

PART B – CHEMISTRY

19

1. For an ideal Solution of two components A and B, which of the following is true ?

- (1) $\Delta H_{\text{mixing}} < 0$ (zero)
 (2) A – A, B – B and A – B interactions are identical
 (3) A – B interaction is stronger than A – A and B – B interactions
 (4) $\Delta H_{\text{mixing}} > 0$ (zero)

Ans. (2)

2. Which of these statements is not true ?

- (1) In aqueous solution, the Tl^+ ion is much more stable than $\text{Tl}(\text{III})$
 (2) LiAlH_4 is a versatile reducing agent in organic synthesis.
 (3) NO^+ is not isoelectronic with O_2
 (4) B is always covalent in its compounds

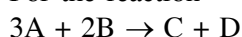
Ans. (4)

3. Nickel ($Z = 28$) combines with a uninegative monodentate ligand to form a dia magnetic complex $[\text{NiL}_4]^{2-}$. The hybridisation involved and the number of unpaired electrons present in the complex are respectively :

- (1) sp^3 , zero (2) sp^3 , two
 (3) dsp^2 one (4) dsp^2 , zero

Ans. (4)

4. For the reaction



the differential rate law can be written as

$$(1) -\frac{1}{3} \frac{d[A]}{dt} = \frac{d[C]}{dt} = k[A]^n[B]^m$$

$$(2) +\frac{1}{3} \frac{d[A]}{dt} = -\frac{d[C]}{dt} = k[A]^n[B]^m$$

$$(3) \frac{1}{3} \frac{d[A]}{dt} = \frac{d[C]}{dt} = k[A]^n[B]^m$$

$$(4) -\frac{d[A]}{dt} = \frac{d[C]}{dt} = k[A]^n[B]^m$$

Ans. (1)

Sol. Rate = $-\frac{1}{3} \frac{d(A)}{dt} = -\frac{1}{2} \frac{d(B)}{dt} = \frac{d(C)}{dt} = \frac{d(D)}{dt}$

$$\text{Rate} = K (A)^n (B)^m$$

$$\frac{1}{3} \frac{d(A)}{dt} = -\frac{1}{2} \frac{d(B)}{dt} = \frac{d(C)}{dt} = \frac{d(D)}{dt}$$

$$= K(A)^n(B)^m$$

$$\text{so } -\frac{1}{3} \frac{d(A)}{dt} = \frac{d(C)}{dt} = K(A)^n(B)^m$$

5. Which one of the following molecules is paramagnetic?

- (1) NO (2) O_3
 (3) N_2 (4) CO

Ans. (1)

6. Ionization energy of gaseous Na atoms is $495.5 \text{ kJ mol}^{-1}$. The lowest possible frequency of light that ionizes a sodium atom is

- ($h = 6.626 \times 10^{-34} \text{ Js}$, $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$)
 (1) $3.15 \times 10^{15} \text{ s}^{-1}$ (2) $4.76 \times 10^{14} \text{ s}^{-1}$
 (3) $1.24 \times 10^{15} \text{ s}^{-1}$ (4) $7.50 \times 10^4 \text{ s}^{-1}$

Ans. (3)

Sol. $\Delta E = h\nu$

$$\nu = \frac{\Delta E}{h}$$

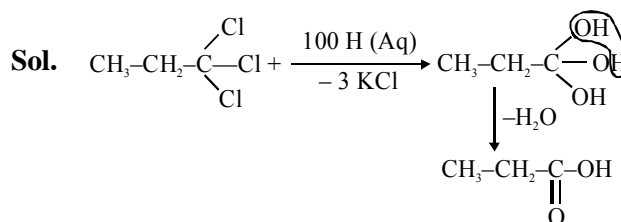
$$\nu = \frac{495.5 \times 10^3 \text{ Joule}}{6.023 \times 10^{23}} \times \frac{1}{6.626 \times 10^{-34}}$$

$$\nu = 1.24 \times 10^{15} \text{ sec}^{-1}$$

7. The major product formed when 1,1,1 - trichloro - propane is treated with aqueous potassium hydroxide is :

- (1) 2 - Propanol (2) Propionic acid
 (3) Propyne (4) 1 - Propanol

Ans. (2)



8. The final product formed when Methyl amine is treated with NaNO_2 and HCl is :

- (1) Methylcyanide (2) Methylalcohol
 (3) Nitromethane (4) Diazomethane

Ans. (2)



it is third order reaction.

9. Which one of the following is an example of thermosetting polymers?

- (1) Nylon 6, 6 (2) Bakelite
 (3) Buna-N (4) Neoprene

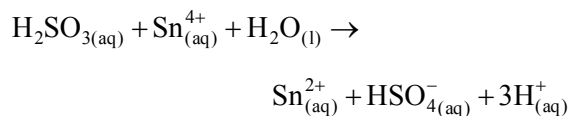
Ans. (2)

Sol. Bakelite becomes hard on heating and the process is irreversible

10. Which one of the following has largest ionic radius ?
 (1) Li^+ (2) F^- (3) O_2^{2-} (4) B^{3+}

Ans. (3)

11. Consider the reaction

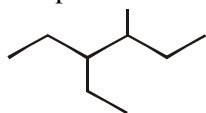


Which of the following statements is correct?

- (1) H_2SO_3 is the reducing agent because it undergoes oxidation
 (2) H_2SO_3 is the reducing agent because it undergoes reduction
 (3) Sn^{4+} is the reducing agent because it undergoes oxidation
 (4) Sn^{4+} is the oxidizing agent because it undergoes oxidation

Ans. (1)

12. The correct IUPAC name of the following compound is:



- (1) 3, 4 - ethyl methylhexane
 (2) 3 - ethyl - 4 - methylhexane
 (3) 4 - ethyl - 3 - methylhexane
 (4) 4 - methyl - 3 - ethylhexane

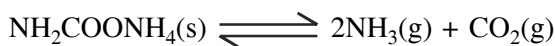
Ans. (2)

13. Which one of the following ores is known as Malachite

- (1) Cu_2O (2) CuFeS_2
 (3) Cu_2S (4) $\text{Cu}(\text{OH})_2 \cdot \text{CuCO}_3$

Ans. (4)

14. For the decomposition of the compound, represented as

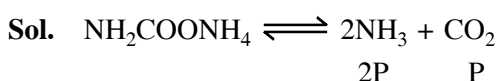


the $K_p = 2.9 \times 10^{-5} \text{ atm}^3$.

If the reaction is started with 1 mol of the compound, the total pressure at equilibrium would be :

- (1) $38.8 \times 10^{-2} \text{ atm}$ (2) $1.94 \times 10^{-2} \text{ atm}$
 (3) $5.82 \times 10^{-2} \text{ atm}$ (4) $7.66 \times 10^{-2} \text{ atm}$

Ans. (3)



$$K_p = (2p)^2 (P) = 4p^3 = 725 \times 10^{-6}$$

$$p = 1.94 \times 10^{-2}$$

$$\text{total pressure} = 2P + P = 5.82 \times 10^{-2} \text{ atm}$$

15. The reason for double helical structure of DNA is the operation of :

- (1) Electrostatic attractions
 (2) Hydrogen bonding
 (3) Dipole - Dipole interactions
 (4) van der Waals forces

Ans. (2)

16. Amongst LiCl , RbCl , BeCl_2 and MgCl_2 the compounds with the greatest and the least ionic character, respectively are :

- (1) RbCl and MgCl_2 (2) LiCl and RbCl
 (3) MgCl_2 and BeCl_2 (4) RbCl and BeCl_2

Ans. (4)

17. Which one of the following compounds will not be soluble in sodium bicarbonate ?

- (1) Benzene sulphonic acid
 (2) Benzoic acid
 (3) O-Nitrophenol
 (4) 2, 4, 6 - Trinitrophenol

Ans. (3)

- Sol. Bicarbonates are weak bases can't react with weaker acid

18. Among the following organic acids, the acid present in rancid butter is:

- (1) Lactic acid (2) Acetic acid
 (3) Pyruvic acid (4) Butyric acid

Ans. (4)

19. The total number of octahedral void(s) per atom present in a cubic close packed structure is :-

- (1) 1 (2) 2 (3) 3 (4) 4

Ans. (1)

- Sol. CCP no. of octahedral void = $12 \times \frac{1}{4} + 1 = 4$
 (edge) (centre)

per atom octahedral void is 1.

20. The observed osmotic pressure for a 0.10 M solution of $\text{Fe}(\text{NH}_4)_2(\text{SO}_4)_2$ at 25°C is 10.8 atm. The expected and experimental (observed) values of Van't Hoff factor (i) will be respectively :

($R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$)

- (1) 3 and 5.42 (2) 5 and 3.42
 (3) 4 and 4.00 (4) 5 and 4.42

Ans. (4)

Sol. $\pi = CRTi$

$$i = \frac{\pi}{CRT} = \frac{10.8}{0.1 \times 0.0821 \times 298}$$

$$i = 4.42 \text{ (observed)}$$

21. Sulphur dioxide and oxygen were allowed to diffuse through a porous partition. 20 dm³ of SO₂ diffuses through the porous partition in 60 seconds. The volume of O₂ in dm³ which diffuses under the similar condition in 30 seconds will be (atomic mass of sulphur = 32u)

(1) 28.2 (2) 14.1

(3) 7.09 (4) 10.0

Ans. (2)

Sol. $\frac{r_1}{r_2} = \sqrt{\frac{M_2}{M_1}}$

$$\frac{20/60}{V/30} = \sqrt{\frac{32}{64}}$$

$$\frac{10}{V} = \sqrt{\frac{1}{2}} \Rightarrow V = 10\sqrt{2} = 14.1$$

22. An octahedral complex with molecular composition M.5NH₃.Cl.SO₄ has two isomers, A and B. The solution of A gives a white precipitate with AgNO₃ solution and the solution of B gives white precipitate with BaCl₂ solution. The type of isomerism exhibited by the complex is :

(1) Geometrical isomerism

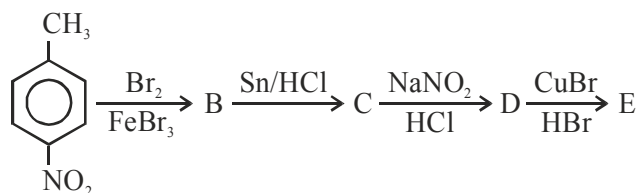
(2) Coordinate isomerism

(3) Ionisation isomerism

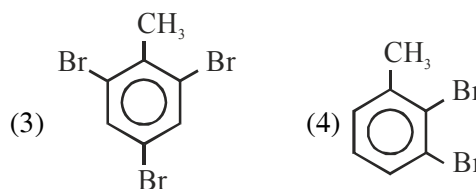
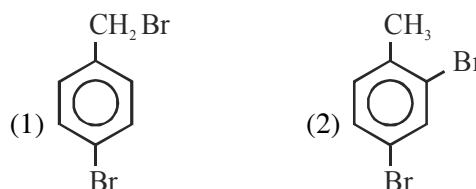
(4) Linkage isomerism

Ans. (3)

23. In a set of reactions p-nitrotoluene yielded a product E

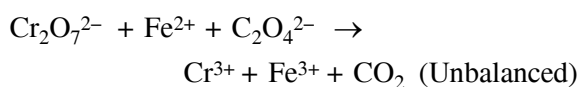


The product E would be :-



Ans. (2)

24. How many electrons are involved in the following redox reaction ?



(1) 3

(2) 4

(3) 5

(4) 6

Ans. (4)

25. Zirconium phosphate [Zr₃(PO₄)₄] dissociates into three zirconium cations of charge +4 and four phosphate anions of charge -3. If molar solubility of zirconium phosphate is denoted by S and its solubility product by K_{sp} then which of the following relationship between S and K_{sp} is correct ?

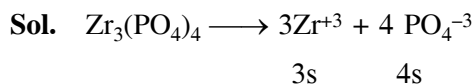
(1) $S = \{K_{sp}/144\}^{1/7}$

(2) $S = \{K_{sp}/(6912)^{1/7}\}$

(3) $S = (K_{sp}/6912)^{1/7}$

(4) $S = \{K_{sp}/6912\}^7$

Ans. (3)



$$K_{sp} = (3s)^3 (4s)^4$$

$$s = \left(\frac{k_{sp}}{6912} \right)^{1/7}$$

26. Choose the correct statement with respect to the vapour pressure of a liquid among the following :-

- (1) Increases linearly with increasing temperature
- (2) Decreases non-linearly with increasing temperature
- (3) Decreases linearly with increasing temperature
- (4) Increases non-linearly with increasing temperature

Ans. (4)

27. Amongst the following, identify the species with an atom in +6 oxidation state :

- (1) $[MnO_4]^-$
- (2) $[Cr(CN)_6]^{3-}$
- (3) Cr_2O_3
- (4) CrO_2Cl_2

Ans. (4)

28. Example of a three-dimensional silicate is :

- (1) Beryls
- (2) Zeolites
- (3) Feldspars
- (4) Ultramarines

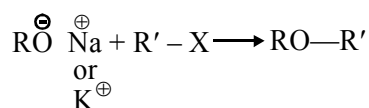
Ans. (2, 3, 4)

29. Williamson synthesis of ether is an example of

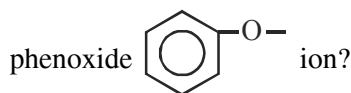
- (1) Nucleophilic addition
- (2) Electrophilic substitution
- (3) Nucleophilic substitution
- (4) Electrophilic addition

Ans. (3)

Sol. Nucleophilic substitution



30. Which one of the following substituents at *para*-position is most effective in stabilizing the



- | | |
|------------------------|--------------------------|
| (1) - CH ₃ | (2) - CH ₂ OH |
| (3) - OCH ₃ | (4) - COCH ₃ |

Ans. (4)

Sol. $\begin{matrix} O \\ || \\ -C-CH_3 \end{matrix}$ is an electron withdrawing group which stabilises the anion.