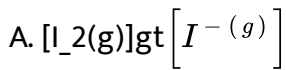
C.  $K_2/K_1 K_3$

D.  $K_1/K_2/K_3$

**Answer: B**

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306. If 1 mole of  $I_2$  is introduced into 1.0 litre flask at 1000 K, at equilibrium ( $K_c = 10^{-6}$ ) which one is correct ?

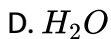
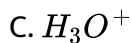
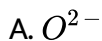


**Answer: A**



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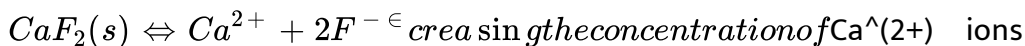
**307.** If ammonia is added to pure water the concentration of a chemical species already present will decrease. The species is :



**Answer: C**

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308. If the system



4 times will cause the equilibrium concentration of  $\text{F}^{-}$  ions to change to :

- A. 1/4 of the initial value
- B. 1/2 of the initial value
- C. 2 times of the initial value
- D. None of these

**Answer: B**

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309. When  $\text{CO}_2$  dissolves in water the following equilibrium is established,  $\text{CO}_2 + 2\text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{HCO}_3^-$  for which the equilibrium

constant is  $3.8 \times 10^{-7}$  and  $\text{PH} = 6.0$  The ratio of  $\frac{\text{HCO}_3}{\text{CO}_2^-}$  IS :

A.  $3.8 \times 10^{-18}$

B. 3.8

C. 0.38

D. 13.8

**Answer: C**



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**310.** For the reaction:  $[\text{Ag}(\text{CN})_2]^- \rightleftharpoons \text{Ag}^+ + 2\text{CN}^-$  the equilibrium constant  $K_c$  at  $25^\circ\text{C}$  is  $4.0 \times 10^{-19}$  then the silver ion concentration in a solution which was or  $\text{AgNO}_3$

A.  $7.5 \times 10^{18}$

B.  $7.5 \times 10^{-18}$

C.  $7.5 \times 10^{19}$

D.  $7.5 \times 10^{-19}$

**Answer: B**



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**311.** Calculate the concentration of hydroxyl ion in a solution left after mixing 100 ml of 0.1 M  $MgCl_2$  and 100 ml of 0.2 M NaOH [ $K_{sp}$  of  $Mg(OH)_2 = 1.2 \times 10^{-11}$ ]

A.  $2.8 \times 10^{-3}$

B.  $2.8 \times 10^{-2}$

C.  $2.8 \times 10^{-4}$

D.  $2.8 \times 10^{-5}$

**Answer: C**



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312. Find the PH of saturated solution of  $Mg(OH)_2$  [ $K_p$  of  $Mg(OH)_2 = 8.9 \times 10^{-12}$ ]

A. 10.4168

B. 9.4168

C. 11.4168

D. 7

Answer: A



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313. What is PH at which an acid indicator with  $K_a = 1 \times 10^{-5}$  changes colour when the indicator concentration is  $1 \times 10^{-3}$  M ?

A. 4

B. 5

C. 6

D. 3

**Answer: B**



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**314.** An acid type indicator  $\text{Hin}$  differ in colour from its conjugate base ( $\text{In}^-$ ) The human eye is sensitive to the colour of differences only when the ratio  $[\text{In}^-]/[\text{Hin}]$  is greater than 10 or smaller than 0.1. What should be the minimum change in the PH of the solution to observe a complete colour change ( $K_a = 1 \times 10^{-5}$ )?

A. 4

B. 2

C. 6

D. 1

**Answer: B**





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**315.** Soda water has a PH value :

- A. Less than 7
- B. More than 7
- C. 7
- D. Greater than 7

**Answer: A**



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**316.** The ionic product of water \_\_\_\_\_ with the increase in temperature

- A. Increases
- B. Decreases
- C. Remains constant

D. None of the above

Answer: A

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317. The PH of a solution is defined by the equation:

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

B.  $pH = \frac{\log 1}{H_{30}^+}$

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

D. All of these

Answer: D

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318. If 1 M  $CH_3COONa$  is added to 1M  $CH_3COOH$ :

A. pH of the solution increases

B. pH decreases

C. pH does not change

D. None of these

**Answer: A**

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**319.** The pH of mixture of ,  $CH_3COONa + CH_3COOH$  after adding water shows \_\_\_\_ value:

A. Increased

B. Decreased

C. Constant

D. All of the above

**Answer: C**

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**320.** The unit of ionic product of water ( $K_w$ ) is :

A.  $\text{mol}^{-1}\text{litre}^{-1}$

B.  $\text{mol}^{-1}\text{litre}^{-2}$

C.  $\text{mol}^{-2}\text{litre}^{-2}$

D.  $\text{mol}^2\text{litre}^{-2}$

**Answer: D**

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**321.** Isoelectric point is defined as the pH at which :

A. An amino acid becomes acidic

B. An amino acid becomes basic

C. Zwitter ion has positive charge

D. Zwitter ion has zero charge

**Answer: D**

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**322.** The addition of HCl does not suppresses the ionisation of :

A. Acetic acid

B. Benzoic acid

C.  $H_2S$

D.  $H_2SO_4$

**Answer: D**

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**323.** Water acts as an acid in presence of :

A.  $NH_3$

B.  $H_2SO_4$

C.  $C_6H_6$

D. HCl

**Answer: A**

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**324.** The dissociation constants of a weak acid and a weak base constituting the salt are same. The pH of a solution of salt is :

A. 7

B. More than 7

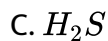
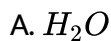
C. Less than 7

D. Zero

**Answer: A**

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**325.** Which one is bronstad acid but not a bronstad base?



**Answer: C**

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**326.** The pH of blood is maintained by  $CO_2$  and  $H_2CO_3$  in the body and chemical constituents of blood. The phenomenon is called:

A. Collidal

B. Buffer solution

C. Acidity

D. Salt balance

**Answer: B**



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**327.** Fear or excitement generally cause one to breathe rapidly and it results in the decreases 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 be 7

**Answer: C**



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328. On adding solid potassium cyanide to water :

- A. pH will increase
- B. pH will decrease
- C. pH will not change
- D. Electrical conductance will not change

Answer: A



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329. The hydrogen ion concentration in a solution of weak acid of dissociation constant  $K_a$  and concentration  $C$  is nearly equal to :

A.  $\sqrt{\frac{k_c}{C}}$

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

C.  $K_a C$

D.  $\sqrt{K_a C}$

**Answer: D**

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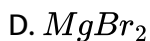
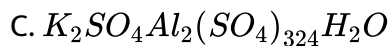
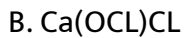
**330.** A 50 ml solution of 0.1M acetic acid is titrated against a 0.1 M sodium hydroxide. The best indicator will be :

- A. Phenolphthalein
- B. Methyl orange
- C. A self indicator
- D. Methyl red

**Answer: A**

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331. Which is a mixed salt ?



Answer: B



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332. The aqueous solution of disodium hydrogen phosphate is :

A. Acidic

B. Neutral

C. Basic

D. None of these

**Answer: C**



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**333.** The aqueous solution of aluminium chloride is acidic due to :

- A. Cation hydrolysis
- B. Anion hydrolysis
- C. Hydrolysis of both anion and cation
- D. Dissociation

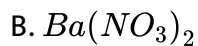
**Answer: A**



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**334.** Which gives a neutral solution in water?

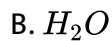
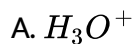




**Answer: B**

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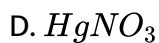
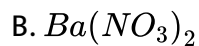
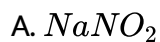
**335.** Reaction of an acid with a base usually results in the production of



**Answer: B**

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336. The precipitation is noticed when an aqueous solution of :

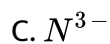


Answer: D



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337. Conjugate base of hydrazoic acid :



**Answer: B**



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**338.** Which one of the strongest base ?

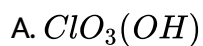


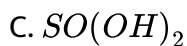
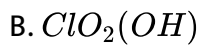
**Answer: D**



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**339.** Which one of the strongest acid ?





**Answer: A**

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**340.** Arrange  $\text{H}_2\text{SO}_4$  (I) ,  $\text{H}_3\text{PO}_4$  (II)  $\text{HClO}_4$  (III) in decreasing order of acidic nature:

A. IgtIIgtII

B. IgtIIgtIII

C. IIgtIIgtI

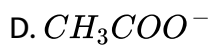
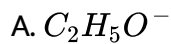
D. IIgtIgtII

**Answer: D**

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341. Which anion is weakest base ?



Answer: B



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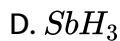
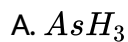
342. The weakest base among the following is :



**Answer: D**

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**343.** Which one is the strongest base?

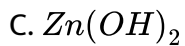
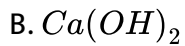


**Answer: B**

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**344.** Weakest base among the following is :



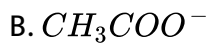


**Answer: C**



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**345. The strongest base is :**

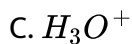
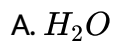


**Answer: B**



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346. The conjugate base of  $OH^-$  ion is :

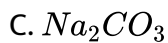


Answer: B



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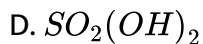
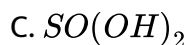
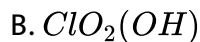
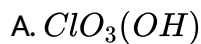
347. Aqueous solution of which salt has the lowest pH :



**Answer: B**

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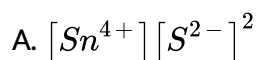
**348.** The strongest acid among the following is :

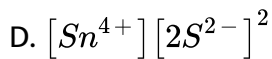
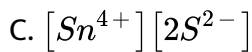
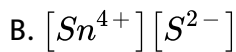


**Answer: A**

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**349.** The correct representation for solubility product of  $\text{SnS}_2$  is :



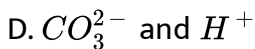
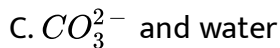
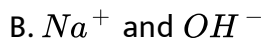
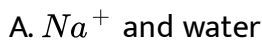


**Answer: A**



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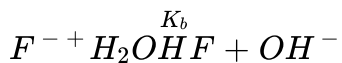
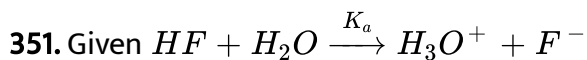
**350.** The hydrolysis of sodium carbonate involves the reaction between:



**Answer: C**



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Which relation is correct?

A.  $K_b = K_w$

B.  $K_b = \frac{1}{K_w}$

C.  $K_a \times K_b = K_w$

D.  $\frac{K_a}{K_b} = K_w$

Answer: C



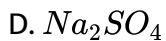
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352. Which hydrolysis in water :

A. NaCl

B.  $NH_4Cl$

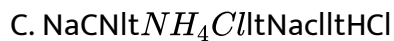
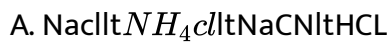
C. KCl



Answer: B

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353. The pH of 0.1 M solution of the following salts increases in the order:



Answer: B

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354. A solution of  $CuSO_4$  in water will :



- A. Turn red litmus blue
- B. Turns blue litmus red
- C. Show no effect on litmus
- D. Decolourise litmus

**Answer: B**

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**355.** If  $s$  and  $S$  are respectively solubility and solubility product of a sparingly soluble binary electrolyte then:

- A.  $s=S$
- B.  $s=S^{12}$
- C.  $s=S^{\frac{1}{2}}$
- D.  $s=1/2S$

**Answer: C**

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**356.** Which statement is /are correct?

- A. All bronstad bases are also Lewis bases
- B. All bronstad acids are not Lewis acid
- C. All cations are acids and all anions are base
- D. All of the above

**Answer: D**

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**357.** If the solubility of a sparingly soluble salt of the type  $BA_2$  (giving three ions on dissociation of a molecule) is  $x$  mole per litre, Then its solubility product is given by :

- A.  $x^2$

B.  $2x^2$

C.  $4x^2$

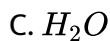
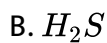
D.  $4x^3$

**Answer: D**



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**358.** The bronstad acid which gives the weakest conjugate base is :

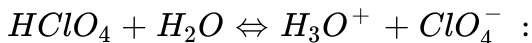


**Answer: D**



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359. The correct statement for the equilibrium is ,



- A.  $HClO_4$  is the conjugate acid of  $H_2O$
- B.  $H_2O$  is the conjugate acid of  $H_3O^+$
- C.  $H_3O^+$  is the conjugate base of  $H_2O$
- D.  $ClO_4^-$  is the conjugate base of  $HClO_4$

Answer: D



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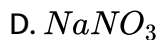
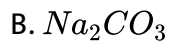
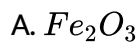
360. The common ion effect is shown by which of the following:

- A.  $BaCl_2 + BaNO_3$
- B.  $NaCl + HCl$
- C.  $NH_4OH + NH_4Cl$
- D. None of these

**Answer: C**

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**361.** A white substance having alkaline nature in solution:



**Answer: B**

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**362.** The correct relation for hydrolysis constant of  $NH_4CN$  is :

A.  $\sqrt{\frac{K_w}{K_a}}$

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

C.  $\frac{\sqrt{K_H}}{C}$

D.  $\frac{K_a}{K_b}$

**Answer: B**

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**363.** For weak acid strong base titration the indicator used is :

A. Pottasium dichromate

B. Methyl orange

C. Litmus

D. Phenolphthalein

**Answer: D**

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364. Phenolphthalein is not a good indicator for titrating:

- A. NaOH against oxalic acid
- B. Ferrous sulphate against  $KMnO_4$
- C. NaOH against HCl
- D. NaOH against  $H_2SO_4$

Answer: B



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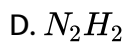
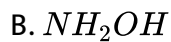
365. The compound that does not act as lewis acid :

- A.  $AlCl_3$
- B.  $BF_3$
- C.  $NH_3$
- D.  $FeCl_2$

**Answer: C**

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**366.** The conjugate acid of  $NH_2^-$  is :



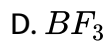
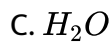
**Answer: A**

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**367.** Which is lewis acid ?



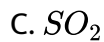
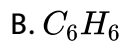




**Answer: D**

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**368.** Aprotic solvent is :



D. All of these

**Answer: D**

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369. For which salt the pH OF its solution does not change the dilution:



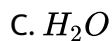
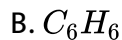
D. None of these

**Answer: B**



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370. Hcl does not behave as acid in :



D. None of these

**Answer: B**

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**371.** In the reaction  $AlCl_3 + Cl \rightarrow [AlCl_4]^-$ ,  $AlCl_3$  acts as :

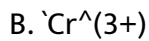
- A. Salt
- B. Lewis base
- C. Lewis acid
- D. Bronstad acid

**Answer: C**

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**372.** Which one is hard base ?

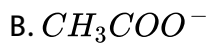
- A.  $Ag^+$



**Answer: D**

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**373.** Which does not act as bronsted acid ?



**Answer: B**

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374. Which species would be least likely to act as Lewis base ?

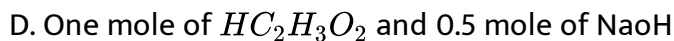
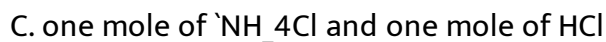
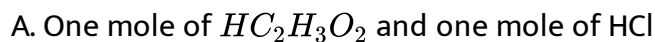


Answer: D



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375. Which may be added to one litre of water to act as a buffer ?



**Answer: D**

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**376.** The  $OH^-$  ion concentration of a weak base is :

- A.  $C \cdot K_b$
- B.  $\sqrt{C \cdot K_b}$
- C.  $\sqrt{K_b/C}$
- D.  $\sqrt{K_b}$

**Answer: B**

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**377.** Addition of  $NH_4Cl$  to  $NH_4OH$  results in :

- A. Increases in  $OH^-$  concentration

- B. Decreases in  $OH^-$  concentration
- C. No change in  $OH^-$  concentration
- D. None of these

**Answer: B**

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**378.** The relation for calculating ph of a weak base is :

A.  $pH = PK_w - \frac{1}{2}pK_b + \frac{1}{2}\log C$

B.  $pH = PK_w - \frac{1}{2}pK_b - \frac{1}{2}\log C$

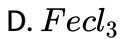
C.  $pH = PK_w - \frac{1}{2}pK_b + \frac{1}{2}\log C$

D. None of these

**Answer: A**

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379. Which aqueous solution will have Ph less than 7?



Answer: D



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380. Which statement/relationship is correct?

A. Use hydrolysis salt of strong base and weak acid gives a solution

with  $pH < 7$

B.  $pH = -\frac{\log 1}{H^+}$

C. only at  $25^\circ C$  the ph of water is 7



D. The value of  $PK_w$  at  $25^\circ C$  is 7

**Answer: C**

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**381.** Ionic product of water increases if :

- A. Pressure is reduced
- B.  $H^+$  ion is added
- C.  $OH^-$  ion is added
- D. Temperature is increased

**Answer: D**

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**382.** A buffer solution helps in maintaining the :

- A. Alkanity of solution
- B. Acidic nature of solution
- C. pH of medium
- D. None of these

**Answer: C**

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**383.**  $[H^+]$  in aqueous ammonium sulphate solution is :

- A. More than  $10^{-7}$
- B. Less than  $10^{-7}$
- C.  $10^{-7}$
- D.  $10^{-4}$

**Answer: A**

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**384.** The correct statement about buffer solution:

- A. It contains a weak acid and its conjugate base.
- B. it contains a weak base and its conjugate acid
- C. it shows little change in ph on adding small amount of an acid or base
- D. All of the above

**Answer: D**



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**385.** Phenolphthalein does not act as indicator for the titration between :

- A. KOH and  $H_2SO_4$
- B.  $Ba(OH)_2$  and HCl

C. NaOH and acetic acid

D. Oxalic acid and  $KMnO_4$

**Answer: D**

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**386.** The pink colour of phenolphthalein in alkaline medium is due to :

A. Negative ion

B. Positive ion

C.  $OH^-$  ION

D. neutral ion

**Answer: A**

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**387.** Phenolphthalein shows \_\_\_ in acid medium:

- A. Red colour
- B. yellow colour
- C. Pink colour
- D. No colour

**Answer: D**



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**388.** The indicator used in the titration of sodium carbonate with sulphuric acid is :

- A. Pottasium ferrocyanide
- B. Pottasium ferricyanide
- C. Methyl orange
- D. Phenolphthalein

**Answer: C**

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**389.** The indicator use in the titrating oxalic acid with caustic soda solution is :

- A. Methyl orange
- B. Methyl red
- C. Fluorescein
- D. Phenolphthalein

**Answer: D**

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**390.** Methyl orange gives red colour in :

- A. Sodium carbonate solution
- B. Sodium chloride solution
- C. Hydrochloric acid solution
- D. Pottasium hydroxide solution

**Answer: C**

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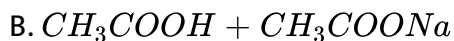
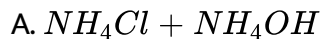
**391.** The range of ph in which methyl orange works as indicator:

- A. 3-4
- B. 10-12
- C. 8-10
- D. 6-8

**Answer: A**

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392. Which can act as buffer?



C. 40 ml of 0.1 M NaCN + 20 ml of 0.1 M HCl

D. All of these

Answer: D



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393. Which statement is /are correct?

A. All arhenius acids are bronstad acids

B. All arhenius bases are bronstad bases

C.  $H^+$  ion in solution exist as  $H_9PO_4^+$



D. All of the above

**Answer: D**



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**394.** Which indicator works in ph range 8-9.8?

A. Phenolphthalein

B. Methyl orange

C. Methyl red

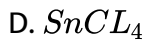
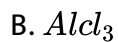
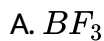
D. Litmus

**Answer: A**



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**395.** Which of the following is not a lewis acid ?



**Answer: C**

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**396.** The strongest bronsted base is:



**Answer: A**

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397. The weakest Lewis base is :



Answer: C



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398. Glycine is :

A. Arrhenius acid

B. Lewis base

C. Simplest amino acid

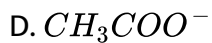
D. All of the above

**Answer: D**



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**399.** Strongest conjugate base among the following is :



**Answer: D**



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**400.** The strongest base among the following is :

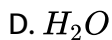


**Answer: A**



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**401.** Hydrolysis of oxide ion in water produces



**Answer: B**



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402.  $H_3BO_3$  IS \_\_\_\_\_ acid ?

A. Monobasic

B. dibasic

C. Tribasic

D. NONE

**Answer: A**



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403. The conjugate base of  $H_3BO_3$  is :

A.  $B(OH)_4^-$

B.  $H_2BO_3^-$

C.  $HBO_3^{2-}$

D. none

**Answer: A**



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**404.** The aqueous solution of an acid is characterised by the presence of :

A.  $OH^-$  ions

B.  $H_3O^+$  ions

C.  $H^+$  ions

D.  $H_4O^+$  ions

**Answer: B**



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**405.** The solubility of  $A_2X_3$  is  $y \text{ mol dm}^{-3}$  its solubility product is

A.  $6y^4$

B.  $64y^4$

C.  $36y^5$

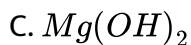
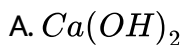
D.  $108y^5$

**Answer: D**



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**406.** Although CO is neutral but it shows acidic nature on reaction at high P and T with



**Answer: B**



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407. Which oxide is neutral ?

A.  $N_2O$

B. NO

C. Co

D. ALL

Answer: D

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408. Which is not a lewis acid ?

A.  $ZnCl_2$

B.  $BF_3$

C.  $Ag^+$

D.  $H_2O$

**Answer: D**



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**409.** Which is not a lewis base ?

A.  $OH^-$

B.  $Ag^+$

C.  $NH_3$

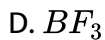
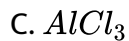
D.  $H^-$

**Answer: B**



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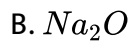
**410.** Which is not a lewis acid ?



**Answer: A**

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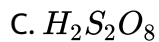
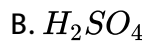
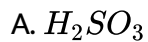
**411. Which is acid anhydride?**



**Answer: C**

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412. The oxyacid of  $SO_2$  is :



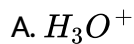
D. None

Answer: A



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413. The conjugate acid of  $H^-$  ion is :



D.  $H_2O$

Answer: B

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414. The increasing order of acid strength  $HClO_4$ ,  $HClO_3$ ,  $HClO_2$ ,  $HClO$  is

A.  $HClO$  lt  $HClO_2$  lt  $HClO_3$  lt  $HClO_4$

B.  $HClO_4$  lt  $HClO_3$  lt  $HClO_2$  lt  $HClO$

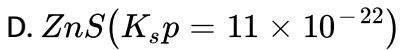
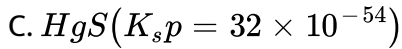
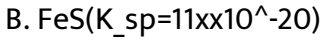
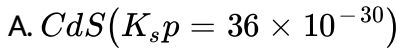
C.  $HClO_4$  lt  $HClO_2$  lt  $HClO_3$  lt  $HClO$

D. None of these

Answer: A

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415. Which metal sulphide has maximum solubility in water?



Answer: B



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416. The solubility of  $PbCl_2$  is given by,

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

B.  $[K_{sp}]^{1/3}$

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

D.  $[8K_{sp}]^{1/2}$

**Answer: C**

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**417.** The metallic sulphide not precipitated if  $H_2S$  gas is passed through HCl containing aqueous solution is:

A.  $CoS$

B.  $Bi_2S_3$

C.  $HgS$

D.  $CuS$

**Answer: D**

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**418.** The solubility of  $AgI$  in  $NaI$  is lower than that in pure water, because:

- A. AgI forms complex with NaI
- B. Effect of common ion increases ionic concentration of  $I^-$
- C. Solubility product of AgI is less than that of NaI
- D. The temperature of the solution decreases

**Answer: B**

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**419.** Which of the following is most soluble in water?

- A.  $MnS(K_{sp} = 8 \times 10^{-37})$
- B.  $ZnS(K_{sp} = 7 \times 10^{-16})$
- C.  $Bi_2S_3(K_{sp} = 1 \times 10^{-70})$
- D.  $Ag_2S(K_{sp} = 6 \times 10^{-51})$

**Answer: B**

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420. The polyprotic acid is:

A. HCL

B.  $HClO_4$

C.  $H_3PO_4$

D.  $HNO_3$

Answer: C



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421. The salt that does not hydrolyse:

A.  $SnCl_2$

B.  $FeCl_3$

C.  $SnCl_4$

D.  $\text{CaCl}_2$

**Answer: D**



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**422.** Which is not a Lewis acid?

A.  $\text{MgCl}^2$

B.  $\text{SnCl}_2$

C.  $\text{Cl}_4$

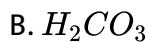
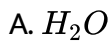
D.  $\text{RMgX}$

**Answer: C**



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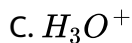
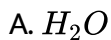
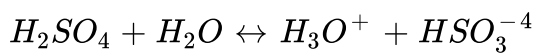
**423.** The conjugate acid of  $\text{CO}_3^{2-}$



**Answer: D**

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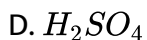
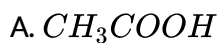
**424.** The conjugate base of  $H_2SO_4$  in the following reaction is:



**Answer: B**

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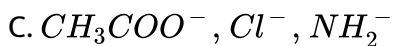
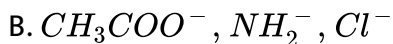
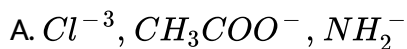
425. Ostwald's dilution law is applicable in the case of the solution of:



Answer: A

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426. The decreasing order of strength of following bases is :



D.  $NH_2^-$ ,  $CH_3COO^-$ ,  $Cl^-$

**Answer: D**

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**427.** The pH of 10 M HCl aqueous solution is:

A. Less than zero

B. One

C. Two

D. Zero

**Answer: D**

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**428.** In a buffer solution consisting of a weak acid its salt, the ratio of concentration of salt to acid is increased tenfold, then the pH of the solution will:

- A. Increase by one
- B. Increase tenfold
- C. Decrease by one
- D. Decrease tenfold

**Answer: A**



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**429.** The Ph of a 0.005 M aqueous solution of sulphuric acid is approximately:

- A. 0.005
- B. 2

C. 1

D. 0.01

**Answer: B**



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**430.** The pH of a  $10^{-10}$  HCl solution is approximately:

A. 10

B. 7

C. 1

D. 14

**Answer: B**



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431. If the dissociation constant of an acid HA is  $1 \times 10^{-5}$  the Ph of a 0.1 M solution of the acid HA will be approximately:

- A. 3
- B. 5
- C. 1
- D. 6

**Answer: A**



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432. The ph of a solution is 5.0 to this solution sufficient acid is added to decreases the ph to 2.0 The increase in hydrogen ion concentration is :

- A. 1000 times
- B. 5/2 times
- C. 100 times



D. 5 times

**Answer: A**



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**433.** When the pH of a solution is 2 the hydrogen ion concentration is :

A.  $1.0 \times 10^{-14}$  M

B.  $1.0 \times 10^{-2}$  M

C.  $1.0 \times 10^{-7}$  M

D.  $1.0 \times 10^{-12}$  M

**Answer: B**



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**434.** The Ph of (1/1000) N KOH solution is :

A.  $10^{-11}$

B. 3

C. 2

D. 11

**Answer: D**



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**435.** The pH of 1 % ionised 0.1 M solution of a weak monobasic acid :

A. 1

B. 2

C. 3

D. 11

**Answer: C**



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**436.** A monoprotic acid in 1.00 M solution is 0.01 % ionised. What is the dissociation constant of the acid ?

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

B.  $1.0 \times 10^{-6}$

C.  $1.0 \times 10^{-8}$

D.  $10^{-5}$

**Answer: C**



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**437.** 50 ml of 2 N acetic acid mixed with 10 ml of 1N sodium acetate solution will have an approximate ph of ( $K_a=10^{-5}$ )

A. 4

B. 5

C. 6

D. 7

**Answer: A**

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**438.** How many times a solution of pH =2 has higher acidic nature than the solution of pH=6 ?

A. 1000

B. 12

C. 400

D. 4

**Answer: A**

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439. A monotropic acid in 1.00 M solution is 0.01 % ionised. What is the dissociation constant of the acid ?

A.  $1.0 \times 10^{-3}$

B.  $1.0 \times 10^3$

C.  $1.0 \times 10^{-8}$

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

Answer: D



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440. one litre of water contains  $10^{-7} \text{ moles } \leq \text{H}^+$  ions what is degree of ionisation of water ?

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

B.  $1.8 \times 10^{-9} \%$

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

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

**Answer: A**

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**441.** The hydrogen ion concentration of 0.001 N NaOH solution is:

A.  $1.0 \times 10^{-2} \text{ M}$

B.  $1.0 \times 10^{-11} \text{ M}$

C.  $1.0 \times 10^{-14} \text{ M}$

D.  $1.0 \times 10^{-12} \text{ M}$

**Answer: B**

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**442.** Hclo is a weak acid. What is the concentration of  $H^+$  ions in 0.1 solution of Hclo '(K<sub>a</sub> = 5 x 10<sup>-8</sup>)'?

A.  $7.07 \times 10^{-5}$  M

B.  $5 \times 10^{-7}$  M

C.  $5 \times 10^{-7}$  M

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

**Answer: A**



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**443.** The pH of simple sodium acetate and acetic acid buffer is given by,  $pH = pK_a + \log \frac{[Salt]}{[Acid]}$   $K_a$  of acetic acid =  $1.8 \times 10^{-5}$ . If  $[Salt] = [Acid] = 0.1$  M, the pH of the solution would be about:

A. 7

B. 4.7

C. 5.3

D. 1.4

**Answer: B**

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**444.** Find the pH of a 0.01 M solution of acetic acid having degree of dissociation 12.5%.

A. 4.509

B. 3.723

C. 2.903

D. 5.623

**Answer: C**

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**445.** For weak acid strong base titration the indicator used is :

- A. Methyl orange (3 to 4)
- B. Methyl red (5 to 6)
- C. Bromothymol blue (6 to 7.5)
- D. Phenolphthalein (8 to 9.6)

**Answer: D**



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**446.** The  $pK_a$  of acetylsalicylic 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 9. Aspirin will be

- A. unionized in the small intestine and in the stomach
- B. Completely ionized in the small intestine and in the stomach
- C. Ionized in the stomach and almost unionized in the small intestine

D. ionized in the small intestine and almost unionized in the stomach

**Answer: D**

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**447.** The alkali not suitable for volumetric determination of HCl, using phenolphthalein as an indicator is:

A. NaOH

B.  $Ba(OH)_2$

C. KOH

D.  $NH_4OH$

**Answer: D**

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**448.** The hydrolysis of the salt of weak acid and strong base is known as:

- A. Anionic hydrolysis
- B. Cationic hydrolysis
- C. Neutral hydrolysis
- D. Acid hydrolysis

**Answer: A**



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**449.** The hydrolysis of the salt of strong acid and weak base is called:

- A. increases with concentration
- B. decreases with concentration
- C. Amphoteric hydrolysis
- D. None of these

**Answer: B**

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**450.** Degree of hydrolysis of a salt of weak acid and a weak base:

- A. increases with concentration
- B. decreases with concentration
- C. Independent of concentration
- D. None of these

**Answer: C**

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**451.** The hydrolysis constant of a salt of weak acid and weak base is inversely proportional to:

- A. Dissociation constant of weak acid
- B. Dissociation constant of weak base
- C. Ionic product of water
- D. Dissociation constant of both weak acid and weak base

**Answer: D**

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**452.** Ostwald dilution law is expressed as:

A.  $K_a = \frac{C \cdot \alpha^2}{1 - \alpha}$

B.  $K_a = \frac{C \cdot \alpha}{1 - \alpha}$

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

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

**Answer: A**

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453. Phenolphthalein is a:

- A. Weak acid
- B. Weak base
- C. strong acid
- D. Strong base

**Answer: A**



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454. Which one has maximum solubility in liquid  $CCl_4$ :

- A.  $Cl_2$
- B.  $I_2$
- C. NaCl

D.  $Br_2$

**Answer: B**



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**455.** The pH of gastric juice is normally:

- A. Greater than 1.5 and less than 1.2
- B. less than 1.5
- C. greater than 1 and less than 3
- D. Less than 1 and greater than zero

**Answer: C**



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**456.** Blood is:

- A. Strong acidic
- B. Strongly basic
- C. Neutral
- D. Slightly basic

**Answer: D**

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**457.** To a mixture of acetic acid and sodium acetate a further amount of sodium acetate is added. The pH of the mixture:

- A. Increases
- B. Decreases
- C. Remains unchanged
- D. Not predictable

**Answer: A**



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

A.  $pH = \frac{1}{2} [PK_w + PK_a + \log C]$

B.  $pH = \frac{1}{2} [PK_w + PK_a - \log C]$

C.  $pH = \frac{1}{2} [PK_w + PK_b + \log C]$

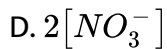
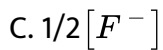
D. None of these

**Answer: A**

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459. Solubility of  $BaF_2$  in a solution of  $Ba(NO_3)_2$  will be represented by the concentration term:

A.  $[Ba^{2+}]$



**Answer: C**



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**460.** The blood buffers are most often involved in stabilizing the pH in presence of metabolically produced:

A. Acids

B. bases

C. salts

D. None of these

**Answer: A**



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**461.** Acidosis is diagnosed when blood pH:

- A. falls below 7.35
- B. Rises above 7.45
- C. BOTH (A) AND (B)
- D. None of the above

**Answer: A**



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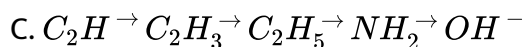
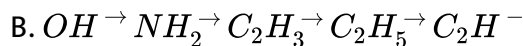
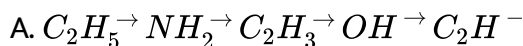
**462.** The solution of AgCl is unsaturated if:

- A.  $[Ag^+][Cl^-] < K_{sp}$
- B.  $[Ag^+][Cl^-] < K_{sp}$
- C.  $[Ag^+][Cl^-] = K_{sp}$
- D. none of these

Answer: A

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463. Select the correct order for the strength of bases given below:



Answer: D

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464. In the precipitation of iron group in qualitative analysis,  $NH_4Cl$  is added before the addition of  $NH_4OH$ :

- A. To prevent the interference of phosphate
- B. To decrease  $NH_4^+$  ions concentration
- C. To increase  $OH^-$  ions concentration
- D. To prevent the precipitation of subsequent groups

**Answer: D**

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**465.** What is the pH of 0.01 M NaOH assuming complete ionisation ?

- A. 2
- B. 14
- C. 12
- D. 0.01

**Answer: C**

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**466.** The pH of the solution obtained by mixing 10 mL of  $10^{-1}$  N HCl and 10 mL of  $10^{-1}$  N NaOH is:

- A. 8
- B. 2
- C. 7
- D. None

**Answer: C**



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**467.** At  $90^\circ C$  pure water has  $[H_3O^+] = 10^{-6}$  mol/ litre. The value of  $K_w$  at  $90^\circ C$  is:

- A.  $10^{-6}$
- B.  $10^{-12}$

C.  $10^{-14}$

D.  $10^{-8}$

**Answer: B**



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**468.** 0.4 g of NaOH present in one litre solution shows the *pH*:

A. 12

B. 2

C. 6

D. 10

**Answer: A**



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469.  $pH$  of  $10^{-8}$  M solution of HCl in water is:

- A. 8
- B. -8
- C. Between 7 and 8
- D. Between 6 and 7

**Answer: D**



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470. The hydrogen ion concentration in a given solution is  $6 \times 10^{-4}$ . Its  $pH$  will be:

- A. 6
- B. 4
- C. 3.22
- D. 2



**Answer: C**



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**471.** A certain buffer solution contains equal concentration of  $X^-$  and HX. The  $K_b$  for  $X^-$  is  $10^{-10}$ . What is the pH of the buffer?

A. 4

B. 7

C. 10

D. 14

**Answer: A**



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**472.**  $10^{-6}$  M HCl is diluted to 100 times. Find its pH value.

A. 6

B. 8

C. 6.95

D. 9.5

**Answer: C**



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**473.** An aqueous solution contains a substance which yields  $4 \times 10^{-3}$  mol *liter*<sup>-1</sup> ion of  $H_3O^+$ . If  $\log 2 = 0.3010$  the pH of the solution is:

A. 1.5

B. 2.398

C. 3

D. 3.4

**Answer: B**



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474. If the hydrogen ion concentration of a given solution is  $5.5 \times 10^{-3}$

M. Find the pH of the solution.

A. 2.26

B. 3.4

C. 3.75

D. 4.76

Answer: A



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475. What is the pH of a 1 M  $CH_3COONa$  solution?  $K_2$  of acetic acid =

$1.8 \times 10^{-5}$  and  $K_w = 10^{-14} \text{ mol}^2 \text{ litre}^{-2}$ :

A. 2.4

B. 3.6

C. 4.8

D. 9.4

**Answer: D**



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**476.** A 0.01 M ammonia solution is 5% ionized. The concentration of  $\text{OH}^-$  ion is:

A. 0.005 M

B. 0.0001 M

C. 0.0005 M

D. 0.05 M

**Answer: C**



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**477.** 0.04 g of pure NaOH is dissolved in 10 litof distilled water. The pH of the solution is:

- A. 9
- B. 10
- C. 11
- D. 12

**Answer: B**



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**478.** The pH of the solution produced when an aqueous solution of strong acid pH 5 is mixed with equal volume of an aqueous solution of strong acid of pH 3 is:

- A. 3.3

B. 3.5

C. 4.5

D. 4

**Answer: A**



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**479.** 100 mL of 1 N  $NH_4OH$  ( $K_b = 5 \times 10^{-5}$ ) is neutralised to equivalence point by 1 N HCl. Calculate the pH of solution at equivalence point.

A. 2

B. 2.5

C. 3

D. 5

**Answer: D**

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480. A certain weak acid has a dissociation constant  $1.0 \times 10^{-4}$ . What is the equilibrium constant for its reaction with a strong base?

A.  $1 \times 10^{-4}$

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

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

D.  $1 \times 10^{-14}$

Answer: C

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481. If  $K_a$  for a weak acid is  $10^{-5}$ .  $pK_b$  value of its conjugate base is:

A. 5

B. 6

C. 7

D. 9

**Answer: D**

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**482.** The buffer action of acidic buffer is maximum when its pH is equal to:

A. 5

B. 7

C. 10

D.  $Pk_a = 1$

**Answer: D**

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**483.** The pH of a solution is 2. Its pH is to be changed to 4. Then the  $H^+$  concentration of original solution has to be:

- A. Halved
- B. doubled
- C. increase by 100 times
- D. decrease by 100 times

**Answer: D**

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**484.** A buffer mixture of acetic acid and potassium acetate has pH= 5.24.

The ratio of  $[CH_3COO^-]/[CH_3COOH]$  in this buffer is, ( $pK_a = 4.740$ )

:

- A. 3:1
- B. 1:3

C. 1:1

D. 1:2

**Answer: A**

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**485.** The  $[H_3O^+]$  in the rain water of  $\text{pH} = 4.35$  is:

A.  $4.5 \times 10^{-5} \text{ M}$

B.  $6.5 \times 10^{-5} \text{ M}$

C.  $9.5 \times 10^{-5} \text{ M}$

D.  $12.5 \times 10^{-5} \text{ M}$

**Answer: A**

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**486.** What is the pH of a 0.02 M ammonia solution which is 5% ionised?

A. 2

B. 5

C. 7

D. 11

**Answer: D**



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**487.** The hydrogen ion concentration of a solution is  $3 \times 10^{-6}$  g ion/litre.

Find its pH value

A. 5.523

B. 6.523

C. 6.477

D. 6.3

**Answer: A**



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**488.** Find the  $[\text{OH}^-]$  in 100 mL of 0.015 M HCl (aq.) solution.

A.  $5 \times 10^{-12}$  M

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

C.  $6.7 \times 10^{-13}$  M

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

**Answer: C**



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**489.** A certain buffer solution contains equal concentration of  $X^-$  and HX. The  $K_a$  for HX is  $10^{-8}$ . What is the pH of the buffer solution?

A. 3

B. 8

C. 11

D. 14

**Answer: B**

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**490.** The pH of a  $10^{-10}$  M NaOH solution is nearest to:

A. 10

B. 7

C. 4

D. -10

**Answer: B**

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491. The  $H^+$  ion concentration in 0.001 M acetic acid is  $1.34 \times 10^{-4}$  g ion/litre. What is the  $H^+$  ion concentration of 0.164 g of  $CH_3COONa$  is added to a litre of 0.001 M  $CH_3COOH$  will be ?

A.  $9 \times 10^{-6}$

B.  $18 \times 10^{-6}$

C.  $4.5 \times 10^{-6}$

D.  $5 \times 10^{-6}$

Answer: A



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492.  $K_a$  for HCN is  $5 \times 10^{-10}$  at  $25^\circ C$ . For maintaining a constant pH of 9. Find the volume of 5 M KCN solution required to be added to 10 mL of 2 M HCN solution.

A. 4 ml

B. 7.95 ml

C. 2 ml

D. 9.3 ml

**Answer: C**

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**493.** An aqueous solution of 0.1 M  $\text{NH}_4\text{Cl}$  will have a pH closer to:

A. 9.1

B. 8.1

C. 7.1

D. 5.1

**Answer: D**

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**494.** Find the number of mole of hydroxide ( $OH^-$ ) ion in 0.3 litre of 0.005 M solution of  $Ba(OH)_2$ .

A. 0.0075

B. 0.0015

C. 0.003

D. 0.005

**Answer: C**



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**495.** How many grams of NaOH must be present in one litre of the solution of give it a pH = 12?

A. 0.20 g/lit

B. 0.4 g/lit



C. 4 g/lit

D. 0,10 g/lit

**Answer: B**

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**496.** The pH of pure water at  $50^{\circ}C$  is .....( $pK_w = 13.26$  at  $50^{\circ}C$ ):

A. 6

B. 6.63

C. 7

D. 7.13

**Answer: B**

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**497.** The pH of a solution formed by mixing 40 mL of 0.10 M HCl and 10 mL of 0.45 M NaOH is:

- A. 5
- B. 8
- C. 12
- D. 10

**Answer: C**



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**498.** The pH of a soft drink is 3.82. Its  $H^+$  ion concentration will be:

- A.  $1.96 \times 10^{-2}$  mol/lit
- B.  $1.96 \times 10^{-3}$  mol/lit
- C.  $1.5 \times 10^{-4}$  mol/lit
- D.  $1.96 \times 10^{-1}$  mol/lit

**Answer: C**

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**499.** The solubility of  $Al(OH)_3$  is 's' mol per litre, the solubility product of  $Al(OH)_3$  is :

A.  $s^3$

B.  $27s^4$

C.  $s^2$

D.  $4s^2$

**Answer: B**

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**500.** The equivalent conductance of  $0.1N$  acetic acid is  $5cm^2 ohm^{-1}geq^{-1}$  and at infinite dilution is  $390cm^2 ohm^{-1}geq^{-1}$ . Calculate

the degree of dissociation of acetic acid.

A. 0.0013

B. 0.013

C. 0.13

D. 0.5

**Answer: B**



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**501.** The dissociation constant of HCN is  $1.3 \times 10^{-9}$ . The value of hydrolysis constant of KCN will be:

A.  $1.3 \times 10^{-19}$

B.  $10^{-14}$

C.  $7.7 \times 10^{-5}$

D.  $0.77 \times 10^{-5}$

**Answer: D**



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**502.** If the solubility of lithium sodium hexafluoro-aluminate,  $Li_3Na_3(AlF_6)_2$  is 'a' mol/litre, its solubility product is equal to:

A.  $a^2$

B.  $12a^2$

C.  $18a^3$

D.  $2916a^8$

**Answer: D**



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**503.** The solubility of AgCl in water at  $10^\circ C$  is  $6.2 \times 10^{-6}$  mol/litre. The  $K_{sp}$  of AgCl is:

A.  $\frac{[6.2 \times 10^{-6}]^1}{2}$

B.  $6.2 \times 10^{-6} \wedge 2$

C.  $(6.2)^2 \times 10^{-6}$

D.  $[6.2 \times 10^{-6}]^2$

**Answer: D**

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504.  $K_{sp}$  of AgCl at  $18^\circ C$  is  $1.8 \times 10^{-10}$ . If  $Ag^+$  of solution is  $4 \times 10^{-3}$  mol/litre. The  $Cl^-$  must exceed by or  $eAgCl$  is precipitated would be:

A.  $4.5 \times 10^{-8}$  mol/lit

B.  $7.2 \times 10^{-13}$  mol/lit

C.  $4 \times 10^{-3}$  mol/lit

D.  $4.5 \times 10^{-7}$  mol/lit

**Answer: A**



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505. When equal volumes of the following solutions are mixed, precipitation of  $\text{AgCl}$  ( $K_{sp} = 1.8 \times 10^{-10}$ ) will occur only with

- A.  $10^{-4} \text{ M (Ag}^+)$  and  $10^{-4} \text{ M (Cl}^-)$
- B.  $10^{-5} \text{ M (Ag}^+)$  and  $10^{-5} \text{ M (Cl}^-)$
- C.  $10^{-6} \text{ M (Ag}^+)$  and  $10^{-6} \text{ M (Cl}^-)$
- D.  $10^{-10} \text{ M (Ag}^+)$  and  $10^{-10} \text{ M (Cl}^-)$

Answer: A



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506. Solubility product of  $\text{PbCl}_2$  at 298 K is  $1.0 \times 10^{-6}$ . At this temperature solubility of  $\text{PbCl}_2$  in mol per litre is :

- A.  $(1.0 \times 10^{-6})^{\frac{1}{2}}$

B.  $(1.0 \times 10^{-6})^{\frac{1}{3}}$

C.  $(0.25 \times 10^{-6})^{\frac{1}{3}}$

D.  $(0.25 \times 10^{-6})^{\frac{1}{2}}$

**Answer: C**

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507. Solubility product of  $Ba(OH)_2$  is  $4 \times 10^{-9}$  its solubility in water is

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

B.  $1 \times 10^{-9}$  M

C.  $4 \times 10^{-27}$  M

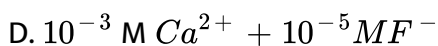
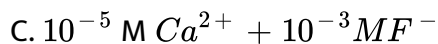
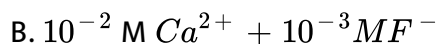
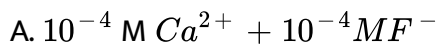
D.  $1 \times 10^{-27}$  M

**Answer: A**

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508. The precipitate of  $CaF_2$  ( $K_s = 1.7 \times 10^{-10}$ ) is obtained when equal volumes of the following are mixed:



Answer: B



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509. The solubility of  $PbCl_2$  at  $25^\circ C$  is  $6.3 \times 10^{-3} \text{ mol/litre}$ . The solubility product of  $PbCl_2$  at  $25^\circ C$  is:

A.  $(6.3 \times 10^{-3}) \times (6.3 \times 10^{-3})$

B.  $(6.3 \times 10^{-3}) \times (12.6 \times 10^{-3})$

C.  $(6.3 \times 10^{-3}) \times (12.6 \times 10^{-3})^2$

D.  $(12.6 \times 10^{-3}) \times (12.6 \times 10^{-3})$

**Answer: C**

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**510.** A saturated solution of  $Ag_2SO_4$  is  $2.5 \times 10^{-2}$  M. The value of its solubility product is:

A.  $62.5 \times 10^{-6}$

B.  $6.25 \times 10^{-4}$

C.  $15.625 \times 10^{-6}$

D.  $3.125 \times 10^{-6}$

**Answer: A**

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511. The  $pK_a$  of an indicator is 4. Its working range lies in between pH:

A. 1-5

B. 3-5

C. 5-8

D. 8-12

**Answer: B**



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512. A saturated solution of  $Mg(OH)_2$  in water at  $25^\circ C$  contains 0.11 g  $Mg(OH)_2$  per litre of solution. The solubility product of  $Mg(OH)_2$  is :

A.  $(0.11)^2$

B.  $(0.11)^3$

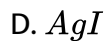
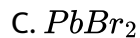
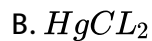
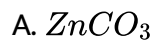
C.  $4 \times (0.11)^3$

$$D. 4 \times \frac{(0.11)^3}{(58)^3}$$

**Answer: D**

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**513.** Which is least soluble in  $H_2O$ .



**Answer: B**

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514. The solubility product of  $CaSO_4$  is  $6.4 \times 10^{-5}$ . The solubility of  $CaSO_4$  is:

A.  $8 \times 10^{-3} M$

B.  $8 \times 10^{-6} M$

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

D.  $1.6 \times 10^{-3} M$

**Answer: A**



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515. What is the solubility of  $Mg(OH)_2$  in mole per litre if  $K_p = 1.0 \times 10^{-11}$  ?

A.  $2.46 \times 10^{-14}$

B.  $1.36 \times 10^{-4}$

C.  $2.60 \times 10^{-7}$

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

**Answer: B**

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**516.** If the solubility of  $Ca(OH)_2$  is  $\sqrt{3}$ , the solubility product of  $Ca(OH)_2$  is :

A. 3

B. 27

C.  $\sqrt{3}$

D.  $12\sqrt{3}$

**Answer: D**

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517. The solubility product,  $K_f$  of a sparingly soluble salt MX at  $25^\circ\text{C}$  is  $2.5 \times 10^{-9}$ . The solubility of the salt in  $\text{mol litre}^{-1}$  at this temperature is :

A.  $1.0 \times 10^{-14}$

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

C.  $1.25 \times 10^{-9}$

D.  $5.0 \times 10^{-5}$

**Answer: D**



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518. What is the solubility product of  $\text{CaF}_2$ , if its saturated solution contains 0.017 g of  $\text{CaF}_2$  per litre ?

A.  $1.44 \times 10^{-4}$

B.  $4.14 \times 10^{-11}$

C.  $4.14 \times 10^{-18}$

D.  $41.4 \times 10^{-24}$

**Answer: B**

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519.  $K_{sp} = 1.2 \times 10^{-5}$  of  $M_2SO_4$  ( $M^+$  is monovalent metal ion) at 298 K find the maximum concentration of  $M^+$  ions that could be attained in a saturated solution of this solid at 298 K.

A.  $3.46 \times 10^{-3}$  M

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

C.  $2.88 \times 10^{-2}$  M

D.  $14.4 \times 10^{-3}$  M

**Answer: C**

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520. To 100 mL of 0.1 M  $AgNO_3$  solution solid  $K_2S_4$  is added. Find the concentration of  $K_2SO_4$  at equilibrium. ( $K_{sp}$  for  $Ag_2SO_4 = 6.4 \times 10^{-5}$  M)

A. 0.1 M

B.  $6.4 \times 10^{-3}$  M

C.  $6.4 \times 10^{-7}$  M

D.  $6.4 \times 10^{-5}$  M

Answer: B



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521. If the solubility of  $Pb_3(PO_4)_2$  is  $s$  mol per litre, then the solubility product of  $Pb_3(PO_4)_2$  will be :

A.  $6s^2$

B.  $6s^5$

C.  $s^5$

D.  $108s^5$

**Answer: D**

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**522.** How many grams of  $CaC_2O_4$  saturation will dissolve in one litre of saturated solution ? ( $K_{sp}$  of  $CaC_2O_4$  is  $2.5 \times 10^{-9} mol^{-2}$  and its molecular weight is 128).

A. 0.0064g

B. 0.0128g

C. 0.0032 g

D. 0.0640 g

**Answer: A**

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523. The  $K_{sp}$  of  $PbCO_3$  and  $MgCO_3$  are  $1.5 \times 10^{-15}$  and  $1 \times 10^{-15}$  respectively at 298 K. What is the concentration of  $Pb^{2+}$  ions in saturated solution containing  $MgCO_3$  and  $PbCO_3$  ?

A.  $1.5 \times 10^{-4}$  M

B.  $3 \times 10^{-8}$  M

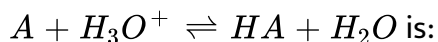
C.  $2 \times 10^{-8}$  M

D.  $2.5 \times 10^{-8}$  M

**Answer: B**

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524.  $K_s$  for the acid HA is  $1 \times 10^{-6}$ . The value of K for the reaction



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

B.  $1 \times 10^{12}$

C.  $1 \times 10^{-12}$

D.  $1 \times 10^6$

**Answer: D**

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**525.** The pH of a solution is 5.0 to this solution sufficient acid is added to decrease the pH to 2.0 The increase in hydrogen ion concentration is :

A. Increases 1000 times

B. Decreases 1000 times

C. Increases 100 times

D. Decreases 100 times

**Answer: A**

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526. Decinormal solution of  $CH_3COOH$  ionised to an extent of 1.3%.

pH of the solution is, ( $\log 1.3 = 0.11$ )

A. 2.89

B. 1.945

C. 3.4

D. 4.98

**Answer: A**

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527. If 50 mL of 0.2 M KOH is added to 40 mL of 0.5 M HCOOH. Find the resulting solution. ( $K_c = 1.8 \times 10^{-4}$ ):

A. 3.75

B. 5.6

C. 7.5

D. 3.4

**Answer: A**



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**528.** In 100 mL of an aqueous HCl of pH 1.0, 900 mL of distilled water is added, the pH of the resultant becomes:

A. 1

B. 2

C. 4

D. 7

**Answer: B**



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529. If  $[OH^-]$  is  $1 \times 10^{-8}$  ion/litre. Is pH is:

A. 6

B. 7

C. 5

D. 8

**Answer: A**



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530. The weight of HCl present in one litre of solution, if pH of the solution is one :

A. 3.65 g

B. 36.5 g

C. 0.365 g

D. 0.0365 g

**Answer: A**

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**531.** Solution prepared by dissolving equal number of mole of HOCl ( $K_s = 3.2 \times 10^{-8}$ ) and NaOCl is a buffer of pH :

A. 8

B. 3.2

C. 7.5

D. 4.8

**Answer: C**

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532. The  $pK_c$  of equimolecular sodium acetate and acetic acid mixture is 4.74. If pH is :

- A. 1.4
- B. 4.74
- C. 9.2
- D. 7

**Answer: B**



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533. The ionic product of water at  $60^\circ C$  is  $9.61 \times 10^{-14}$ . The pH of water at  $60^\circ C$  is :

- A. 6.51
- B. 6.7
- C. 9.61

D. 7

**Answer: A**



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**534.** What is the pH of boiling water (373 K)? ( $K_w$  at 373 K =  $10^{-12}$ ):

A. 12

B. 8

C. 6

D. 2

**Answer: C**



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535. The solubility of  $PbCl_2$  in water is 0.01 M at  $25^\circ C$  its maximum concentration in 0.1M NaCl will be :

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

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

C.  $1.6 \times 10^{-2}$  M

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

**Answer: D**



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536. if the solubility of product of lead iodide( $PbI_2$ ) is  $3.2 \times 10^{-8}$  its solubility will be:

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

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

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

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

**Answer: A**



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**537.** The solubility product of salt  $AB_2$  is  $4 \times 10^{-9}$  at 373K . The solubility of  $AB_2$  in boiling water will be :

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

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

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

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

**Answer: D**



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**538.** The solubility of is 0.0015 gm /lit. The solubility product of AgCl will be :

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

B.  $1.1 \times 10^{-10}$

C.  $3.1 \times 10^{-10}$

D.  $4.1 \times 10^{-10}$

**Answer: B**



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**539.** A saturated solution of calcium fluoride contains  $2 \times 10^{-4}$  mole of the salt per litre of the solution its  $K_{sp}$  is :

A.  $8 \times 10^{-18}$

B.  $3.2 \times 10^{-11}$

C.  $4 \times 10^{-6}$

D.  $1.43 \times 10^{-9}$

**Answer: B**

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**540.** IF the concentration of  $CrO_4^{2-}$  ion in a saturated solution of silver chromate be  $2 \times 10^{-4}$  M solubility of sodium chloride is :

A.  $4 \times 10^{-8}$

B.  $8 \times 10^{-12}$

C.  $32 \times 10^{-12}$

D.  $6 \times 10^{-12}$

**Answer: C**

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541.  $K_{sp}$  for sodium chloride is  $36 \frac{\text{mol}^2}{\text{l}^2}$ . The solubility of sodium chloride is :

- A.  $1/36 \text{ M}$
- B.  $1/6 \text{ M}$
- C.  $6 \text{ M}$
- D.  $3600 \text{ M}$

**Answer: C**



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542. The solubility of AgCl ( $K_{sp} = 1.2 \times 10^{-10}$ ) in a 0.10 M NaCl solution is :

- A.  $0.1 \text{ M}$
- B.  $1.2 \times 10^{-6} \text{ M}$
- C.  $1.2 \times 10^{-9} \text{ M}$

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

**Answer: C**

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**543.** The solubility product of a sparingly soluble salt AB at room temperature is  $1.21 \times 10^{-6}$  its molar solubility is :

A.  $1.21 \times 10^{-6}$

B.  $1.21 \times 10^{-3}$

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

D.  $1.1 \times 10^{-3}$

**Answer: D**

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544. If the concentration of lead iodide in its saturated solution at  $25^{\circ}C$  be  $2 \times 10^{-3}$  mol per litre its solubility product is :

A.  $4 \times 10^{-6}$

B.  $8 \times 10^{-12}$

C.  $6 \times 10^{-12}$

D.  $32 \times 10^{-9}$

**Answer: D**



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545. The dissociation constant of two weak acids are  $K_1$  and  $K_2$  their relative strength can given by:

A.  $\sqrt{\frac{K_1}{K_2}}$

B.  $K_1 + K_2$

C.  $K_1 - K_2$

D.  $\sqrt{K_1 \times K_2}$

**Answer: A**



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**546.**  $K_b$  for the hydrolysis reaction :  $B^+ + H_2O \rightleftharpoons BOH + H^+$  is  $1.0 \times 10^{-6}$  the hydrolysis constant of the salt is :

A.  $10^{-6}$

B.  $10^{-7}$

C.  $10^{-8}$

D.  $10^{-9}$

**Answer: C**



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547. The dissociation constant of  $NH_4OH$  is  $1.8 \times 10^{-5}$  predict the hydrolysis constant of  $NH_4Cl$

A.  $1.8 \times 10^{-19}$

B.  $1.8 \times 10^{-5}$

C.  $5.55 \times 10^{-5}$

D.  $5.55 \times 10^{-10}$

**Answer: D**



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548. The pH of 1 M aqueous solution of the weak acid HA is 6.0. Find its dissociation constant.

A.  $10^{-6}$

B.  $10^{-12}$

C. 1

D. 6

**Answer: B**



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**549.** A solution of pH 2.0 is more acidic than the one with pH 6.0 by a factor of

A. 3

B. 4

C. 3000

D. 10000

**Answer: D**



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550. In a mixture of  $CH_3COOH$  and  $CH_3COONa$  the ratio of salt to acid concentration is increased by ten folds. The pH of the solution will increase by :

A. zero

B. 1

C. 2

D. 3

**Answer: B**



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551. 0.1 M acetic acid solution is titrated against 0.1M NaOH solution. What would be the difference in pH between 1/4 and 3/4 stages of neutralisation of acid :

A.  $2 \log 3/4$

B.  $2\log 1/4$

C.  $\log 1/3$

D.  $2\log 3$

**Answer: D**



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**552.** The dissociation of water at  $25^\circ C$  is  $1.9 \times 10^{-7}$  percent and the density of water is  $1 \frac{m}{c} m_3$  the ionisation constant of water is :

A.  $3.42 \times 10^{-6}$

B.  $3.42 \times 10^{-8}$

C.  $1.0 \times 10^{-14}$

D.  $2.0 \times 10^{-16}$

**Answer: D**



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553. If  $Pk_b$  for  $CN^-$  at  $25^\circ C$  is 4.7. Find the pH of 0.5 M aqueous NaCN solution,

A. 12

B. 10

C. 11.5

D. 11

**Answer: C**



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554. 50% neutralisation of a solution of formic acid ( $K_a = 2 \times 10^{-4}$ ) with NaOH would result in a solution having a hydrogen ion concentration of:

A.  $2 \times 10^{-4}$

B. 3.7

C. 2.7

D. 1.85

**Answer: A**



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555. The pH of pure water at  $25^{\circ}C$  and  $35^{\circ}C$  are 7 and 6 respectively.

What is the heat of formation of water from  $H^{+}$  and  $OH^{-}$  ?

A. 84.55 kcal/mol

B. 84.55 kcal/mol

C. 74.55 kcal/mol

D. None of these

**Answer: B**



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556. What is the Ph of a solution obtained by mixing 10 ml of 0.1 M HCl and 40 ml of 0.2M  $H_2SO_4$ ?

A. 1.4865

B. 0.4865

C. 0.4685

D. 3

**Answer: C**



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557. Calculate the ph of solution obtained by mixing 100 ml of 0.1 M HCl and 9.9 ml of 1.0m  $H_2SO_4$ .

A. 3.0409

B. 3.4049

C. 2.0409

D. None

**Answer: A**



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**558.** What is the resultant pH of solution of mixing 200 ml of an aqueous solution of HCl (pH=2.0) is mixed with 300 ml of an aqueous solution of NaOH (pH=12)?

A. 11.031

B. 11.301

C. 10

D. None

**Answer: A**



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559. What volume of 1 M sodium formate solution should be added to 50 ml of 0.05 M formic acid to produce a buffer solution of (ph=4( $PK_a$  of formic acid =3.80)?

- A. 39 ml
- B. 39.62 ml
- C. 40 ml
- D. 40.62 ml

**Answer: B**

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560. How many mole of HCl are required to prepare one litre of buffer solution (containing NaCN+HCl) of ph 8.5 using 0.01 g formula weight of NaCN( $K_a(\text{HCN})=4.1 \times 10^{-10}$ )?

- A.  $8.85 \times 10^{-3}$

B.  $8.75 \times 10^{-2}$

C.  $8.85 \times 10^{-4}$

D.  $8.85 \times 10^{-2}$

**Answer: A**



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**561.** Find the composition of an acidic buffer mixture made up of HA AND naA of total molarity 0.29 having ph 4.4 and  $K_a = 1.8 \times 10^{-5}$  in terms of concentration of salt and acid respectively:

A. 0.09 M and 0.20 M

B. 0.20 M and 0.09 M

C. 0.1 M and 0.19 M

D. 0.19 M and 0.10 M

**Answer: A**

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562. A weak acid HA after treatment with 12 ml of 0.1M strong base BOH has a PH of 5 . At the end point the volume of same base required is 26.6 ml .what is the value  $K_a$  acid ?

- A.  $1.8 \times 10^{-5}$
- B.  $8.12 \times 10^{-6}$
- C.  $1.8 \times 10^{-6}$
- D.  $8.2 \times 10^{-5}$

**Answer: B**

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563. Zn salt is mixed with  $(NH_4)_2SO_4$  of molarity 0.021M. Calculate the amount of  $Zn^{(2+)}$  which remains unprecipitated in 12 ml of this solution.

A.  $1.677 \times 10^{-22}$  g

B.  $1.767 \times 10^{-22}$  g

C.  $2.01 \times 10^{-23}$  g

D. None of these

**Answer: A**

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**564.** What is the PH at which  $Mg(OH)_2$  begins precipitate from a solution containing 0.10 M  $Mg^{2+}$  ions. [ $K_{sp}$  of  $Mg(OH)_2 = 1 \times 10^{-11}$ ]

A. 5

B. 9

C. 4

D. 10

**Answer: B**

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**565.** 18 ml of mixture of acetic acid and sodium acetate required 6 ml of 0.1 M NaOH For Neutrilsation of the acid and 12 ml of 0.1 M HCl for reaction with salt Separately . If  $Pk_a$  of the acid is 4.75 What is the pH pf the mixture.

- A. 5.05
- B. 4.75
- C. 4.5
- D. 4.6

**Answer: A**

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**566.** A certain ion  $B^-$  has an Arhenius constant of basic character (equ. Constant :  $2.8 \times 10^{-7}$ ) What is the equilibrium constant for lowry

bronstad character.

A.  $2.8 \times 10^{-7}$

B.  $3.57 \times 10^{-8}$

C.  $3.57 \times 10^8$

D.  $2.8 \times 10^7$

**Answer: D**



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**567.** Acetic acid and propionic acid have  $K_a$  value  $1.75 \times 10^{-5}$  and  $1.3 \times 10^{-5}$  respectively at a certain temperature. An equimolar solution of a mixture of the two acid is partially neutralised by NaOH. How is the ratio of the contents of acetate and propanate ions related to the  $K_a$  value and the molarity ?

A. ionisation fraction of acids

B. The ratio is unrelated to the  $K_a$  values



C. The ratio is unrelated to the molarity

D. The ratio is unrelated to the PH of the solution

**Answer: A**

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**568.** The ionisation constant of  $NH_4^+$  in water is  $5.6 \times 10^{-10}$  at  $25^\circ C$  the rate constant for the reaction of  $NH_4^+$  and  $OH^-$  to form  $NH_3$  and  $H_2O$  at  $25^\circ C$  IS  $3.4 \times 10^{10} L \text{ mol/sec}$  Find the rate constant for proton transfer from water to  $NH_3$ ?

A.  $6.07 \times 10^5 s^{-1}$

B.  $6.07 \times 10^{-10} s^{-1}$

C.  $6.07 \times 10^{-5} s^{-1}$

D.  $6.07 \times 10^{10} s^{-1}$

**Answer: A**

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569. If  $PK_b$  for fluoride ion at  $25^\circ C$  is 10.83. predict the ionisation constant of hydrofluoric acid in water at this temperature.

A.  $1.74 \times 10^{-5}$

B.  $3.52 \times 10^{-3}$

C.  $6.75 \times 10^{-4}$

D.  $5.38 \times 10^{-2}$

Answer: C



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570. Approximate PH of 0.10 M aqueous  $H_2S$  solution having  $K_1$  and  $K_2$  for  $H_2S$  at  $25^\circ C$  are  $10^{-7}$  and  $10^{-13}$  respectively is :

A. 4

B. 5

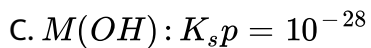
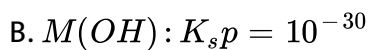
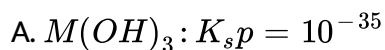
C. 6

D. 8

**Answer: A**

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**571.** Which of the following species is more soluble in water ?



**Answer: A**

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572. The self ionisation constant for pure formic acid  $K = \frac{[HCOOH_2^+][HCOO^-]}{[HCOOH]}$  has been estimated as  $10^{-6}$  at room temperature. The density of formic acid is  $1.22 \frac{g}{cm^3}$ . Find the percentage of formic acid molecules in pure formic acid converted to formate ion.

- A. 0.002 %
- B. 0.004 %
- C. 0.006 %
- D. 0.008 %

**Answer: B**

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573. Liquid ammonia ionises to a slight extent. At  $-50^\circ C$  its self ionisation constant  $K_{NH_3} = \frac{[NH_4^+][NH_2^-]}{[NH_3]} = 10^{-30}$ . How many amide ions are present per  $cm^3$  of pure liquid ammonia. (Assume  $N = 6.0 \times 10^{23}$ )?

A.  $6 \times 10^6$  ions

B.  $6 \times 10^5$  ions

C.  $6 \times 10^{-5}$  ions

D.  $6 \times 106(-6)$  ions

**Answer: B**



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**574.** What is the concentration of fluoracetic acid ( $K_a$  of acid =  $2.6 \times 10^{-3}$ ) which is required to get  $[H^+] = 1.50 \times 10^{-3}$  M?

A. 0.865 M

B.  $2.37 \times 10^{-3}$  M

C.  $2.37 \times 10^{-4}$  M

D.  $2.37 \times 10^{-2}$  M

**Answer: B**

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575. What molar concentration of  $NH_3$  provides a  $[OH^-]$  of  $1.5 \times 10^{-3}$ ? ( $K_b = 1.8 \times 10^{-5}$ ):

- A. 0,125 M
- B.  $(0.125 + 1.5 \times 10^{-3})$  M
- C.  $(0.125 - 1.5 \times 10^{-3})$  M
- D.  $1.5 \times 10^{-3}$  M

**Answer: A**

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576. 1 ml of 0.1 N HCl is added to 999 ml solution of NaCl . The PH of the resulting solution will be :

- A. 7

B. 4

C. 2

D. 1

**Answer: B**



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577. What is the volume of water needed to dissolve 1 g of  $BaSO_4$  ( $K_{sp} = 1.1 \times 10^{-10}$ ) at  $25^\circ C$ ?

A. 820 litre

B. 410 litre

C. 205 litre

D. None of these

**Answer: B**



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578. The solubility of  $BaSO_4$  in water is 0.00233 g per litre at  $30^\circ C$ . The solubility of  $BaSO_4$  in 0.1M  $(NH_4)_2SO_4$  solution at the same temperature is :

A.  $10^{-5}$  mol/lit

B.  $10^{-6}$  mol/lit

C.  $10^{-8}$  mol/lit

D.  $10^{-9}$  mol/lit

**Answer: D**



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579. Formic acid is 4.6 % dissociated in a 0.1 N solution at  $20^\circ C$ . The ionisation constant of formic acid is :

A.  $21 \times 10^{-4}$



B. 21

C.  $0.21 \times 10^{-4}$

D.  $2.1 \times 10^{-4}$

**Answer: D**



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**580.** The dissociation constants of two acid  $HA_1$  and  $HA_2$  are  $2.9 \times 10^{-4}$  and  $1.8 \times 10^{-5}$  respectively The relative strengths of the acid will be :

A. 1:4

B. 4:1

C. 1:16

D. 16:1

**Answer: B**

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581. In the hydrolytic equilibrium

$A^{-} + H_2O \rightleftharpoons HA + OH^{-}$   $K_a = 1.0 \times 10^{-5}$ . The degree of hydrolysis of 0.001 M solution of the salt is :

A.  $10^{-3}$

B.  $10^{-4}$

C.  $10^{-5}$

D.  $10^{-6}$

Answer: A

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582. For preparing a buffer solution of pH 6 BY mixing sodium acetate and acetic acid the ratio of concentration of salt and acid ( $K_a = 10^{-5}$ )

Should be :

A. 1:10

B. 10:1

C. 100:1

D. 1:100

**Answer: B**



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**583.** At  $20^{\circ}\text{C}$  the  $[\text{Ag}^+]$  in a saturated solution of  $\text{Ag}_2\text{CrO}_4$  is  $1.5 \times 10^{-4}$  M find the solubility product of  $\text{Ag}_2\text{CrO}_4$  :

A.  $3.375 \times 10^{-12}$

B.  $1.6875 \times 10^{-10}$

C.  $1.6875 \times 10^{-12}$

D.  $1.6875 \times 10^{-11}$

**Answer: C**

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**584.** Let the solubilities of AgCl in  $H_2O$  0.01 M  $CaCl_2$  0.01 M NaCl and 0.05 M  $AgNO_3$  be  $S_1, S_2, S_3, S_4$  respectively. What is the correct relationship between the 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.  $S_4 > S_3 > S_2 > S_1$

**Answer: C**

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