



PART : CHEMISTRY

1. The oxidation number of phosphorous in hypophosphoric acid is

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

Ans. (4)

Sol. Hypophosphoric acid — $H_4P_2O_8$
 $4 \times 1 + 2 \times x + 8 \times (-2) = 0$
 $\therefore x = +4$



2. Which of the following micelle structure is obtained when surfactant is added in polar solvent.



Ans. (1)

Sol. When surfactant added in polar solvent following micelles structure is obtained.

3. For reversible reaction at $T = 27^\circ\text{C}$ & $P = 1$ atm pressureThen value of K_c is $X \times 10^{-12}$, then value of X is. (Nearest integer)

Ans. (35)



$$\Delta n = 1 - \frac{3}{2} = -\frac{1}{2}$$

$$K_p = K_c (\text{RT})^{\Delta n}$$

$$7 \times 10^{-12} = K_c [0.082 \times 300]^{-\frac{1}{2}}$$

$$7 \times 10^{-12} = K_c [0.082 \times 300]^{\frac{1}{2}}$$

$$K_c = 7 \times 10^{-12} \times [0.082 \times 300]^{\frac{1}{2}}$$

$$= 7 \times 10^{-12} \times 4.96$$

$$= 34.72 \times 10^{-12} \approx 35 \times 10^{-12}$$

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4. The outer electronic configuration of Nd^{3+} is given as-
(1) $4f^6 s^2$

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4. The outer electronic configuration of Nd^{2+} is given as-

- (1) $4f^6s^2$
- (2) $4f^6s^0$
- (3) $4f^6s^2$
- (4) $4f^6s^0$

Ans. (2)

Sol. $Nd(Z = 80) = 4f^6s^2$
 $Nd^{2+} = 4f^6$ 5. Identify correct increasing order of size of Ca^{2+} , S^{2-} , K^+ , Cl^- ions is

- (1) $Ca^{2+} < K^+ < Cl^- < S^{2-}$
- (2) $K^+ < Ca^{2+} < Cl^- < S^{2-}$
- (3) $K^+ < Ca^{2+} < S^{2-} < Cl^-$
- (4) $S^{2-} < Cl^- < K^+ < Ca^{2+}$

Ans. (1)

Sol. The correct increasing order of size is
 $Ca^{2+} < K^+ < Cl^- < S^{2-}$ 6. The increasing order of basic strength of oxides of vanadium, V_2O_3 , V_2O_4 , V_2O_5 .

- (1) $V_2O_4 > V_2O_3 > V_2O_5$
- (2) $V_2O_3 < V_2O_4 < V_2O_5$
- (3) $V_2O_5 < V_2O_4 < V_2O_3$
- (4) $V_2O_3 = V_2O_4 = V_2O_5$

Ans. (3)

Sol. Basic strength of oxides $\propto \frac{1}{O.N.}$ of element

oxide	V_2O_3	V_2O_4	V_2O_5
O.N.	+3	+4	+5
Basic strength	$V_2O_3 < V_2O_4 < V_2O_5$		
	Acidic	Amphoteric	less basic

7. The hybridization of XeF_4 , SF_4 , NH_4^+ and BF_3 are respectively given as

- (1) sp^3d^2 , sp^3d , sp^3 , sp^2
- (2) sp , sp^3d , sp^3 , sp^2
- (3) sp^2 , sp^3 , sp^3 , sp^3d
- (4) sp^3 , sp^3 , sp^2 , sp^3

Ans. (1)



Sol.

Hybridisation = No. of L.P. + No. of σ - bondFor XeF_4 Hybridisation = $4 + 2 = 6$ sp^3d^2 For SF_4 Hybridisation = $4 + 1 = 5$ sp^3d For NH_4^+ Hybridisation = $4 + 0 = 4$ sp^3 For BF_3 Hybridisation = $3 + 0 = 3$ sp^2 **Resonance Eduventures Ltd.**

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8. 2.56 gm of a non-electrolyte solute is dissolved in one litre of a solution. It has osmotic pressure equal to 4 bar at 300 K temperature. The molar mass of the compound is

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8. 2.56 gm of a non-electrolyte solute is dissolved in one litre of a solution. It has osmotic pressure equal to 4 bar at 300 K temperature. The molar mass of the compound is : (nearest integer) (Given $R = 0.083 \text{ bar} \cdot \text{L}^{-1} \text{mol}^{-1} \text{K}^{-1}$)

Ans. (16)

Sol. $\pi = CRT$

$$4 = \frac{2.56}{M} \times \frac{1}{1} \times 0.083 \times 300$$

$$M = \frac{2.56 \times 0.086 \times 300}{4}$$

$$= 15.936 \approx 16 \text{ gm/mol}$$

9. 0.492 gm of an organic compound on combustion with excess oxygen give 0.792 gm of CO_2 then find the percentage of carbon in the given organic compound.

Ans. (44)

Sol. 44 gm of CO_2 contains 12 g carbon

$$0.792 \text{ gm of } \text{CO}_2 \text{ contains } \frac{0.792 \times 12}{44} \text{ g of carbon}$$

$$\% \text{ of carbon} = \frac{0.216}{0.492} \times 100$$

$$= 43.9\% \approx 44\%$$

10. In which of the following reactions H_2O_2 acts as a reducing agent.



Ans. (2)

Sol. H_2O_2 acts as a reducing agent in the following reaction.



11. The molar volume of H_2 gas at STP conditions is 22.7 Lt. When 11.5gm of Zn reacts with excess conc. HCl, the volume of H_2 gas formed (in lt) is :

(Atomic mass of Zn = 65.3 u)

Ans. (4)

Sol. $\text{Zn} + 2\text{HCl} \longrightarrow \text{ZnCl}_2 + \text{H}_2$

$$\text{No. of moles of Zn} = \frac{11.5}{65.3} = \text{No. of moles of } \text{H}_2$$

$$\text{No. of } \text{H}_2 \text{ liberated} = 0.176 \times 22.7 \text{ Lt.}$$

$$= 3.99 \text{ L} \approx 4 \text{ Lt.}$$

12. Which of the following processes are not used for concentration of ore ?

(A) Froth floatation

(B) Leaching

(C) Liqutation

(D) Electrolysis

(E) Hydraulic washing

(1) A & E only

(2) B & E only

(3) C and D only

(4) A & B only

Ans. (3)

Sol. Concentration processes

(i) Hydraulic washing

(ii) Magnetic separation

(iii) Froth floatation method

(iv) Leaching

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13. Following values of K (rate constants) are given at different temperatures. Find out E_a (activation

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13. Following values of K (rate constants) are given at different temperatures. Find out E_a (activation energy).

- (1) 2.527 kJ (2) 11.488 kJ (3) 1.106 kJ (4) 51.437 kJ

Ans. (1)

$$\text{Sol. } \ln \left(\frac{K_2}{K_1} \right) = \frac{E_a}{R} \left[\frac{1}{T_1} - \frac{1}{T_2} \right]$$

$$\log \left(\frac{0.05}{0.03} \right) = \frac{E_a}{2.303 \times 8.314} \left[\frac{1}{200} - \frac{1}{300} \right]$$

$$[0.70 - 0.48] = \frac{E_a}{2.303 \times 8.314} \left[\frac{300 - 200}{300 \times 200} \right]$$

$$0.22 = \frac{E_a}{2.303 \times 8.314} \left[\frac{1}{600} \right]$$

$$E_a = 0.22 \times 2.303 \times 8.314 \times 600$$

$$= 2527 \text{ J/m}$$

$$= 2.527 \text{ kJ}$$

14. What transition in the hydrogen spectrum would have the same wavelength as the transition from $n = 4$ to $n = 2$ in He^+ ion spectrum?

- (1) $n_2 = 2$ to $n_1 = 1$ (2) $n_2 = 3$ to $n_1 = 1$ (3) $n_2 = 4$ to $n_1 = 3$ (4) $n_2 = 5$ to $n_1 = 2$

Ans. (1)

$$\text{Sol. } \lambda_{\text{H}} = \lambda_{\text{He}^+}$$

$$R_H \times (1)^2 \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right) = R_H \times (2)^2 \left(\frac{1}{(2)^2} - \frac{1}{(4)^2} \right)$$

$$\left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right) = \left(\frac{4}{4} - \frac{4}{16} \right)$$

$$\frac{1}{n_1^2} - \frac{1}{n_2^2} = \frac{1}{1} - \frac{1}{4}$$

$$n_1 = 1; n_2 = 2 \text{ for H-atom}$$

15. Lead storage battery have 38% (w/w) H_2SO_4 . Find the temp at which the liquid of battery will freeze.

$$(i = 2.67); \text{ Kg of water} = 1.86 \text{ k} \left(\frac{\text{K}}{\text{Mol}} \right)$$

- (1) -3.1°C (2) -31°C (3) -0.31°C (4) -0.031°C

Ans. (2)

$$\text{Sol. } \Delta T_f = i \times K_f \times \text{molality}$$

Consider 100 g solution

$$W(\text{H}_2\text{SO}_4) = 38 \text{ gm}$$

$$W(\text{Water}) = 62 \text{ g}$$

$$\text{Molality} = \frac{38 \times 1000}{98 \times 62} = 6.254$$

$$\Delta T_f = i \times K_f \times \text{molality}$$

$$= 2.67 \times 1.86 \times 6.254 = 31$$

Freezing point of liquid in battery is -31°C

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16. The bond enthalpy of $\text{Cl}-\text{Cl}$ is 240 kJ/mole . Electron gain enthalpy of $\text{Cl}(g)$ is -350 kJ/mole and hydration

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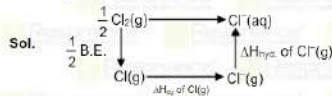
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16. The bond enthalpy of Cl-Cl = 240 kJ/mole, Electron gain enthalpy of Cl(g) = -350 kJ/mole and Hydration enthalpy of Cl⁻(g) = -360 kJ/mole. Calculate ΔH_f° for $\frac{1}{2}\text{Cl}_2(\text{g}) \rightarrow \text{Cl}^-(\text{aq})$

Ans. (-590)



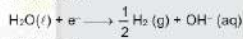
$$\Delta H_f^\circ = \frac{1}{2} \times \text{B.E.} + \Delta H_{\text{eg}} + \Delta H_{\text{hyd}}$$

$$\Delta H_f^\circ = \frac{1}{2} \times 240 + (-350) + (-360) = -590 \text{ kJ/mole}$$

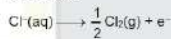
17. Choose the correct information regarding the products obtained on electrolysis of brine solution.
(1) Cl₂ at cathode (2) O₂ at cathode (3) H₂ at cathode (4) OH⁻ at anode

Ans. (3)

Sol. Brine solution - NaCl(aq)
at Cathode :



at Anode :



18. The total pressure of mixture of 0.6g gas X (MW = 20g) and 0.45 g gas Y (MW = 45 g) is 740 mm of Hg. The partial pressure of gas X is :
(555)

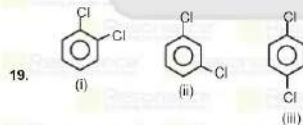
Ans. (555)

Sol. Number of moles of gas X = $\frac{0.6}{20} = 0.03$

Number of moles of gas Y = $\frac{0.45}{45} = 0.01$

Total number of moles = 0.03 + 0.01 = 0.04 mole

Partial pressure of gas X = Mole fraction × Total pressure
= $\frac{0.03}{0.04} \times 740 = 555$



Boiling point order of the given compound is :

(1) (i) > (ii) > (iii)

(2) (ii) > (iii) > (i)

(3) (iii) > (ii) > (i)

(4) (i) > (iii) > (ii)

Ans. (1)

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Sol. Boiling point of o, m, p dichlorobenzene depends primarily on polarity or dipole moment, hence the bp.

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Sol. Boiling point of o, m, p dichlorobenzene depends primarily on polarity or dipole moment, hence the bp. of o, m, p dichlorobenzene is in the order $o > m > p$.

20. Which of the given has maximum sweetness level ?

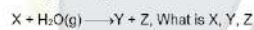
- (1) Alitame (2) Sucralose (3) Aspartame (4) Saccharine

Ans. (1)

Sol.

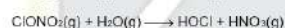
Sweetener	Sweetness value
Cane sugar	1
Aspartame	100
Saccharin	550
Sucralose	600
Alitame	2000

21. In the stratosphere, the reactions are :



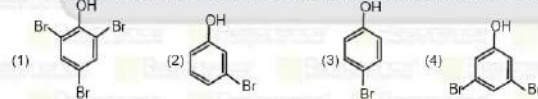
- (1) HOCl, HNO₂, ClONO₂ (2) ClONO₂, HOCl, HNO₂
 (3) ClONO₂, HNO₂, HOCl (4) HNO₂, ClONO₂, HOCl

Ans. (2)



from NCERT

22. When phenol reacts with Br₂ in low polarity solvent, which of the following will be the major product.



Ans. (3)

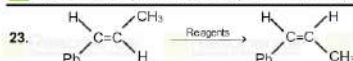
Sol. Phenol in low polarity solvent undergoes bromination yielding o and p bromophenol, whereas in high polarity solvent (water), undergoes bromination to give 2, 4, 6-tribromophenol.

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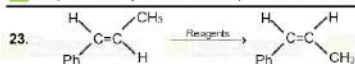
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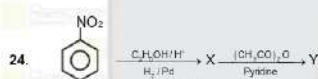
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What is reagent

- (1) Br₂, alc. KOH, lindlar catalyst (2) alc. KOH, Br₂, lindlar catalyst
(3) lindlar catalyst, alc. KOH, Br₂ (4) Br₂, lindlar catalyst, alc. KOH

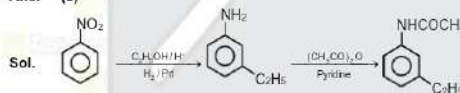
Ans. (1)



X and Y is respectively.

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

Ans. (3)

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