

Regd. Office: Aakash Tower, 8, Pusa Road, New Delhi-110005, Ph.011-47623456

Chemistry JEE Solutions 2022

Chemistry

(White) $P_4 \xrightarrow{Conc.HNO_3}$ 1.

(1) $H_3PO_3 + N_2$ (2) $NO_2 + PH_3$

(3) $H_3PO_4 + NO_2$ (4) $H_3PO_4 + NO_2$

Sol. Answer (3)

$$\mathsf{P_4} + 20\mathsf{HNO_3} \rightarrow 4\mathsf{H_3PO_4} + 20\mathsf{NO_2} + 4\mathsf{H_2O}$$

- 2. Chlorine nitrate on hydrolysis produces X along with HNO3 and chlorine nitrate on reaction with HCl produces Y along with HNO3. X and Y are respectively,
 - (1) HOCI, HCIO₂
- (2) HOCI, CI₂
- (3) HCl, Cl₂
- (4) HOCI, HCIO₃

Sol. Answer (2)

$$\mathsf{CIONO}_{2(g)} + \mathsf{H}_2\mathsf{O}_{(g)} \to \mathsf{HOCI}_{(g)} + \mathsf{HNO}_{3(g)}$$

$$\mathsf{CIONO}_{2(g)} + \mathsf{HCl}_{(g)} \xrightarrow{} \mathsf{Cl}_{2(g)} + \mathsf{HNO}_{3(g)}$$

3. Consider the following reaction

The major product formed in the above reaction

Sol. Answer (3)

Allswer (3)

$$OH \longrightarrow OH \longrightarrow OH \longrightarrow CI \longrightarrow CHO_{CI} \longrightarrow CHO_{CI}$$

4. Match the acidic radicals present in column I with their characteristic observations in column II

Column I Column II

- (i) CO_3^{2-}
- (P) Brisk Effervescence
- (ii) NO_3^-
- (Q) White Precipitate
- (iii) SO₄²⁻
- (R) Brown Ring
- (iv) S²⁻
- (S) Rotten egg smell
- (i) S
- (i) P
- $(1) \quad \begin{array}{c} (ii) R \\ (iii) Q \end{array}$
- (2) (ii) Q (iii) R
- (iv) P
- (iv) S
- (i) P
- (i) P
- (3) (ii) R
- $(4) \quad \begin{array}{c} (ii) R \\ (iii) S \end{array}$
- (iii) Q (iv) – S
- (iv) Q

Sol. Answer (3)

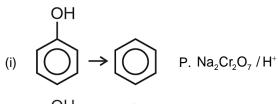
(i)
$$CO_3^{2-} + dil\ HCl \rightarrow CO_2^{-}$$
(brisk effervescence)

(ii) $NO_3^- + Conc.H_2SO_4 \rightarrow HNO_3$

$$6FeSO_4 + 2HNO_3 + 3H_2SO_4 \rightarrow 3Fe_2(SO_4)_3 + 4H_2O + 2NO$$

 $[Fe(H_2O)_6]SO_4 \cdot H_2O + NO \rightarrow [Fe(H_2O)_5NO]SO_4$

- + 2H₂O
- (iii) $SO_4^{2-} + BaCl_2 \rightarrow BaSO_4 \downarrow$ white ppt.
- (iv) $S^{2-} + dil\ HCl \rightarrow H_2S \uparrow$ Rotten Egg small
- 5. Match the reagent with the organic conversion



$$(ii) \qquad \stackrel{\bigcirc}{\longrightarrow} \qquad \stackrel{\bigcirc}{\longrightarrow} \qquad Q. Zn$$

(iii)
$$OH$$
 OH Br Br $R. FeCl_3$

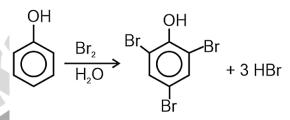
(iv)
$$\rightarrow$$
 Violet S. Br_2/H_2O

- (1) (i) \rightarrow Q, (ii) \rightarrow P, (iii) \rightarrow S, (iv) \rightarrow R
- (2) (i) \rightarrow P, (ii) \rightarrow Q, (iii) \rightarrow R, (iv) \rightarrow S
- (3) (i) \rightarrow Q, (ii) \rightarrow R, (iii) \rightarrow S, (iv) \rightarrow P
- (4) (i) \rightarrow R, (ii) \rightarrow S, (iii) \rightarrow P, (iv) \rightarrow Q

Sol. Answer (1)

$$\begin{array}{c}
OH \\
& \\
\hline
Benzene
\end{array}$$

$(ii) \longrightarrow P$



2,4,6-tribromophenol (white precipitate)

$$(ii) \longrightarrow P$$

$$\begin{array}{c}
OH \\
Br_{2}
\end{array}$$
Br OH Br + 3 HBr

2,4,6-tribromophenol (white precipitate)

OH
+ FeCl₃
$$\rightarrow$$
 3H⁺ + [Fe(OC₆H₅)₆]³⁻+3 HCl
violet complex

(Neutral FeCl₃ test)

$$(iv) \longrightarrow R$$

- **6.** Arrange the following coordination complexes in increasing order of their magnetic moments
 - $I = [Fe(CN)_6]^{3-}$
- $II = [FeF_6]^{3-}$
- $III = [Mn(CI)_6]^{3-}$
- $IV = [Mn(CN)_6]^{3-}$
- (1) I < III < II < IV
- (2) I < IV < III < II

- (3) IV < II < I < III
- (4) II < I < IV < III

Sol. Answer (2)

(i) $[Fe(CN)_6]^{3-}$

e⁻ configuration of Fe⁺³ = [Ar]3d⁵ 4s^o i.e t_{2q}^5 e_q^0 \Rightarrow 1 unpaired e⁻

- (ii) $[FeF_6]^{3-}$ e^- configuration of $Fe^{+3} = [Ar]3d^5 4s^\circ$ i.e. $t_{2\alpha}^3 e_{\alpha}^2 \Rightarrow 5$ unpaired e^-
- (iii) [MnCl₆]³⁻ e^- configuration of Mn⁺³ = [Ar]3d⁴ 4s° i.e. t_{2a}^3 e_a^1 \Rightarrow 4 unpaired e^-
- (iv) $[Mn(CN)_6]^{3-}$ e^- configuration of $Mn^{+3} = [Ar]3d^4 4s^o$ i.e. t_{2g}^4 e_g^o \Rightarrow 2 unpaired e^-
- 7. Statement -1: In extraction of gold, the oxidation state of gold in the cyanide complex form is +3

Statement 2: When the cyanide complex is treated with zinc, Zn get oxidised to +2 state

- (1) Statement 1 and 2 both are correct
- (2) Statement 1 is correct but statement 2 is wrong
- (3) Statement 1 wrong but statement 2 is correct
- (4) Statement 1 and 2 both are wrong.

Sol. Answer (3)

Extraction of gold - by leaching

$$= 4A\overset{\circ}{u} + 8NaCN + 2H_2O + O_2 \rightarrow 2-5\%$$

$$\Rightarrow \overset{\circ}{\mathsf{Zn}} + 2\mathsf{Na}[\mathsf{Au}(\mathsf{CN})_2] \to \overset{\circ}{\mathsf{2Au}} + \mathsf{Na}_2[\mathsf{Zn}(\mathsf{CN})_4]$$

Statement 1 is wrong

Statement 2 is correct

8. Arrange the following compounds in increasing order of H-bonding

HCN, NH₃, CH₄

- (1) $CH_4 < NH_3 < HCN$
- (2) $HCN < NH_3 < CH_4$
- (3) $NH_3 < CH_4 < HCN$
- (4) $CH_4 < HCN < NH_3$

Sol. Answer (1)

Usually C-H bond is not that polar but here in $H-C\equiv N$ carbon is sp hybridized resulting in high polarity of C-H bond

Hence order of H-bonding:

$$CH_4 < NH_3 < HCN$$

9. Match column I with column II

Column I Column II (i) Tranquilizers (a) Relieve pain (ii) Analgesics (b) Lowers body

(iii) Antipyretic (c) Control acidity

temperatures

(iv) Antacids (d) Reduce stress

(1) (i)-d, (ii)-a, (iii)-b, (iv)-c

(2) (i)-b, (ii)-c, (iii)-d, (iv)-a

(3) (i)-c, (ii)-d, (iii)-b, (iv)-a

(4) (i)-b, (ii)-d, (iii)-a, (iv)-c

Sol. Answer (1)

Tranquilizers: They are neurologically active drugs and are used for treatment of stress and mild or even severe mental diseases.

(i) \rightarrow d

Analgesics: It reduces or abolishes pain without causing impairment of consciousness, mental confusion or other disturbances of nervous system

(ii) \rightarrow a

Antipyretic: Lowers body temperature

 $(iii) \rightarrow b$

Antacids: Controls acidity

(iv) \rightarrow c

10. The gas releases in the following reaction is

 $PCI_5 + NH_4CI \rightarrow Gas + side product$

- (1) NCl₃
- (2) PCI₃
- (3) HCI
- $(4) N_2$

Sol. Answer (3)

$$4PCl_5 + 4NH_4Cl \rightarrow (Cl_2PN)_4 + 16HCl$$

11. The Product of the following reaction is

$$CH_3-C-CH_2-C \equiv CH \xrightarrow{\begin{array}{c} 1. \text{ R-Li} \\ 2. \text{ C}_3H_7-CI \\ \text{CH}_3 \end{array}} \text{ Product}$$

(1)
$$CH_3$$
 $CH-CH_2-C=C$ H CH

(2)
$$CH_3$$
 CH_2 CH_2 CH_3 CH_4 CH_5 $CH_$

(4)
$$CH_3$$
 $CH-CH_2-C=C < H_3$ CH_3

Sol. Answer (4)

$$\begin{array}{c} CH_3 \\ H_3C-C-CH_2-C \equiv CH \xrightarrow{R-Li} H_3C-C-CH_2-C \equiv C \\ H \end{array}$$

$$\begin{array}{c} \mathsf{CH_3} \\ \mathsf{I} \\ \mathsf{CH_1} \\ \mathsf{CH_2} \\ \mathsf{CH_3} \\ \mathsf{H} \end{array} \\ \mathsf{CC} \\ \mathsf{CH}_3 \\ \mathsf{CC} \\ \mathsf{CC}$$

- **12.** Which of the following is correct statement regarding Buna-N.
 - (1) Monomer of Buna-N are styrene and Butadiene
 - (2) Monomers of Buna-N are Butadiene and vinyl cyanide
 - (3) Buna-N is a condensation polymer
 - (4) Buna-N is natural Rubber

Sol. Answer (2)

n
$$CH_2$$
=CH-CH= CH_2 + n CH_2 =CH

1, 3 - Butadiene Acrylonitrile

(vinyl cyanide)

CN

CN

(vinyl cyanide)

CN

CN

CN

CN

Buna-N

Dulla-IN

It is a synthetic rubber and an addition polymer.

13. Assertion (A) : Fluorine forms only one oxoacid known as Hypofluorous acid

Reason (R): Flourine has small size and high electronegativity

- (1) Both (A) and (R) are true and (R) is the correct explanation of (A)
- (2) both (A) and (R) are true but (R) is not the correct explanation of (A)
- (3) (A) is true but (R) is false
- (4) (A) is false but (R) is true

Sol. Answer (1)

Fluorine forms only one oxoacid i.e. HOF

∴ Assertion is true

Due to small size of fluorine, high electronegativity and non-availability of vacant d-orbitals, fluorine forms only one oxoacid.

- (A) and (R) both are true and also correct explanation.
- 14 Statement 1 -Maltose is composed of two α-D-glucose units in which C-1 of one glucose is linked to C-4 of another glucose unit

Statement 2 Maltose is composed of α -D-glucose and β -D-glucose in which C-1 of α -D-glucose is linked to C-6 of β -D-glucose

- (1) Statement 1 is correct and Statement 2 is incorrect
- (2) Statement 1 is incorrect and Statement 2 is correct
- (3) Both the statements are correct
- (4) Both the statements are incorrect
- Sol. Answer (1)

Maltose is composed of two α -D-glucose units in which C_1 of one glucose is linked to C_4 of another glucose unit.

- Statement 1 is correct but Statement 2 is incorrect
- 15. Calculate the pH of 0.001 M NaOH
 - (1) 11
- (2) 10
- (3) 9
- (4) 6

Sol. Answer (1)

NaOH
$$\rightarrow$$
 Na⁺ + $^{-}$ OH
10⁻³M 0 0
0 10⁻³M 10⁻³ M

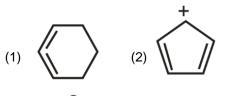
$$[^{-}OH] = 10^{-3}M$$

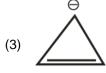
pOH = $-log[^{-}OH]$
= 3

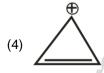
$$pH + pOH = 14$$

 $pH = 14 - 3 = 11$

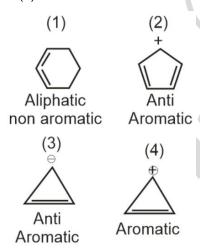
16. Among the following most stable species is,







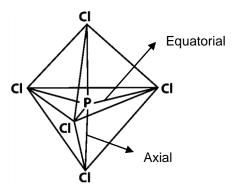
Sol. Answer (4)



Aromatic > Non aromatic > Anti Aromatic

- 17. Correct Statement about PCI₅ is/are
 - (a) PCI₅ has TBP geometry
 - (b) Axial bonds are stronger than equatorial bond
 - (c) All equatorial bonds are in same plane
 - (d) PCI₅ shows sp³d hybridization
 - (1) a,b,c
- (2) a,b,d
- (3) a,c,d
- (4) b,c,d

Sol. Answer (3)



- (a) Trigonal Bipyramidal geometry
- (b) Axial bond lengths are longer due to no %s character than equatorial bond, so weak in nature
- (c) All equatorial bonds are in same plane
- (d) sp³d hybridisation
- **18.** Which of the following elements has the highest value of $E_{M^{2+}/M}^{\circ}$?
 - (1) Ni
- (2) Mn
- (3) Cu
- (4) Fe
- Sol. Answer (3)

From electrochemical series:

$$E_{\text{Cu}^{2+}/\text{Cu}}^{\text{o}} = +0.34\text{V}$$

$$E_{Ni^{2+}/Ni}^{o} = -0.25V$$

$$E_{Mn^{2+}/Mn}^{o} = -1.18V$$

$$E^{\text{o}}_{\text{Fe}^{2+}/\text{Fe}} = -0.44 \text{V}$$

Hence Cu has highest SRP value.

- 19. When BeO reacts with HF in the presence of ammonia, a compound A is formed. On heating, a compound B is formed along with ammonium fluoride. The oxidation state of Be in compound B is
- Sol. Answer (2)

$$\mathsf{BeO} + \mathsf{4HF} + \mathsf{2NH}_3 \to \mathsf{(NH_4)_2BeF4} \xrightarrow{\Delta} \mathsf{BeF_2}^{2+} \mathsf{2NH_4F}$$

20. Among the elements with Atomic Number 57 to 70, the number of elements with half-filled configuration are X and fully filled configuration are Y.

The sum of X and Y is

Sol. Answer (3)

$$X \rightarrow Half - filled \rightarrow _{63}Eu - 4f^75d^06s^2$$

$$_{64}$$
 Gd $-4f^75d^16s^2$

$$Y \rightarrow Fully filled \rightarrow {}_{70}Yb \rightarrow 4f^{14}5d^{0}6s^{2}$$

Sum of
$$X+Y = 2+1 = 3$$

- **21.** In carius method of estimation of halogen, 0.25 g of an organic compound gave 0.40 g of AgCl. Find out the percentage of chlorine in the compound.
- Sol. Answer (29.58)

Weight of organic compound = 0.25 gm

143.5 gm AgCl contains Cl = 35.5 gm

0.4 gm AgCl contains Cl =
$$\frac{35.5}{143.5} \times 0.4$$
 gm

% CI =
$$\frac{\text{weight of chlorine}}{\text{weight of organic compound}} \times 100$$

$$=\frac{35.5\times0.4}{143.5\times0.25}\times100=39.58\%$$

22. Consider an electrochemical cell

Given,
$$E_{Aq^{+}/Aq}^{0} = + 0.80V$$

the value of ΔG^0 for the cell represented above is -x kJ, then the value of x in nearest integer is

Sol. Answer (77)

$$Pt, H_2 | H^+ || Ag^+ | Ag$$

$$E_{Aq^+/Aq}^0 = 0.80V$$

$$E_{H^{+}/H_{2}/Pt}^{0} = 0$$

$$\mathsf{E}_{\mathrm{cell}}^0 = \mathsf{E}_{\mathrm{cathode}}^0 - \mathsf{E}_{\mathrm{anode}}^0$$

$$= 0.80 - 0 = 0.80 \text{ V}$$

$$\Delta G_{cell}^0 = -nF E_{cell}^0$$

 $=-1\times96500\times0.80$

= -77200 J

= -77.2 kJ

Hence, -x = -77.2 kJ

 $x = 77.2 \approx 77$

23. How many of the following set of quantum numbers are possible.

n I m

(i) 3 3 3

(ii) 2 1 1

(iii) 3 2 2

(iv) 2 2 2

Sol. Answer (2)

'l' can take value from 0 to n-1

'mı' can take all integral values from —l to +l including 0.

(i) n = 3 l = 3

not possible

(ii) n = 2 l = 1

 $m_1 = 1$ possible

(iii) n = 3 l = 2

 $m_l = 2$ possible

(iv) n = 2 l = 2

not possible

- .. Only 2 set of quantum numbers are possible
- **24.** The boiling point of pure water is 373.15 k. It changes to 373.535 k, when 2.5×10⁻³kg of a non-volatile and non-electrolyte solute has been added to 75×10⁻³kg water.

Find the molecular mass of solute in g/mol

 $K_b(H_2O) = 0.52 \text{ k kg mol}^{-1}$

[Round off to the nearest integer]

Sol. Answer (45)

 $T_b = 373.15 \text{ k}$

 $T_b' = 373.535 \text{ k}$

$$\Delta T_{b} = 373.535 - 373.15$$

$$= 0.385 k$$

Now,
$$\Delta T_b = k_b m$$

$$0.385 = 0.52 \times \frac{2.5 \times 10^{-3} \times 10^{3}}{M_{\text{solute}} \times 75 \times 10^{-3}}$$

$$M_{solute} = \frac{0.52 \times 2.5}{0.385 \times 75 \times 10^{-3}}$$

= 45 gm/mole

25. Which gas in produced during following reaction:

 $NH_4CI + NaNO_2 \xrightarrow{\Delta} Product$

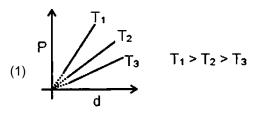
- (1) NH₃
- (2) N_2
- (2) Cl₂
- (4) N_2O

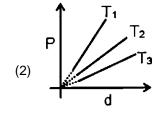
Sol. Answer (2)

$$NH_4CI + NaNO_2 \xrightarrow{\Delta} NaCI + NH_4NO_2$$

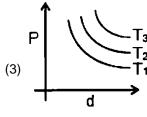
$$NH_4NO_2 \xrightarrow{\Delta} N_2(g) + 2H_2O$$

26. Which of the following graph is correct for an ideal gas

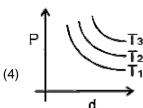




$$T_3 > T_2 > T_1$$



$$T_3 > T_2 > T_1$$



$$T_1 > T_2 > T_3$$

Sol. Answer (1)

$$PV = nRT$$

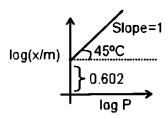
$$P = \! \left[\frac{w}{V} \right] \! \frac{RT}{M}$$

$$P = \frac{dRT}{M}$$
 so $P \propto d$ Slope = $\frac{RT}{M}$

Slope =
$$\frac{RT}{M}$$

Greater is slope greater is Temperature.

27. At 1.003 atm pressure, value of $\left(\frac{x}{m}\right)$ will be



Report your answer to nearest integer.

Sol. Answer (4)

$$\left(\frac{x}{m}\right) = KP^{1/n}$$

$$\log\left(\frac{x}{m}\right) = \log K + \frac{1}{n} \log P$$

Intercept $\log K = 0.602 = \log 4$

$$K = 4$$

Slope
$$\Rightarrow \frac{1}{n} = 1$$
 so $n = 1$

so
$$\left(\frac{x}{m}\right) = 4(1.003) = 4.012$$

28. 5 mole of an ideal gas change it's volume from 10 L to 20 L. reversible isothermally at 300 K then work done by gas isKCal. [Given R = 2 Cal]

Sol. Answer (2)

For isothermal reversible process

$$W = -2.303 \text{ nRT log} \left(\frac{V_2}{V_1}\right)$$

$$= -2.303 \times 5 \times 2 \times 300 \log \left(\frac{20}{10}\right)$$

$$= -2079.82 \text{ Cal} = -2.0798 \times 10^3 \text{ Cal}$$

- Both Statement-I & Statement-II are true
- Both Statement-I & Statement-II are false
- Statement-I is true & Statement-II is false
- Statement-I is false & Statement-II is true

Sol. Answer (1)

In this process absorbed & emitted photon have equal energy.

