

Chemistry



1. Calculate the pOH of a solution at 25°C that contains 1×10^{-10} M of hydronium ions, i.e. H_3O^+ :
Ans : 4.000
2. Which of the following will give a pair of enantiomorphs ?
Ans : $[\text{Co}(\text{en})_2\text{Cl}_2]\text{Cl}$
3. The correct order of increasing thermal stability of K_2CO_3 , MgCO_3 , CaCO_3 and BeCO_3 is :
Ans : $\text{BeCO}_3 < \text{MgCO}_3 < \text{CaCO}_3 < \text{K}_2\text{CO}_3$
4. A weak acid, HA, has a K_a of 1.00×10^{-5} . If 0.100 mol of this acid is dissolved in one litre of water, the percentage of acid dissociated at equilibrium is closest to :
Ans : 1.00%
5. The number of moles of KMnO_4 that will be needed to react with one mole of sulphite ion in acidic solution is :
Ans : $\frac{2}{5}$
6. Identify the incorrect statement among the following :
Ans : As a result of lanthanoid contraction the properties of 4d series of the transition elements have no similarities with the 5d series of elements
7. Which of the following oxidation states are the most characteristic for lead and tin respectively :
Ans : +2, +4
8. The correct order of C—O bond length among CO , CO_3^{2-} , CO_2 is :
Ans : $\text{CO} < \text{CO}_2 < \text{CO}_3^{2-}$
9. Which of the following presents the correct order of the acidity in the given compounds ?
Ans : $\text{FCH}_2\text{COOH} > \text{ClCH}_2\text{COOH} > \text{BrCH}_2\text{COOH} > \text{CH}_3\text{COOH}$
10. The following equilibrium constants are given :

$$\text{N}_2 + 3\text{H}_2 \rightleftharpoons 2\text{NH}_3; K_1$$

$$\text{N}_2 + \text{O}_2 \rightleftharpoons 2\text{NO}; K_2$$

$$\text{H}_2 + \frac{1}{2}\text{O}_2 \rightleftharpoons \text{H}_2\text{O}; K_3$$
 The equilibrium constant for the oxidation of NH_3 by oxygen to give NO is :
Ans : $K_2K_3^3 / K_1$

11. Which one of the following vitamins is water- soluble ?
Ans : Vitamin B
12. If there is no rotation of plane polarized light by a compound in a specific solvent, thought to be chiral , it may mean that :
Ans :The compound is certainly meso

13. Consider the following sets of quantum numbers :

	n	l	m	s
(a)	3	0	0	+ 1/2
(b)	2	2	1	+ 1/2
(c)	4	3	-2	- 1/2
(d)	1	0	-1	- 1/2
(e)	3	2	3	+ 1/2

Which of the following sets of quantum number is not possible ?

Ans : a and c

14. Which one of the following ions is the most stable in aqueous solution ?

Ans :Mn³⁺

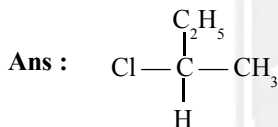
15. Concentrated aqueous sulphuric acid is 98 % H₂SO₄ by mass and has a density of 1.80 g mL⁻¹. Volume of acid required to make one litre of 0.1 M H₂SO₄ solution is :

Ans : 5.55 mL

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

Ans : NH₂⁻

17. CH₃—CHCl—CH₂—CH₃ has a chiral centre. Which one of the following represents its R configuration ?



18. 0.5 molal aqueous solution of a weak acid (HX) is 20% ionised . If K_f for water is 1.86 K kg mol⁻¹ , the lowering in freezing point of the solution is :

Ans : 1.12 K

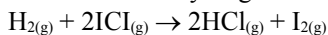
19. Which one of the following polymers is prepared by condensation polymerization ?

Ans : Nylon -66

20. The Langmuir adsorption isotherm is deduced using the assumption :

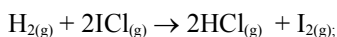
Ans : The adsorbed molecules interact with each other .

21. The reaction of hydrogen and iodine monochloride is given as :

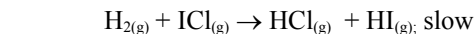


This reaction is of first order with respect to H_{2(g)} and ICl_(g) , following mechanisms were proposed :

Mechanism A :



Mechanism B :



Which of the above mechanism(s) can be consistent with the given information about the reaction ?

Ans : A only

22. RNA and DNA are chiral molecules, their chirality is due to :

Ans : Chiral bases

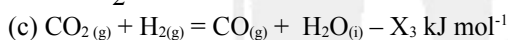
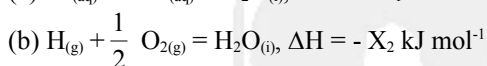
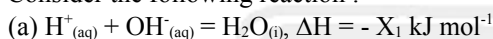
23. In which of the following the hydration energy is higher than the lattice energy ?

Ans : Ba SO₄

24. Which one of the following on reduction with lithium aluminium hydride yields a secondary amine ?

Ans : Methylisocyanide

25. Consider the following reaction :



Enthalpy of formation of $\text{H}_2\text{O}_{(\text{l})}$ is :

Ans : $-X_2 \text{ kJ mol}^{-1}$

26. Given that bond energies of H—H and Cl—Cl are 430 kJ mol⁻¹ respectively and $\Delta_f H$ for HCl is -90 kJ mol⁻¹, Bond enthalpy of HCl is :

Ans : 290 kJ mol⁻¹

27. Reduction of aldehydes and ketones into hydrocarbons using zinc amalgam and conc. HCl is called :

Ans : Clemmensen Reduction

28. Which one of the following anions is present in the chain structure of silicates ?

Ans : $(\text{SiO}_3^{2-})_n$

29. The fraction of total volume occupied by the atoms present in a simple cube is :

Ans : $\frac{\pi}{6}$

30. For the following

(a) I⁻

(b) Cl⁻

(c) Br⁻

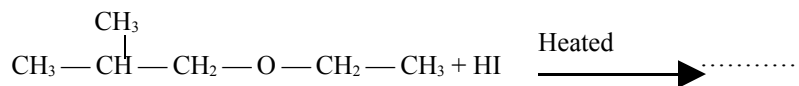
The increasing order of nucleophilicity would be :

Ans : Cl⁻ < Br⁻ < I⁻

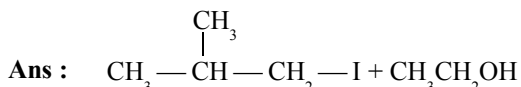
31. Which one of the following orders correctly represents the increasing acid strengths of the given acids :

Ans : HOCl < HOClO < HOClO₂ < HOClO₃

32. In the reaction :



Which of the following compounds will be formed ?



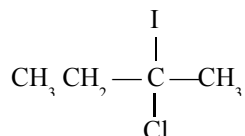
33. With which of the following electronic configuration and atom has the lowest ionization enthalpy ?

Ans : $1s^2 2s^2 2p^5$

34. Predict the product Obtained in the following reaction of butyne -1.



Ans :



35. An element, X has the following isotopic composition ;

$^{200}\text{X} : 90\%$

$^{199}\text{X} : 8.0\%$

$^{202}\text{X} : 2.0\%$

The weighted average atomic mass of the naturally – occurring element X is closest to :

Ans : 199 amu

36. In a first-order reaction $\text{A} \rightarrow \text{B}$, if k is rate constant and initial concentration of the reactant A is 0.5 M then half –life is :

Ans : $\frac{\log 2}{k}$

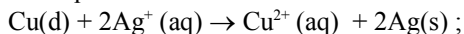
37. Which of the following statements, about the advantage of roasting of sulphide ore before reduction is not true ?

Ans : Roasting of the sulphide to the oxide is thermodynamically feasible

38. If 60% of a first order reaction was completed in 60 minutes, 50% of the same reaction would be completed in approximately :

Ans : 45 minutes

39. The equilibrium constant of the reaction :



$E^\circ = 0.46 \text{ V}$ at 298 K is :

Ans : 4.0×10^{15}

40. Which of the compounds with molecular formula C_5H_{10} yields acetone on ozonolysis ?

Ans : 2-Methyl – 2- butene

41. Sulphide ores of metals are usually concentrated by Froth Flotation process. Which one of the following sulphide ores offers an exception and is concentrated by chemical leaching ?

Ans : Copper pyrite

42. The efficiency of a fuel cell is given by :

Ans : $\frac{\Delta H}{\Delta G}$

43. Which one of the following on treatment with 50% aqueous sodium hydroxide yields the corresponding alcohol and acid ?


Ans : C₆H₅CHO


44. Identify the correct order of the size of the following :


Ans : Ca²⁺ < K⁺ < Ar < Cl⁻ < S²⁻

45. Consider the following compounds

(i) C₆H₅COCl

(ii) O₂N——COCl

(iii) H₃C——COCl

(iv) OHC——COCl

The correct decreasing order of their reactivity towards hydrolysis is :

Ans : (ii) > (iv) > (i) > (iii)

46. The product formed in Aldol condensation is :

Ans : a beta – hydroxyl aldehyde or a beta – hydroxyl ketone

47. If NaCl is doped with 10⁻⁴ mol % of SrCl₂, the concentration of cation vacancies will be (N_A = 6.02 × 10²³ mol⁻¹) :

Ans : 6.02 × 10¹⁷ mol⁻¹

48. The d electron configurations of Cr²⁺, Mn²⁺, Fe²⁺ and Ni²⁺ are 3d⁴, 3d⁵, 3d⁶ and 3d⁸ respectively. Which one of the following aqua complexes will exhibit the minimum paramagnetic behaviour

Ans : [Ni(H₂O)₆]²⁺

49. The order of decreasing reactivity towards an electrophilic reagent, for the following :

- (a) Benzene
- (b) Toluene
- (c) Chlorobenzene and
- (d) Phenol

Would be :

Ans : d > b > a > c

50. In which of the following pairs, the two species are iso-structural ?

Ans : BrO₃⁻ and XeO₃