Chemical Equilibrium -3

1. **Arrhenius neutralisation involves**

   1. Formation of dative bond

   2. Formation of water by the combination of H^+ with OH^-

   3. Transfer of proton

   4. All of these

2. **NH_3 is not a base according to**

   1. Bronsted theory 2. Lewis theory 3. Arrhenius theory 4. Lowry theory

3. **Assertion A: According to Bronsted concept H_2O is an amphoteric substance.**

   Reason R: H_2O molecule can accept as well as donate a proton.

   1) 'A' and 'R' are true, 'R' is correct explanation of 'A'.

   2) 'A' and 'R' are true. 'R' is not correct explanation of 'A'.

   3) 'A' is true and 'R' are false.

   4) Both A and R are false

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

   (i) $HCOO^-$ (ii) NH_3 (iii) O^{-2} (iv) HSO^-_4

   1. i and ii 2. ii and iii 3. ii and iv 4. i and iv

5. **Which of the following is only Bronsted - Lowry acid but not an Arrhenius acid?**

   1) HC*l* 2) NH_4^+ 3) BF_3 4) CH_3COOH

6. **Which of the following species acts as Bronsted base but not as acid?**

   1) CH_3COO^- 2) HCO_3^- 3) $H_2PO_2^-$ 4) both1 &3

7. The conjugate base of hydrazoic acid is

1) N^{3-} 2) N_3^- 3) NH_2^- 4) $N_3H_2^+$

8. Conjugate acid of HPO_4^{2-} is

1) H_3PO_4 2) $H_2PO_4^-$ 3) PO_4^{3-} 4) H_3PO_4

9. The conjugate acid of water is

1) OH^- 2) H^+ 3) H_3O^+ 4) H_3O^-

10. In aqueous solution, HC*l* and HNO_3 are equally strong. This is because

1) Their basic ties are same 2) Both are oxy acids of non-metals

3) Both have lower molecular weights 4) Leveling effect of water

11. Which of the following acts as a Lewis acid in the following reaction?

$$SnCl_4 + 2Cl^- \rightleftharpoons [SnCl_6]^{2-}$$

1) Cl^- 2) $[SnCl_6]^{2-}$ 3) $SnCl_4$ 4) $2Cl^-$

12. Which of the following is relatively strong Lewis acid?

1) BF_3 2) BCl_3 3) BBr_3 4) BI_3

13. In a complex compound ligand acts as

1) Lewis acid 2) Lewis base 3) Lowry-Bronsted acid 4) Arrhenius base

14. Which of the following species acts as a Lewis acid and also as a Lewis base?

1) SO_2 2) SCl_4 3) Both SO_2 and SCl_4 4) SO_3

15. Strength of an weak acid or a weak base depends upon its

1) Temperature 2) Nature of solvent

3) Degree of dissociation 4) All the above

16. Conjugate base of $[Al(H_2O)_6]^{3+}$ is

1) $[Al(H_2O)_6]^{2+}$ 2) $[Al(H_2O)_5OH]^{2+}$

3) $[Al(H_2O)_4OH]^{2}$ 4) $[Al(H_2O)_4(OH)_2]^{2+}$

17. What is the decreasing order of strength of the bases OH^-, NH_2^-, H-CC$^-$ and CH_3-CH_2^-

1) $CH_3 - CH_2^- > NH_2^- > H - C \equiv C^- > OH^-$

2) $H - C \equiv C^- > CH_3 - CH_2^- > NH_2^- > OH^-$

3) $OH^- > NH_2^- > H - C \equiv C^- > CH_3 - CH_2^-$

4) $NH_2^- > H - C \equiv C^- > OH^- > CH_3 - CH_2^-$

18. Which of the following is an acidic salt?

1) Na_3PO_4 2) $Na_2H\ PO_3$ 3) NaH_2PO_2 4) NaH_2PO_4

19. Which of the following has least tendency to act as Lewis acid ?

1) I^- 2) I^+ 3) $SnCl_2$ 4) $AlCl_3$

20. Which of the following relatively more strong acid in aqueous solutions?

1) HCl 2) $HClO_4$ 3) HI 4) All are equally strong.

21. Which of the following is strong Lewis acid?

1) Na^+ 2) Mg^{2+} 3) Al^{3+} 4) All show equal strength

22. Which of the following acts as Lewis acid?

1) Zn^{2+} 2) $FeCl_3$ 3) CO_2 4) All the above

23. Which of the following acts as Lewis base?

1) C_2H_2 2) C_2H_4 3) Pyridine 4) All the above

24. The no.of conjugate acid-base pairs present in the aqueous solution of H_3PO_3 is

1) 2 2) 3 3) 4 4) 5

25. H_2CO_3 ionises in two stages as represented below

$$H_2CO_3 + H_2O \rightleftharpoons H_3O^+ + HCO_3^-$$

$$HCO_3^- + H_2O \rightleftharpoons H_3O^+ + CO_3^{2-}$$

The no.of conjugate acid-base pairs in the above reaction are

1) 2 2) 3 3) 4 4) 5

26. A: HC*l* is not acidic in benzene.

R: Benzene does not accept protons.

1) 'A' and 'R' are true, 'R' is correct explanation of 'A'.

2) 'A' and 'R' are true. 'R' is not correct explanation of 'A'.

3) 'A' is true and 'R' are false.

4) Both A and R are false.

27. A: H_3O^+ is the strongest acid in aqueous solution

R: water levels the strength of hydronium ion.

1) 'A' and 'R' are true, 'R' is correct explanation of 'A'.

2) 'A' and 'R' are true. 'R' is not correct explanation of 'A'.

3) 'A' is true and 'R' are false.

4) Both A and R are false

28.A: ClO_4^- is the weakest base.

R: In ClO_4^-, chlorine atom is SP^3 hybridised.

1) 'A' and 'R' are true, 'R' is correct explanation of 'A'.

2) 'A' and 'R' are true. 'R' is not correct explanation of 'A'.

3) 'A' is true and 'R' are false.

4) Both A and R are false.

29. A: All Bronsted bases are Lewis bases.

R: A species that accepts a proton necessarily should donate a lone pair of electrons.

1) 'A' and 'R' are true, 'R' is correct explanation of 'A'.

2) 'A' and 'R' are true. 'R' is not correct explanation of 'A'.

3) 'A' is true and 'R' are false.

4) Both A and R are false

30. The number of protons present in 10ml of water at 298K is

1)$6.023X10^{14}$ 2) $6.023X10^{16}$ 3) $6.023X10^{19}$ 4) $6.023X10^{21}$

31. At 25^0C, for an acid

1) $[H^+] > 10^{-7}M$ 2) $[OH^-] < 10^{-7}M$ 3) pH < 7 4) All the above

32. Ionic product of water depends on

1) Volume of the water 2) Amount of salt in water

3) Temperature 4) All the above

33. At a given temperature, When an acid is added to water then the value of K_w

1) Decreases 2) Increases

3) Remains same 4) First decreases then increases.

34. If the ionic product of water is $1.96x10^{-14}$ at 35^0C, What is its value at 10^0C

1)$1.96\ X10^{-14}$ 2) $3.92X\ 10^{-14}$ 3) $1.56X_{10}{}^{-15}$ 4) $1.96\ X10^{-13}$

35. Which of the following is relatively stronger acid? K_a values are given in brackets

1) HA (2×10^{-4}) 2) HB (3×10^{-5})

3) HC (1.8×10^{-3}) 4) HD (9.6×10^{-10})

36. Which of the following is relatively stronger base? P^{kb} values are given in brackets.

1) AOH (5.8) 2) BOH (6.8) 3) COH (2.4) 4) DOH (10.9)

37. Which of the following statement is not correct?

1) Cl^- is a Lewis acid

2) The P^H of 10^{-8} M HCl solution is less than 7

3) The ionic product of water at 25^0C is 10^{-14} M^2

4) Bronsted - Lowry theory could not explain the acidic nature of $AlCl_3$

38. Which of the following statement is correct?

1) Bronsted - Lowry theory could not explain the acidic nature of BCl_3

2) The P^H of 0.01M NaOH solution is 2

3) The ionic product of water at 25^0C is 10^{-10} M^2

4) The P^H of a solution can be calculated using the equation $P^H = +\log[H^+]$

39. The P^H of a solution of H_2O_2 is 6.0. Some Cl_2 gas is bubbled into this solution. Which of the following is correct?

1) The P^H of the resultant solution becomes 8

2) H_2 gas is liberated

3) The P^H of the resultant solution becomes less than 6.0 and O_2 gas is liberated.

4) Cl_2O is formed in the resultant solution.

40. Which of the following is correct?

1) The P^H of one liter solution containing 0.49g of H_2SO_4 is 2.0.

2) The conjugate base of H_2S is S^{2-}

3) BF_3 is a Lewis base.

4) CH_3COO^- is amphoteric ion.

41. Which on of the following statements is not correct?

1) $pH + pOH = 14$ for all aqueous solutions

2) The pH of 10^{-8} M HCl is 8

3) The solution with $pH = 3$ is 100 times more acidic than the solution with $pH = 5$.

4) The conjugate base of $H_2PO_4^-$ is HPO_4^{2-}

42. Ostwald dilution law is applicable to

1) Strong electrolytes 2) Weak electrolytes

3) Non - electrolytes 4) All types of electrolytes

43. The correct expression for Ostwald's dilution law is

1) $K_a = \frac{\alpha^2}{(1-\alpha)V}$ 2) $K_a = \alpha^2.V$ 3) $K_a = \frac{\alpha^2}{1-V}$ 4) $K_a = \frac{\alpha^2}{C(1-\alpha)}$

44. For a weak acid, the concentration of H^+ ions is given by

1) $\sqrt{K_a.C}$ 2) K_a/C 3) $\sqrt{K_a/C}$ 4) $\sqrt{C/K_a}$

45. Which of the following is wrong?

1) Degree of dissociation of a weak electrolyte increases with dilution.

2) Increase in temperature increases the ionisation.

3) Strong electrolytes are ionised completely even at moderate concentrations.

4) Addition of NH_4Cl to NH_4OH increases the ionisation of the latter.

46. Dissociation constant of water at 25^0C is

1) 1.0×10^{-14} 2) 1×10^{14} 3) 14 4) 1.8×10^{-16}

Solution; $K_a = K_w$ X 18/1000

47. One litre of water contains 10^{-7} moles of H^+ ions. Degree of ionisation of water (in percentage) is

1) 1.8×10^{-7} 2) 1.8×10^{-9} 3) 3.6×10^{-7} 4) 3.6×10^{-9}

Solution: One litre of water i.e 1000/18 moles contains 10^{-7} moles of H^+ ions

Then 100 moles of water contains $(100x\ 18/1000)10^{-7}=1.8X10^{-7}\%$

48. The P^H of 0.005 M $Ba(OH)_2$ is

1) 2.301 2) 11.699 3) 12 4) 7

Solution; $N=Mxacidity=0.005x2=0.01=10^{-2}$, $P^{OH}=-\log 10^{-2}=2$ and $P^H=14-2=12$

49. Equal volumes of two solutions with P^H=3 and P^H = 11 are mixed. Then the P^H of resulting solution is

1) 8 2) 7 3) 6 4) 0

Solution; $P^H=3$ i.e $[H^+]=10^{-3}$and $P^H=11$ i.e $P^0H=3$. As $P^H= P^{OH}$, solution is neutral.

50. The P^H of a solution is 3.0. This solution is diluted by 100 times. Then the P^H of the resulting solution is

1) 5 2) 7 3) 1 4) 11

Solution; As solution is diluted by 100 times, P^H increased by log 100 i.e 2 units.

KEY

1) 2	**2) 3**	**3) 1**	**4)3**	**5) 2**	**6) 4**	**7) 2**	**8) 2**	**9) 4**	**10) 4**
11) 3	**12) 4**	**13) 2**	**14) 3**	**15) 4**	**16) 2**	**17) 1**	**18) 4**	**19) 1**	**20) 4**
21) 3	**22) 4**	**23) 4**	**24) 4**	**25) 2**	**26) 1**	**27) 1**	**28)**	**29) 1**	**30)1**
31) 4	**32) 3**	**33) 3**	**34) 3**	**35) 3**	**36) 3**	**37) 1**	**38) 1**	**39) 3**	**40) 1**
41) 2	**42) 2**	**43) 1**	**44) 1**	**45) 4**	**46) 4**	**47) 1**	**48) 3**	**49) 2**	**50) 1**