



CHEMISTRY

BOOKS - OMEGA PUBLICATION

EQUILIBRIUM

Questions

1. What is phase transformation ?



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2. What is physical equilibrium ? Give examples.



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3. What is saturated solution ?



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4. State Henry's law and mention its some important applications.



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5. Give the general characteristics of equilibria involving physical processes ?



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6. STATEMENT-1: The physical equilibrium is not static but dynamic in nature.

STATEMENT-2: The physical equilibrium is a state in which two opposing processes are proceeding at the same rate.



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7. What is chemical equilibrium ? Give an example.



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8. State and explain the law of mass action.



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9. Derive the law of chemical equilibrium from law of mass action.



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10. Apply law of mass action for a reversible reaction and state law of chemical equilibrium.



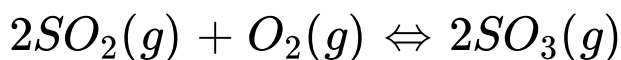
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11. What do you understand by equilibrium constant ? What are its characteristics ?



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12. What is K_c for the following equilibrium when the equilibrium concentration of each substance is : $[SO_2] = 0.60M$, $[O_2] = 0.82M$ and $[SO_3] = 1.90M$?



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13. A liquid is equilibrium with its vapours in a sealed container at a fixed temperature. The volume of the container suddenly increased.

What is the initial effect of the change on vapour pressure ?



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14. A liquid is equilibrium with its vapours in a sealed container at a fixed temperature. The volume of the container suddenly increased.

How do rates of evaporations and condensation changes initially ?



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15. A liquid is equilibrium with its vapours in a sealed container at a fixed temperature. The volume of the container suddenly increased.

What happens when equilibrium is restored finally and what will be the final vapour pressure.



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16. What is homogeneous equilibrium ? Give an example.



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17. Derive a relationship between K_p and k_c .



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18. Derive a relationship between K_p and k_c .



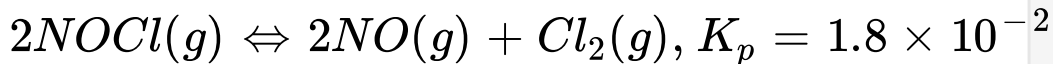
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19. For the reaction :



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20. Find out the value of K_c for each of the following equilibrium from the value of K_p :

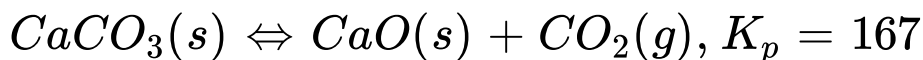


at 500 K.



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21. Find out the value of K_c for each of the following equilibrium from the value of K_p :

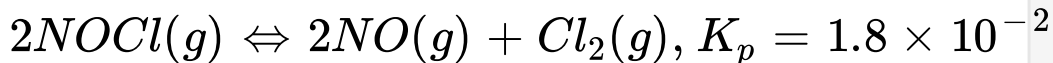


atm at 1073 K.



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22. Find out the value of K_c for each of the following equilibrium from the value of K_p :



at 500 K.



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23. At a certain temperature and total pressure of 10^5 Pa, iodine vapours contains 40% by volume of I atoms.

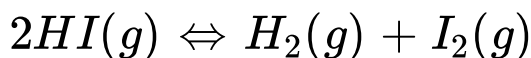


Calculate K_p for the equilibrium.



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24. A sample of HI (g) is placed in a flask at a pressure of 0.2 atm. At equilibrium the partial pressure of HI (g) is 0.04 atm. What is K_p for the given equilibrium ?



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25. What is heterogeneous equilibrium ? Give an example.



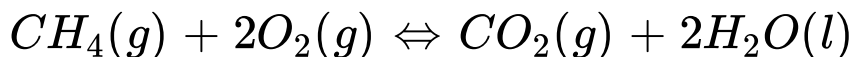
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26. Write the equilibrium constant expression for the following reactions.



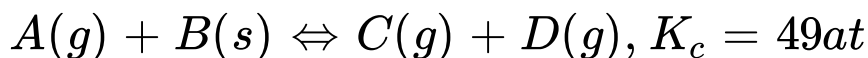
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27. Write the equilibrium constant expression for the following reactions.



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28. Determine K_p for the reaction :



127[^](@)C`.



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29. The concentration of a pure solid or liquid phase is not include in the expression of equilibrium constant because :



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30. Give the characteristics of equilibrium constant.



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31. State Le Chatelier's principle.



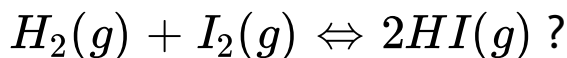
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32. Why does the dissociation of PCl_5 decreases in the presence of Cl_2 ?



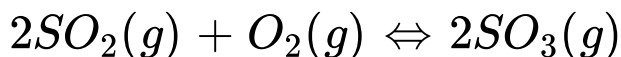
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33. What is the effect of increasing pressure on the equilibrium



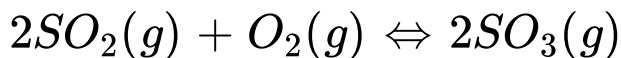
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34. What is the effect of increasing pressure on the equilibrium ?



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35. Discuss the effect of addition of inert gas at constant pressure on reaction.



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36. Discuss the effect of temperature on resistivity of metals.



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37. Why does solubility of CO_2 decreases the rise in temperature ?



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38. For the reaction

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$, what is the effect

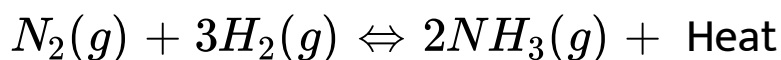
of the temperature and pressure to get more yield of ammonia ?



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39. Using Le-Chatelier's principle predict the effect of

increasing the pressure on following equilibrium :

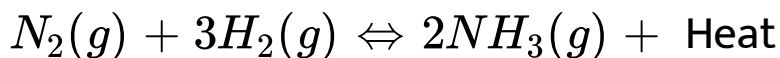


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40. Using Le-Chatelier's principle predict the effect of

increasing the pressure on following equilibrium

:



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41. Equilibrium constant, K_C for the reaction



At a particular time, the analysis shows that composition of the reaction mixture is 3.0 mol

$L^{-1}N_2$, $2.0 \text{ mol } L^{-1}H_2$, $0.5 \text{ mol } L^{-1}NH_3$. Is the

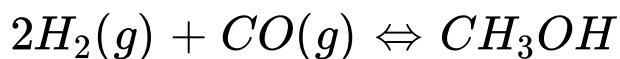
reaction at equilibrium ? If not, in which direction does the reaction tends to proceed to reach equilibrium ?



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42. Describe the effect of :

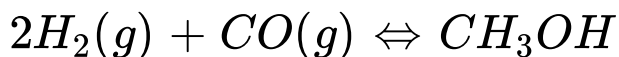
addition of H_2 on the given equilibrium:



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43. Describe the effect of :

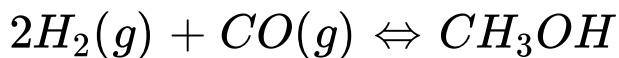
addition of CH_3OH on the given equilibrium:



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44. Describe the effect of :

removal of CO on the given equilibrium:



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45. Describe the effect of :

removal of CH_3OH on the equilibrium of the



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46. Explain the effect of catalyst on the rate of reaction with diagram.



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47. What is arrhenius concept of acid?



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48. Give Bronsted concept of acids.



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49. What is meant by conjugate acid base pair ?

Explain with the help of a chemical reaction.



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50. Give the conjugate bases of followings :



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51. Give the conjugate bases of followings :



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52. Give the conjugate bases of followings :





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53. Give the conjugate bases of followings :



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54. Give the conjugate bases of followings :



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55. Give the conjugate bases of followings :



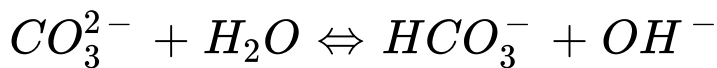
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56. Give the conjugate bases of followings :



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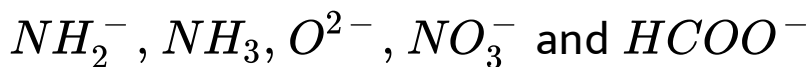
57. Label the conjugate acid-base pair in the following :



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58. Write the conjugate acids for the following

Bronsted bases :



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59. What are aryl halides? Give one example?



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60. What is the Lewis concept of acids ?



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61. What is the Lewis concept of bases ?



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62. What is the Lewis concept of acids ?



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63. Classify the followings into Lewis acids and Lewis bases and show how these act as Lewis acid/base ?



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64. Classify the followings into Lewis acids and Lewis bases and show how these act as Lewis acid/base ?



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65. Classify the followings into Lewis acids and Lewis bases and show how these act as Lewis acid/base ?



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66. Classify the followings into Lewis acids and Lewis bases and show how these act as Lewis acid/base ?





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67. Write conjugate acids of (i) CO_3^{2-} (ii) H_2O
(iii) OH^- (iv) HSO_4^- .



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68. Explain why all Arrhenius are also Bronsted acids, but Arrhenius bases are not Bronsted bases.



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69. All Bronsted bases are also Lewis bases but all Bronsted acid are not Lewis acids. Explain.



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70. What is pH scale ? How does it represent acidic and basic nature of a solution? .



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71. Define pH.



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72. Calculate the pH value of the followings :

0.001 M HCl



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73. Calculate the pH value of the followings :

0.01 M NaOH



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74. Calculate the pH of the followings :



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75. Calculate the pH of the followings :



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76. What happens to ionic product of water if some acid is added ?



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77. 0.63 g of HNO_3 dissolved in 100 ml of solution. Calculate its pH value.



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78. Calculate the pH of the solution containing 2g of NaOH per liter of the solution.



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79. Calculate the pH of 0.005 M NaOH solution.



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80. Calculate the pH of 0.003 M HCl.



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81. What is the pH of 0.1 M HCl ?



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82. What is the ph of 0.01 M HCl ?



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83. What are polybasic or polyprotic acids ?

Given an example.



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84. What is common ion effect ? Explain with an example.



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85. Using s, p, d and f notations, describe the orbital with the quantum number. $n = 3$, $l = 2$



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86. Explain buffer solutions and their types.



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87. Explain the action of basic buffer.



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88. Define basic buffer with an example.



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89. Define acidic buffer with an example.



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90. Explain the action of acidic buffer.



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91. Define solubility product of a salt.

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92. Define solubility product. How does it differ from ionic product ?

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93. The solubility product of $PbBr_2$ is 8.0×10^{-5} . Calculate its solubility.



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94. Solubility of Ag_2CrO_4 is $8 \times 10^{-5} \text{ mol } L^{-1}$. Calculate the solubility product.



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95. The solubility of silver chloride ($AgCl$) in water at $25^\circ C$ is $1.06 \times 10^{-5} \text{ mol } L^{-1}$.

Calculate the solubility product of AgCl at this temperature.



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96. Solubility of Ag_2CrO_4 is $8 \times 10^{-5} \text{ mol } L^{-1}$.

Calculate the solubility product.



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97. Determine the solubilities of silver chromate at 298 K from their solubility product constants

$$1.1 \times 10^{-12}.$$



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98. At 298 K the solubility of silver chloride in water is 0.00188 g/L. What is its K_{sp} ?



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99. Solubility of Ag_2CrO_4 is $8 \times 10^{-5} \text{ mol } L^{-1}$.

Calculate the solubility product.



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100. Determine the solubilities of silver chromate at 298 K from their solubility product constants 1.1×10^{-12} .



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Multiple Choice Questions Mcqs

1. List the value of n and l for the following orbitals : $4s$



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2. For the reaction , $2HI \rightleftharpoons H_2 + I_2$

A. $K_p > K_c$

B. $K_c > K_p$

C. $K_p = K_c$

D. none of these

Answer: C



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3. Equilibrium constant for the reaction $2NO(g) + Cl_2(g) \rightleftharpoons 2NOCl(g)$ is correctly given by the expression

A. $K = \frac{[2NOCl]}{[2NO][Cl_2]}$

B. $K = \frac{[NOCl]^2}{[NO]^2[Cl_2]}$

C. $K = \frac{[NO]^2[Cl_2]^2}{[NO]^2[Cl_2]}$

D. $K = \frac{[NO]^2[Cl_2]^2}{[NOCl]}$

Answer: B



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4. k_1 and k_2 are the velocity constants of forward and backward reactions. The equilibrium constant K of the reaction is

A. $k_1 \times k_2$

B. $k_1 - K_2$

C. $\frac{k_1}{k_2}$

D. $\frac{k_1 + k_2}{k_1 - k_2}$

Answer: C



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5. The number of electrons present in 3d of Cu^+ is



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6. Consider the reaction



Under what conditions shift is undeterminable ?

A. increasing temperature as well as pressure

B. lowering the temperature and increasing the pressure.

C. any value of temperature and pressure

D. lowering of temperature as well as pressure

Answer: B



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7. Using s, p, d notations, describe the orbital with the quantum number. $n = 7, l = 0$



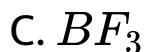
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8. Using s, p, d notations, describe the orbital with the quantum number. $n = 7$, $l = 1$



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9. Which of the following is strongest acid ?



D.

Answer: C



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10. What is the structural formula of 2-Chloro-2-methylpropane?



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11. What is the structural formula of 2-Chlorobutane?



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12. What is the structural formula of 1-Chloro-3-methylpentane?



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13. What is the structural formula for 1-Chloro-2,2-dimethylpropane?



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14. What is the structural formula for Ethylene dibromide?



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15. What is the structural formula of 1-Bromo-2,3-dichlorobutane?



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16. The pH indicators are

- A. salt of strong and strong base
- B. salts of weak acids and weak bases
- C. either weak acids or weak bases
- D. either strong acids or strong bases

Answer: C



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17. What is incorrect 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 change in pH on adding small amount of acid or base

D. All of the above

Answer: C



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18. Precipitation takes place when the ionic product

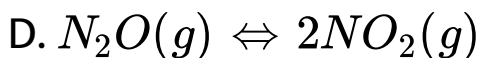
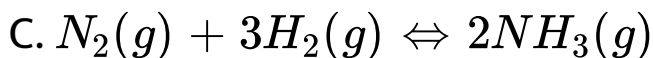
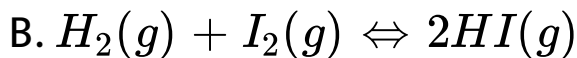
- A. equals to the solubility product
- B. exceeds the solubility product
- C. is less than the solubility product
- D. is almost zero

Answer: B



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19. Which of the following is an example of heterogeneous equilibrium ?



Answer: A



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20. For the reaction, $aA + bB \rightarrow$ Products.

According to law of mass action,

A. rate of reaction $\propto [A][B]$

B. rate of reaction $\propto [A]^a[B]^b$

C. Rate of reaction $\propto \frac{1}{[A]^a[B]^b}$

D. rate of reaction $\propto \frac{1}{[A][B]}$

Answer: B



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21. What is the structural formula of 5-Bromo-1-chloro-2-iodohexane?



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22. Name any one plant that grows in water and eaten as food?



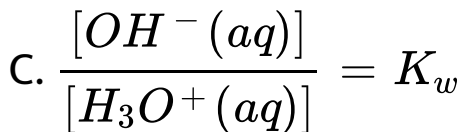
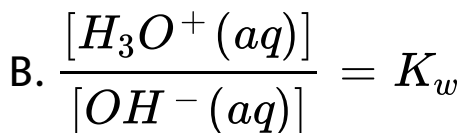
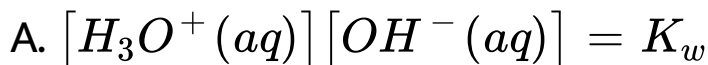
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23. Using s, p, d notations, describe the orbital with the quantum number. $n = 6, l = 1$



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24. How ionic product of water change with temperature ?



D. None of these

Answer: C



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25. Argon is an inert gas used in light bulbs to retard the vaporization of the filament. A certain light-bulb containing argon at 1.25 atm and $18^{\circ}C$ is heated to $85^{\circ}C$ at constant volume. Calculate its final pressure.

- A. pH increases
- B. pH decreases
- C. pH remains 7
- D. none of these

Answer: B



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