Q-1 - JEE ADVANCED-PART TEST-2 (CHEMISTRY)-CHEMISTRY

How many grams of concentrated nitric acid solution be used to prepare 250 mL of 2.0 M HNO_3? The concentrated acid is 70% HNO_3

(A) 90.0 g conc. HNO_3

(B) $70.0g$ conc. HNO_3

(C) 54.0 g conc. HNO_3

(D) 45.0 g conc. HNO_3

Correct Option : D

SOLUTION

$$2 = \frac{Mass}{03} \times \frac{1000}{250}$$

$$mass = \frac{63}{2} gm$$

$$\text{mass of acid} \times \frac{70}{100} = \frac{63}{2}$$

$$\text{mass of acid} = 45 gm$$

Q-2 - JEE ADVANCED-PART TEST-2 (CHEMISTRY)-CHEMISTRY

What is the concetration of nitrate ions if equal volumes of 0.1 M

$AgNO_3$ and 0.1 M NaCl are mixed together:

(A) 0.1 M

(B) 0.2 M

(C) 0.05 M

(D) 0.25 M

Correct Option : C

SOLUTION

$$\left[NO_3^-\right] = \frac{0.1V + 0}{2V} = \frac{0.1}{2} \times 0.05M$$

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4.14 g of pure lead was dissolved in nitric acid and was made to react

with HCl, Cl_2 and NH_4Cl to convert lead completely into

$(NH_4)_2PbCl_6$, However only 2.28 g of $(NH_4)_2PbCl_6$ was actually

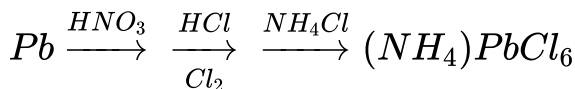produced, the percentage yield of the product is (Atomic wt. of

$Pb = 207$)

(A) 75

(B) 37.5

(C) 50

(D) 25

Correct Option : D

SOLUTION

$$Pb \xrightarrow{HNO_3} \xrightarrow[Cl_2]{HCl} \xrightarrow{NH_4Cl} (NH_4)PbCl_6$$

$(4.14g)(2.28g)$

Applying $POAC$ on Pb,

$$1 \times n_{Po} = 1 \times n_{(NH_4)_2 PbCl_6}$$

$$\Rightarrow 1 \times \frac{4.14}{207} = 1 \times \frac{m_{(NH_4)_2 PbCl_6}(\text{exp}\,ected)}{456}$$

$$\therefore m(NH_4)_2 PbCl_6 (\text{exp}\,ected) = 9.12g$$

$$\therefore \% \, yield\,of \prod uct = \frac{2.28}{9.12} \times 100 = 25\,\%$$

Q-4 - JEE ADVANCED-PART TEST-2 (CHEMISTRY)-CHEMISTRY

10 ml of $KMnO_4$ solution is mixed with excess of KI solution in

acidic medium. The iodine hence liberated required 20 ml of

$Na_2 S_2 O_3$ solution for titration if the molarity of $KMnO_4$ solution is
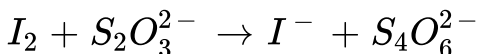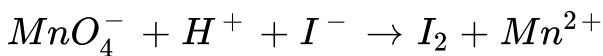
0.05 find molarity of $Na_2 S_2 O_3$ solution

(A) 1

(B) 1.25

(C) 5

(D) 4.5

Correct Option : B

SOLUTION

$$MnO_4^- + H^+ + I^- \rightarrow I_2 + Mn^{2+}$$

$$I_2 + S_2O_3^{2-} \rightarrow I^- + S_4O_6^{2-}$$

milliequivalents of MnO_4^-

$$= 5 \times 0.5 \times 10 = 25$$

milliequivalents of I_2 formed $= 25$

Millequivalents of $S_2O_3^{2-} = milli \equiv a \leq ntsoI_2$

$$\Rightarrow M \times 20 \times 1 = 25 \Rightarrow M = 1.25$$

ATTEMPT FREE TEST ON DOUBTNUT NOW ❯

When $Cr(s) + OH^-(aq) \rightarrow Cr(OH)_4^-(aq) + H_2(g)$ (basic

solution) is balanced, the sum of the coefficients of all the reactants
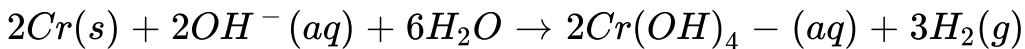
and products is

(A) 14

(B) 15

(C) 17

(D) 9

Correct Option : B

SOLUTION

$$2Cr(s) + 2OH^-(aq) + 6H_2O \rightarrow 2Cr(OH)_4 - (aq) + 3H_2(g)$$

$$2 + 2 + 6 + 2 + 3 = 15$$

ATTEMPT FREE TEST ON DOUBTNUT NOW ⊙

Photons emitted when electrons in a H-atom make transition from a higher energy state to lower energy state, whose difference in angular momentum is h/π, are made to incident on sodium metal (work function, W = 2.3 eV). The maximum possible kinetic energy of emitted photoelectrons is :

(A) 7.9 eV

(B) 0.25 eV

(C) 10.45 eV

(D) 9.79 eV

Correct Option : D

SOLUTION

Difference in angular momentum $= \dfrac{h}{\pi}$

$\therefore (n_2 - n_1)\dfrac{h}{2\pi} = \dfrac{h}{\pi} \therefore n_2 - n_1 = 2$ (Difference in shell no.)

For photoelectric effect to be observed.

Energy of photon $>$ Work function $(2.3 eV)$

$\therefore$ Two photons are possible in $H-$ atom where difference in shell

number is 2 and energy $> 2.3 eV$

$\therefore E_{pho \to n} = 12.9 eV$ (From $3 \to 1$ transition)

$\&2.55 eV$ (From $4 \to 2$ transition)

Max KE of photoelectron will correspond to max energy of incident photon

$\therefore (KE)_{\text{max}} = 12.09 - 2.3 = 9.79eV$

Q-7 - JEE ADVANCED-PART TEST-2 (CHEMISTRY)-CHEMISTRY

At $57C$, gaseous dinitrogen tetraoxide is 50% dissociated. Calculate the standard free energy change per mole of $N_2O_4(g)$ at this temperature and at 1 atm.

$R = 8.3JK^{-1}mol^{-1}$ In $10 = 2.3$, $\log 2 = 0.3$, $\log 3 = 0.48$

(A) $-756Jmol^{-1}$

(B) $-856Jmol^{-1}$

(C) $-656Jmol^{-1}$

(D) none of these

Correct Option : A

SOLUTION

$$N_2O_4(g) \Leftrightarrow 2NO_2(g)$$

$t = 0 \qquad 1 \qquad\quad 0$

$t = eq. \quad 1 - 0.5 \quad 2 \times 0.5$

$$P_{N_2O_4} = \frac{0.5}{1.5} atm \, P_{NO_2} = \frac{1}{1.5} atm$$

$$K_P = \frac{\left(\frac{1}{1.5}\right)^2}{\left(\frac{0.5}{1.5}\right)} = \frac{4}{3}$$

$$\Delta G = -2.3 \times 8.3 \times 330 \times \log\left(\frac{4}{3}\right)$$

$$= -2.3 \times 8.3 \times 330 \times (0.6 - 0.48)$$

$$= -756 J mol^{-1}$$

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Q-8 - JEE ADVANCED-PART TEST-2 (CHEMISTRY)-CHEMISTRY

Calculate the pH of a 0.1 M K_3PO_4 solution the third dissociation constant of phosphoric acid is 10^{-12} Given

$(0.41)^{1/2} = 0.64$, $\log 3 = 0.48$

(A) 12.5

(B) 12.44

(C) 12.25

(D) 12

Correct Option : B

SOLUTION

$$K_P = \frac{K_w}{K_{a3}} = \frac{10^{-14}}{10^{-12}} = 10^{-2}$$

$$K_P = \frac{Ch^2}{(1-h)}$$

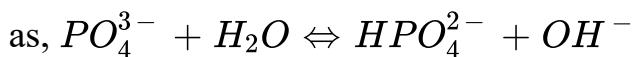as $1 - h = 1$, $h = \sqrt{\frac{K_h}{C}} = \sqrt{\frac{10^{-2}}{0.1}} = 0.316$

as $h > 0.1 \Rightarrow 1 - h \neq 1$

$\therefore 10^{-2} = \dfrac{10^{-1} \times h^2}{(1 - h)}$ or $0.1(1 - h) = h^2$

or, $0.1 - 0.1h = h^2$

or, $h^2 + 0.1h - 0.1 = 0$

or, $h = \dfrac{-0.1 + \sqrt{(0.1)^2 + 4 \times 0.1}}{2} = 0.27$

as, $PO_4^{3-} + H_2O \Leftrightarrow HPO_4^{2-} + OH^-$

$c(1 - h)chch$

$\therefore [OH^-] = ch$

$= 0.1 \times 0.27$

$= 27 \times 10^{-3}$

$pOH = 3 - \log 27 = 3 - \log^2 = 3 - 3\log 3$

$3 - 3 \times 0.48$

$= 1.56$

$pH = 14 - 1.56 = 12.44$

Find the pH of a solution after 20 ml of 0.2 M NaOH is added to 80 ml

of 0.15 M HCN.

$(K_b$ of $CN^- = 5 \times 10^{-5})$. $(\log 2 = 0.3)$

(A) 9

(B) 9.4

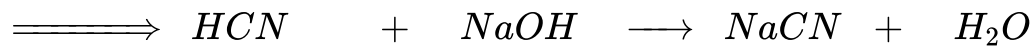(C) 9.7

(D) 10

Correct Option : B

SOLUTION

$$K_a(HCN) = \frac{K_W}{K_b(CN^-)} = \frac{10^{-14}}{5 \times 10^{-5}} = 2 \times 10^{-10}$$

	HCN	$+$	$NaOH$	$\longrightarrow$	$NaCN$	$+$	H_2O
$Initially$	80×0.15		20×0.2		0		0
	$= 12$		$= 4$		0		0
$f \in al$	8		0		4		4

solution is buffer

$$pH = pK_a + \log 2 + \frac{\log(4)}{8}$$

$$= 10 - \log 2 + \frac{\log(1)}{2}$$

$$= 10 - 2\log 2$$

$$= 10 - 2 \times 0.3 = 9.4$$

Q-10 - JEE ADVANCED-PART TEST-2 (CHEMISTRY)-CHEMISTRY

The solubility of $Fe(OH)_3$ in a buffer solution of $pH = 4$ is

$4.32 \times 10^{-2} mol/L$ how many times is this solubility greater than its

solubility in pure water. (ignore the hydrolysis of Fe^{2+} ions) given
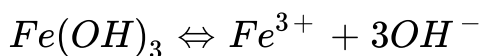
$4.32/\sqrt{0.4} = 6.83$

(A) 10^{11}

(B) 6.83×10^6

(C) 2.16×10^9

(D) none of these

Correct Option : A

SOLUTION

$Fe(OH)_3 \Leftrightarrow Fe^{3+} + 3OH^-$

$S'10^{-10} mol/L$

$$\therefore K_{sp} = [Fe^{3+}][OH^-]^3 = 4.32 \times 10^{-2}(10^{-10}) = 4.32 \times 10^{-3}$$

Let $S = $ solubility in pure water.

Now, $K_{sp} = [Fe^{3+}][OH^-]^3$

$$4.32 \times 10^{-32} = S \times (10^{-7})^3$$

$$\therefore S = 4.32 \times 10^{-11} mol/L$$

$$\text{Ratio} = \frac{S'}{S} = 10^{11}$$

A solution contains 0.01 M Zn^{2+} and Cu^{2+} ions. It is saturated by passing H_2S gas in the solution. The solubility products of ZnS and CuS are 3.0×10^{-22} and 8.0×10^{-36} respectively which of the following is true?

$K_1 = 10^{-7}$, $K_2 = 10^{-14}$, $[H_2S, aq]_{saturated} = 0.1M$

(A) ZnS will precipitate

(B) CuS will precipitate

(C) Both ZnS and CuS will precipitate

(D) Both Zn^{2+} and Cu^{2+} will remain in the solution

Correct Option : B

SOLUTION

Only the ionic prodcut of CuS exceeds its K_{Sp} and hence, is

precipitated.

Q-12 - JEE ADVANCED-PART TEST-2 (CHEMISTRY)-CHEMISTRY

In the electrolysis of brine (NaCl) using mercury cathode, the mass of amalgam (NaHg) produced is 6.69 g. Find the time for which 9.65 A current is passed.
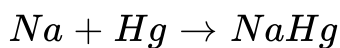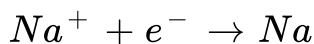
(A) 300 sec

(B) 600 sec

(C) 100 sec

(D) 400 sec

Correct Option : A

SOLUTION

$$Na^+ + e^- \rightarrow Na$$

$$Na + Hg \rightarrow NaHg$$

$$n_{NaHg} = \frac{6.69}{223} = 0.03$$

moles of electron $(e^-) = 0.03$

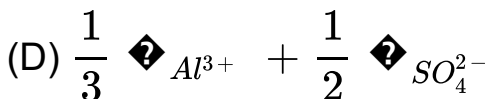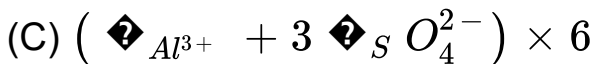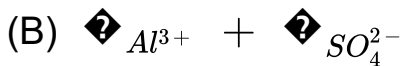Charge $= 0.03 \times 96500 = 9.65 \times L$

$t = 300$ sec.

Which of the following expressions correctly represents the equivalent conductance at infinite dilution of $Al_2(SO_4)_3$ Given that $\_ (Al^{3+})$

and $\_ (SO_4^{2-})$ are the equivalent conductances at infinite dilution of the respective ions?

(A) $2 ⬥_{Al^{3+}} + 3 ⬥_{SO_4^{2-}}$

(B) $\bullet_{Al^{3+}} + \bullet_{SO_4^{2-}}$

(C) $\left(\bullet_{Al^{3+}} + 3 \bullet_S O_4^{2-} \right) \times 6$

(D) $\dfrac{1}{3} \bullet_{Al^{3+}} + \dfrac{1}{2} \bullet_{SO_4^{2-}}$

Correct Option : B

SOLUTION

At inifinite dilution, when dissociation is complete, each ion makes a definite contribution towards molar conductance of the electrolye irrespective of the nature of the other ion with which it is associated

Hence $a < 0197_{Al_2(SO_4)_3} = \left(a < 0197_{Al^{3+}} + a < 0197_{SO_4^{2-}} \right)$

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Time after which one millimole of potassium metal is deposited by the passage of 9.65 ampere through aqueous solution of potassium ions is

(A) 30 s

(B) 10 s

(C) 30,000 s

(D) infinite

Correct Option : B

SOLUTION

$w = zit$

$$39 \times 1 \times 10^{-3} = \frac{39}{96500} \times 9.65 \times t$$

$t = 10s.$

In the closest packing of atoms,

(A) The size of tetrahedral void is greater than that of octahedral void

(B) The size of tetrahedral void is smaller than that of octahedral void

(C) The size of tetrahedral void is equal to that octahedral void

(D) The size of tetrahedral void may be greater or smaller or equal to that octahedral void depending upon the size of

atoms

SOLUTION

N//A

Q-16 - JEE ADVANCED-PART TEST-2 (CHEMISTRY)-CHEMISTRY

The olivine series of minerals consists of crystal in which Fe^{2+} and Mg^{2+} ions may substitute for each-other causing substitutional impurity defect without changing the volume of the unit cell. In olivine series of mineral, oxide ion exist as fcc with Si^{4+} occupying $\frac{1}{4}$ th of octahedral void and divalent ion occupying $\frac{1}{4}$ th of

tetrahedral void. The density of forsterite (Magnesium silicate) is 3.21

g/cc and that of fayalite (Ferrous silicate) is 4.34 g/cc. If density of

olivine is 3.88 g/cc, then which of the following statement is

INCORRECT

(A) Forsterite $= Mg_2SiO_4$, Fayalite $= Fe_2SiO_4$

(B) An olivine contains 40.71% forsterite and 59.29%

fayalite

(C) forsterite Mg_2SiO_4 with 59.29% precentage

(D) (A) & (B)

Correct Option : C

SOLUTION

According to given data

$$O^{2-} = 8 \times \frac{1}{8} + 6 \times \frac{1}{2} = 4$$

$$S^{4+} = \frac{1}{4} \times octahedral void = \frac{1}{4} \times 4 = 1$$

$$M^{++} = \frac{1}{4} \times tetrahedral void = \frac{1}{4} \times 8 = 2.$$

$\because$ Forsterite $= Mg_2SiO_4$ Fayalite $= Fe_2SiO_4$

Let the forsterite is $x\%$ and faylite is $(100-x)\%$ then

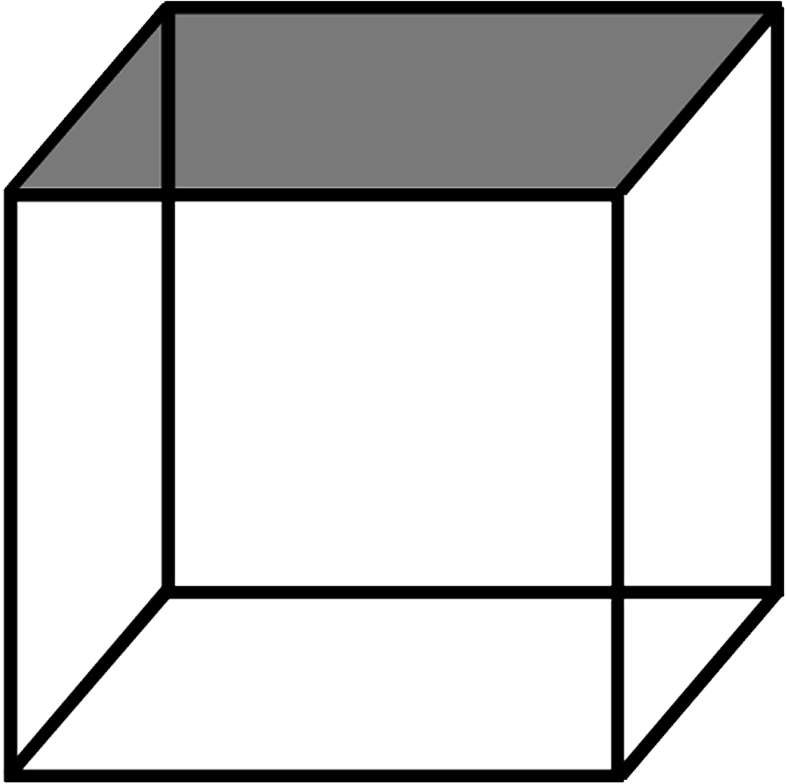$$\frac{\times x3.21 + (100-x) \times 4.34}{100} = 3.88x{=}40.71\%$$

$(F$ or $esterite)$ and 59.29%` (Fayalite).

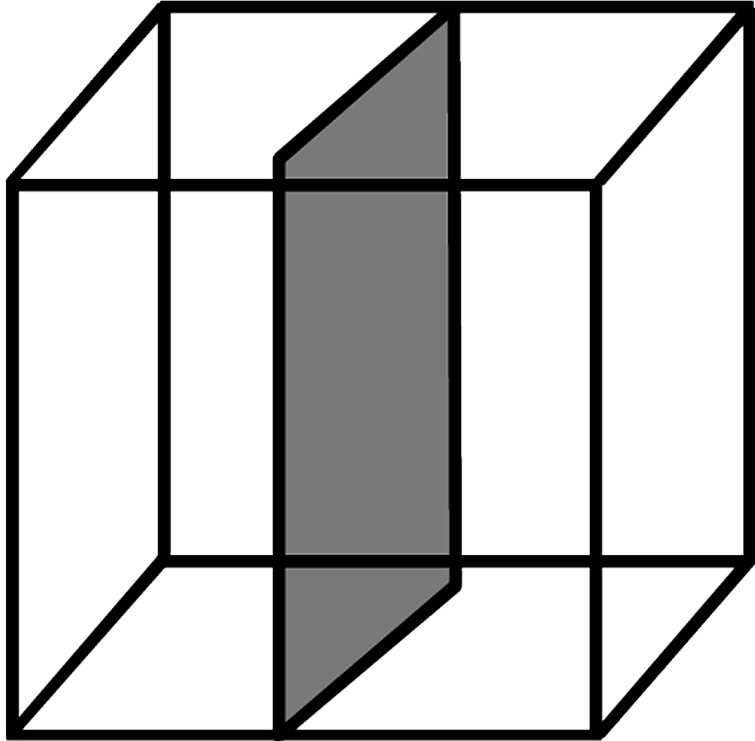Q-17 - JEE ADVANCED-PART TEST-2 (CHEMISTRY)-CHEMISTRY
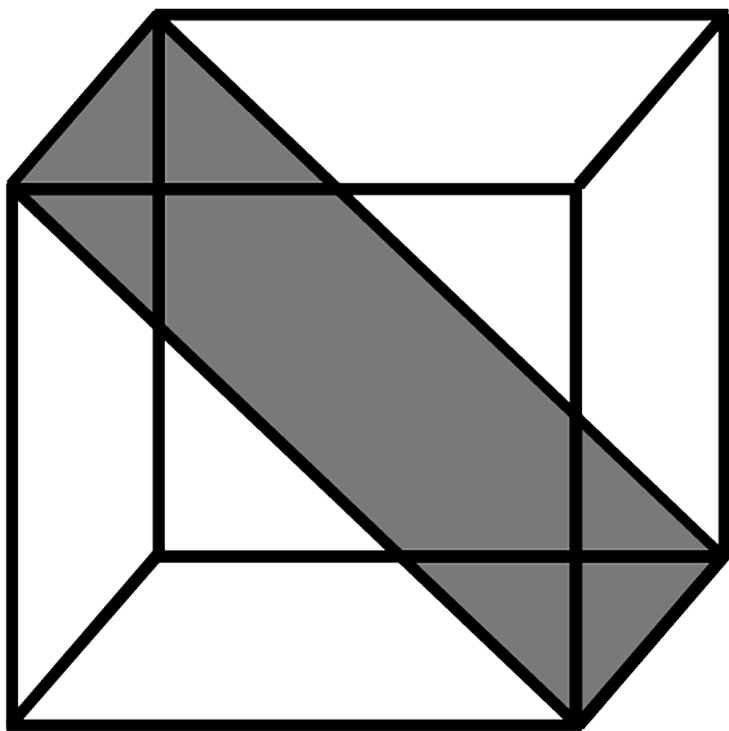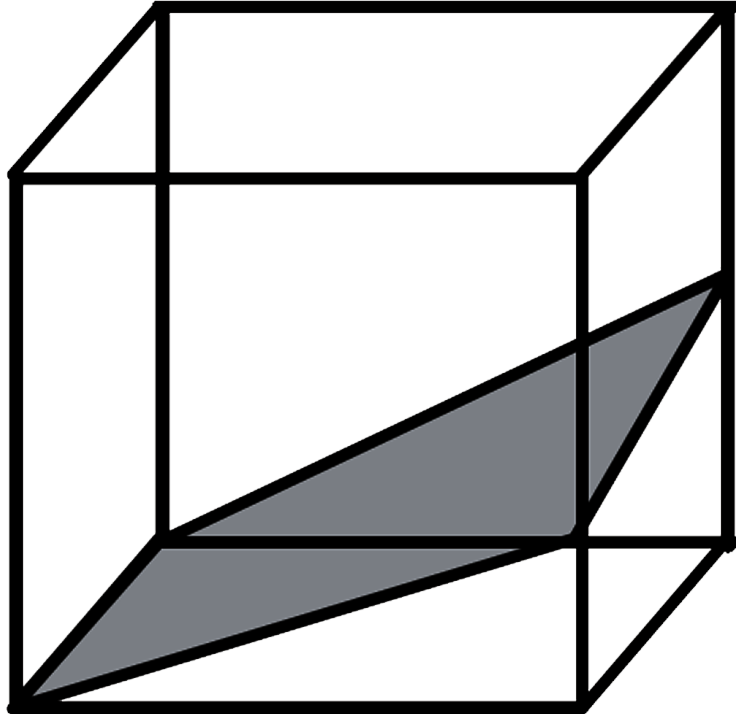
Which of the following planes of FCC are identical?

(i)

(ii)

(iii)

(iv)

(A) I,ii and iii

(B) I and iv

(C) I and ii

(D) none

Correct Option : C

SOLUTION

N//A

Q-18 - JEE ADVANCED-PART TEST-2 (CHEMISTRY)-CHEMISTRY

Which of the following has been names correctly?

(A) $S_2O_3^{2-}$ thiosulphite ion

(B) N_3^{-} nitride ion

(C) $HAsO_3^{-2}$ monohydrogenarsenite ion

(D) $H_2PO_4^{-}$ dihydrogenphosphite ion

Correct Option : C

SOLUTION

N//A

Which of the following is not an ambidentate ligand?

(A) CN^-

(B) SCN^-

(C) NH_3

(D) NO_2^-
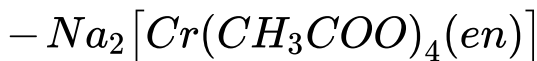
Correct Option : C

SOLUTION

Ligands which can ligate through either of two different atoms present in it are called ambidentate ligands. Examples of such ligands are the CN^-, NO_2^- and SCN^- ions. NH_3 is not an ambidentate ligand
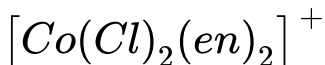
Which of the following is not correctly matched?

(A) Sodium (ethylenediaminetetraacetato) chromate (II)

$- Na_2 \left[Cr(CH_3COO)_4 (en) \right]$

(B) Dichloridobis(ethane-1,2-diamine)cobalt(III) ion-

$\left[Co(Cl)_2 (en)_2 \right]^+$

(C) Ammineaquadibromidocopper(II)-

$[Cu(NH_3)(H_2O)Br_2]$
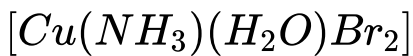
(D) Ammineaquadibromidocopper(II)

$-[Cu(NH_3)(H_2O)Br_2]$
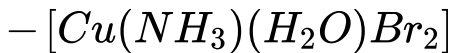
Correct Option : A

SOLUTION

$Na_2[Cr(EDTA)]$ is correct respresentation.

Q-21 - JEE ADVANCED-PART TEST-2 (CHEMISTRY)-CHEMISTRY

100 ppm (w/w) of He (by mass) is present in an Ar sample at $0C$, in a rigid 22.4 L vessel. Which of the following units remain unchanged as the temperature is raised to $100C$?

(A) pp (w/w)

(B) mole fraction

(C) molality grams per litre

(D) grams per litre

Correct Option : A

SOLUTION

N//A

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10 ml of a sample of H_2O_2 solution liberates 112 ml of O_2 gas at STP

upon decomposition identify the correct statements(s)

(A) Normality of the above sample of H_2O_2 is 0.5 N

(B) 15 ml of the same sample of H_2O_2 solution liberates

224 ml of O_2 gas at 1.5 atm and $273°\,C$

(C) Milliequivalents of hypo required for the titration of

liberated I_2 when 10 ml of the same sample of H_2O_2

solution is treated with excess of acidified solution of KI are

20

(D) % (w/v) of given sample of H_2O_2 is $3.4\,\%$

Correct Option : B

SOLUTION

$10ml$ of H_2O_2 solution liberates $112mlO_2$ at STP

$\therefore$ $1L$ of H_2O_2 solution liberates $11.2LO_2$ at STP

$\therefore$ volume strength of H_2O_2 solution $= 11.2V$

$\therefore N = \dfrac{V}{5.6} = \dfrac{11.2}{5.6} = 2\,\% \, w/v = \dfrac{n \times 17}{10} = 3.4\,\%$

$15ml$ of same H_2O_2 solution liberates $\dfrac{15 \times 112}{10} mlO_2$ at STP

$= \dfrac{15 \times 112}{10} \times \dfrac{2}{3} \times 2ml$ at O_2 at 1.5 atm and $273C$

$= 224mlO_2$

meq of H_2O_2 reacted with $Kl = N \times V = 2 \times 10 = 20$

$\therefore$ mez of hypo required $= 20$

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Identify the wrong statement (s) :

(A) Van der Waal's equation is applicable to liquid state as well.

(B) Van der Waal's equation is best applied to vapor-liquid equilibrium zone for a given substance.

(C) Van der Waal's constant b is always independent of temperature.

(D) Third virial coefficient C is always independent of temperature.
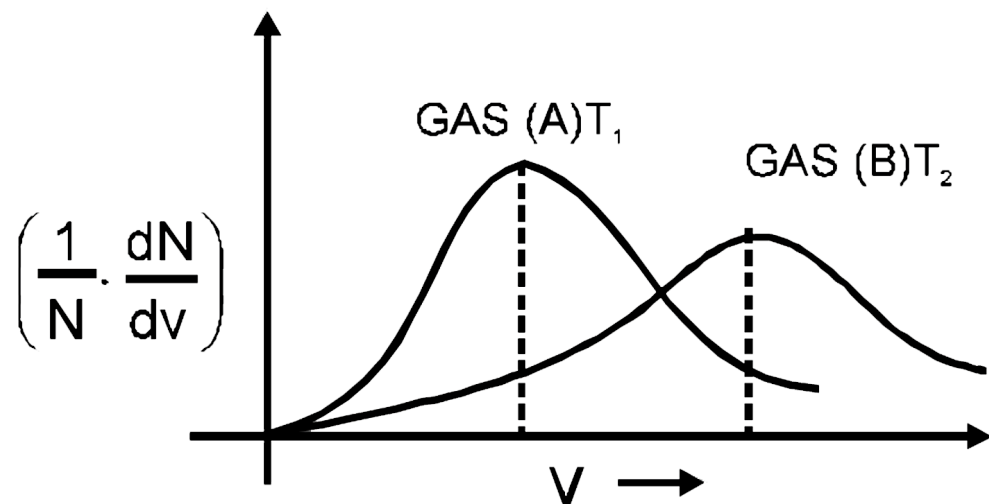

Correct Option : B

SOLUTION

N//A

Q-24 - JEE ADVANCED-PART TEST-2 (CHEMISTRY)-CHEMISTRY

According to Maxwell\'s distribution of molecular speeds, for the

below graph drawn for two different samples of gasesAand B at

temperature T_1 and T_2 respectively, which of the following statements

is/are INCORRECT :

(A) If $T_1 = T_2$, then molecular mass of gas $B(M_B)$ is greater than molecular mass of gas $A(M_A)$.

(B) If $T_1 > T_2$, then molecular mass of gas $B(M_B)$ is necessarily less than molecular mass of gas $A(M_A)$

(C) If $T_1 < T_2$, then molecular mass of gas $B(M_B)$ is necessarily less than molecular mass of gas $A(M_A)$

(D) if gas A is O_1 and gas B is N_2 then considering them to beideal gases, T_1 s necessarily less than T_2.

Correct Option : A

SOLUTION

At constant temperature, decrease in molecular mass causes flattening of the graph for same molecular mass of gas increase in temperature causes flattering of the graph

$$(V_{mp})_{T_1} < (V_{mp})_{T_2}$$

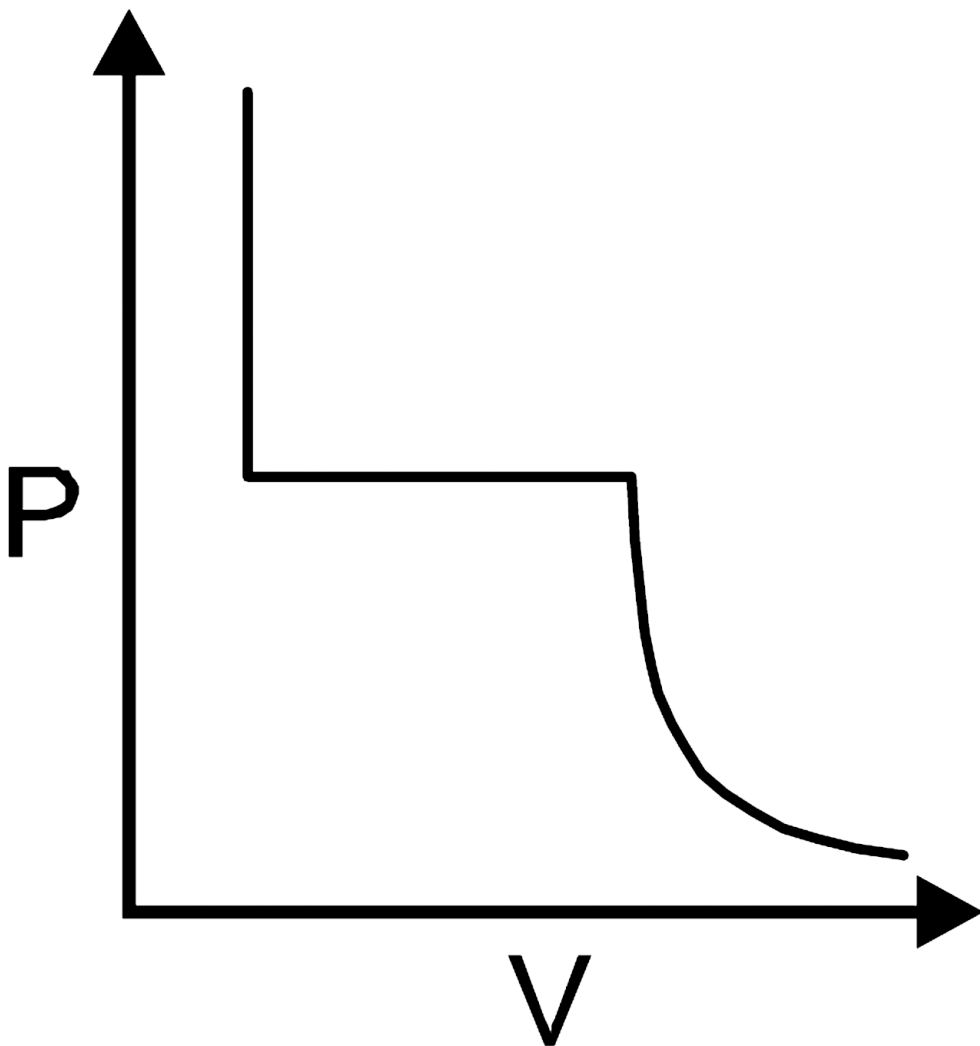$$\therefore \frac{T_1}{M_A} < \frac{T_2}{M_B} \quad \therefore \frac{T_2}{T_1} > \frac{M_B}{M_A}$$

But, $\dfrac{M_B}{M_A}$ can be less than or greater than 1

Similarity, $\dfrac{M_A}{M_B} > \dfrac{T_1}{T_2}$

If gas A is O_2 and gas B is N_2, then $M_A > M_B$

The P-V isotherm shown here may be applicable for

(A) a real gas

(B) vapor - liquid equilibrium of a pure substance

(C) vapor - liquid equilibrium of an ideal mixture of volatile
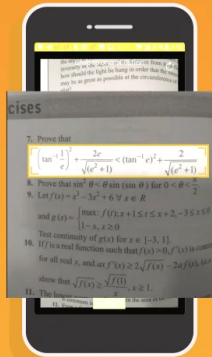
liquids

(D) azeotropic liquid mixture

Correct Option : A

SOLUTION

N//A

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