CHEMISTRY

1. In which of the following metal extraction both Oxidation and Reduction process are involved?

A. Au
B. Cu
C. Fe
D. Al

Answer (A)

Sol.

In the extraction of Gold (Au) first oxidation of gold takes place and then it is reduced into gold.

$$\boldsymbol{At\ Anode,}\quad \boldsymbol{4Au(s) + 8CN^-(aq) + 2H_2O + O_2(g) \rightarrow 4[Au(CN)_2]^-(aq) + 4OH^-(aq)}$$

$$\boldsymbol{At\ Cathode,}\ \boldsymbol{2[M(CN)_2(aq) + Zn(S) \rightarrow [Zn(CN)_2]^{2-}(aq) + 2Au(s)}$$

2. α – particle, proton and electron have same kinetic energy. Select the correct order of de Broglie wavelength

A. $\lambda_p = \lambda_\alpha = \lambda_e$
B. $\lambda_e > \lambda_p > \lambda_\alpha$
C. $\lambda_\alpha > \lambda_e > \lambda_p$
D. $\lambda_p > \lambda_e = \lambda_\alpha$

Answer (B)

Sol.

As we know,

$\lambda = \frac{h}{\sqrt{2m(K.E)}}$

λ= De Broglie wavelength

$m = Mass$ of the Particles, $kE = Kinetic\ Energy\ of\ the\ Particle$

h = Planck's Constant = 6.6×10^{-34} Joule Second

Mass of α – particle > mass of proton > mass of electron

λ is inversely proportional to the mass of the particle.

So, higher the mass of the particle less will be the de Broglie wavelength associated with it so option (B) is the correct option.

3. Find out order of reaction of decomposition of $AB_3(g)$ using the given information

Initial pressure (mmHg) of $AB_3(g)$	50	100	200	400
$t_{\frac{1}{2}}$ (sec)	4	2	1	5

A. 0
B. 1
C. 2
D. 3

Answer (C)

Sol.

As we know,

$(t_{\frac{1}{2}})\ \alpha\ (P_0)^{1-n}$

By observation,

$\frac{4}{2} = \left(\frac{50}{100}\right)^{1\text{-}n}$

$2 = \left(\frac{1}{2}\right)^{1-n}$

$2^1 = 2^{(n-1)}$

1= (n-1)

So, n=2

second order reaction so correct option is (C).

4. Predict the hybridization state of the central metal ion and magnetic nature of the complex $[Co(NH_3)_6]^{3+}$.

A. sp^3d^2, Paramagnetic
B. sp^3d^2, Diamagnetic
C. d^2sp^3, Paramagnetic
D. d^2sp^3, Diamagnetic

Answer (D)

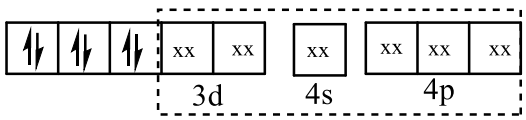
Sol.

Oxidation state of cobalt in the given complex is +3

$Co^{3+} : 3d^6$

$[Co(NH_3)_6]^{3+}$

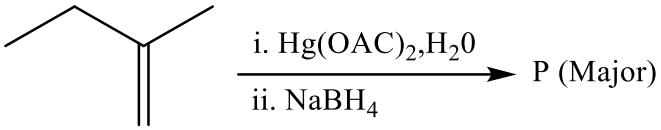
As (NH_3) act as strong field ligand so pairing will be take place here,



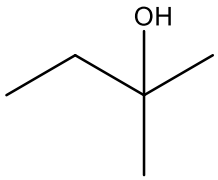
Hybridisation state of $Co^{3+} : d^2sp^3$

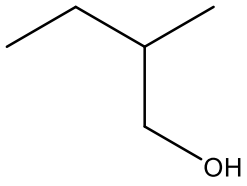
Since no unpaired electron is present here so Magnetic nature is Diamagnetic and Correct option is (D)

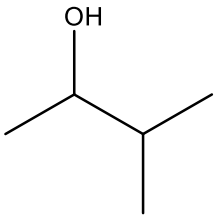
5. Consider the following reaction

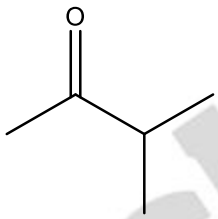


P is ?

A. 

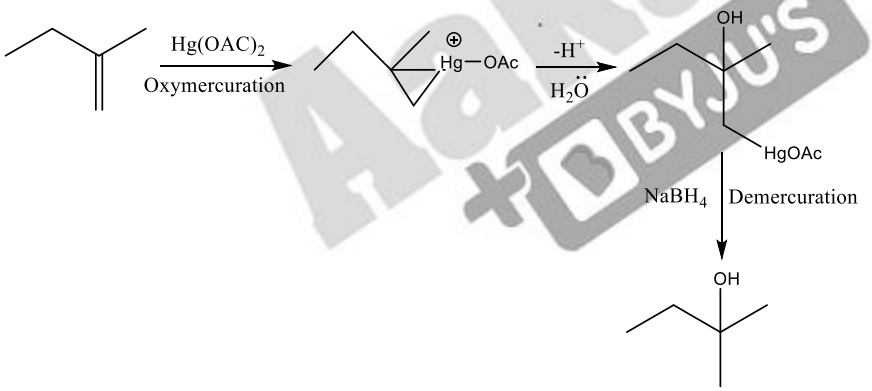
B. 

C. 

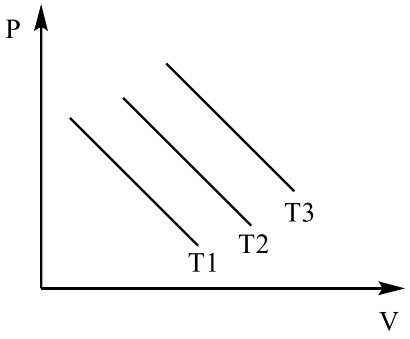
D. 

Answer (A)

Sol.

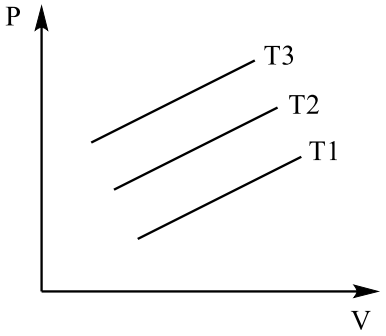


6. Which graph is correct for Isothermal process at T_1, T_2 & T_3 if $(T_3 > T_2 > T_1)$

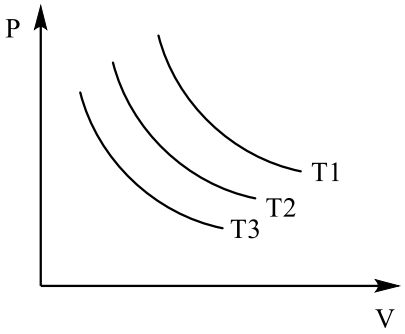


A.

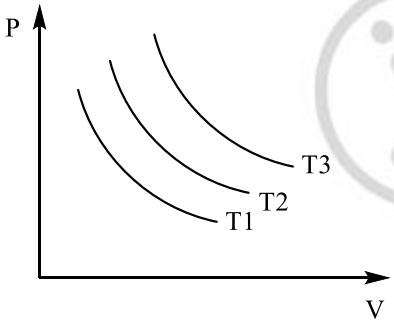
B.



C.



D.



Answer (D)

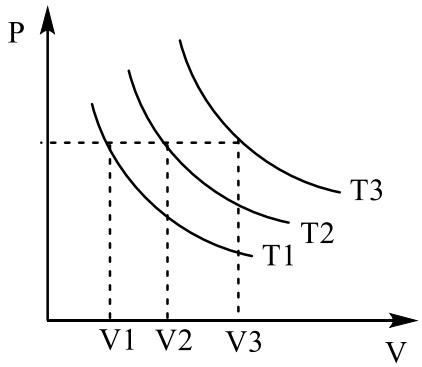
Sol.

According to Boyle Law $P \propto \frac{1}{V}$

The graph must be hyperbola.

As we know, $PV = nRT$

So as increase the Temperature the PV graph area increases.



As $(V_3 > V_2 > V_1)$ for fixed P

= $(T_3 > T_2 > T_1)$

And the correct option is (D)

7. The number of Peptide bonds present in Tripeptide VAL – PRO – GLY is

A. 1

B. 2

C. 3

D. 4

Answer (B)

Sol.

In between two Amino Acids there are 1 peptide bond in question 3 Amino acids are given so Tripeptide has two peptide bonds.

8. Which of the following options contains correct match of the following

A. Antifertility Drugs	P. Arsphenamine
B. Antibiotics	Q. Norethindrone
C. Tranquilizers	R. Seldane
D. Antihistamines	S. Meprobamate

A. A – Q, B – P, C – S, D – R

B. A – P, B – Q, C – R, D – S

C. A – S, B – R, C – Q, D – P

D. A – S, B – R, C – P, D – Q

Answer (B)

Sol.

Antifertility Drugs - Norethindrone

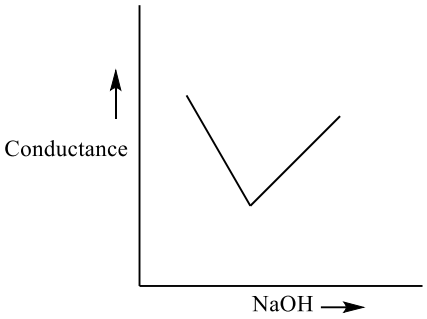
Antibiotics - Arsphenamine

Tranquilizers - Meprobamate

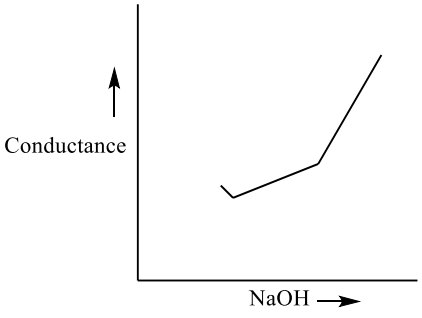
Antihistamines – Seldane

9. When NaOH is added slowly to Benzoic acid, then which of the following plot of conductance Vs amount of NaOH will be correct

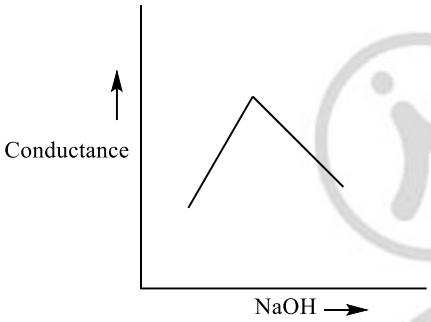
A.



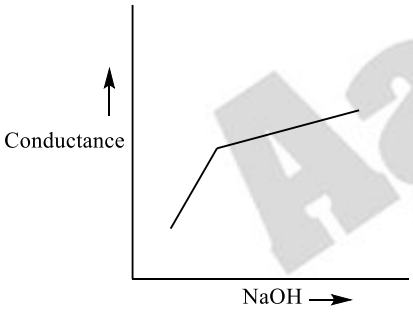
B.



C.



D.



Answer (B)

Sol.

First there are only Benzoic acid is present Which is weak acid

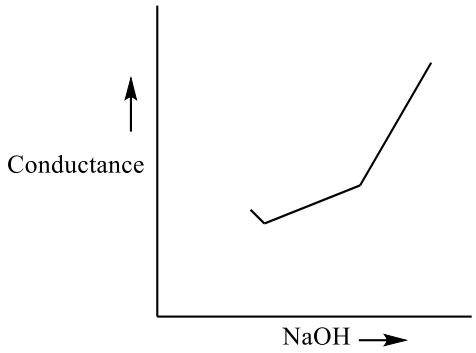
So , $PhCOOH \leftrightarrow PhCOO^{-} + H^{+}$

From Beginning the Conductance increases Slightly

After adding NaOH in that it is make PhCOONa which is a salt and the conductance increases

When all Na^{+} reacts with $PhCOO^{-}$ then Only OH^{-} Present in the solution and the conductance increases very highly

So, option B is the correct answer.



10. Which one of the following is the correct decreasing order of the magnitude of Standard Reduction Potential of $Rb, Na \text{ and } Li$ in aqueous medium

A. $Rb > Na > Li$

B. $Li > Rb > Na$

C. $Na > Rb > Li$

D. $Li > Na > Rb$

Answer (B)

Sol.

The Standard Reduction Potential of the given alkali metals are

Li : - 3.04 V

Na : - 2.71 V

Rb : - 2.93 V

Therefore the correct decreasing order of magnitude of Standard Reduction Potential of the given alkali metals is $Li > Rb > Na$

11. In which of the following reaction H_2O_2 acts as an oxidizing agent?

A. $I_2 + H_2O_2 + 2OH^- \rightarrow 2I^- + 2H_2O + O_2$

B. $2MnO_4^- + 3H_2O_2 \rightarrow 2MnO_2 + 3O_2 + 2H_2O + 2OH$

C. $2Fe^{2+} + H_2O_2 \rightarrow 2Fe^{3+} + 2OH^-$

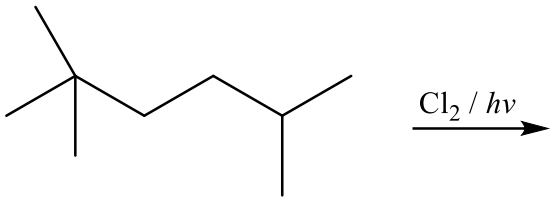
D. $HOCl + H_2O_2 \rightarrow H_3O^+ + Cl^- + O_2$

Answer (C)

Sol.

In reaction C Fe^{2+} is oxidized to Fe^{3+} and H_2O_2 is reduced to OH^-. Hence H_2O_2 acts as an oxidizing agent in this reaction.

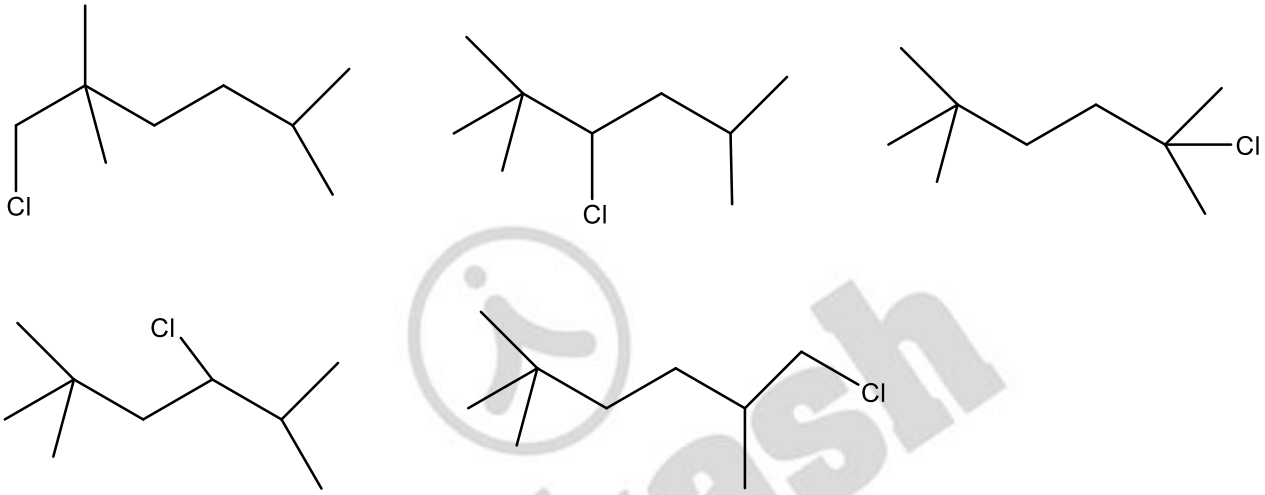
12. Find the number of mono chloro products (structural only) which are obtained in the following reaction is



Answer (5)

Sol.

Possible Mono chloro Products are



13. Which of the following Lanthanoid ions is the best oxidising agent?

A. Lu^{2+}
B. Ce^{2+}
C. Ce^{4+}
D. Sn^{2+}

Answer (C)

Sol.

The most stable oxidation state of lanthanoids is +3. The $Lu^{2+}, Ce^{2+}\ and\ Sn^{2+}$will function as reducing agent because they will easily get oxidised to +3 oxidation state in each case. But Ce^{4+} will function as as oxidising agent and get reduced to Ce^{3+}

$Ce^{4+} + e^{-} \rightarrow Ce^{3+}$

14. The number of 's' electrons in unipositive state of an element having 55 protons in its nucleus is

A. 10
B. 8
C. 11
D. 12

Answer (A)

Sol.

The element is Cs. Cs+ has 10 ‘s’ electrons in its nucleus

15. Select the correct statement about physisorption

A. Physisorption is highly specific
B. Physisorption is always monolayer
C. Physisorption doesn’t require activation energy
D. Physisorption is associated with very high enthalpy of adsorption

Answer (C)

Sol.

Physisorption doesn’t require activation energy

16. How many s-electrons are there in a Br-atom (Atomic No: of Br = 35)

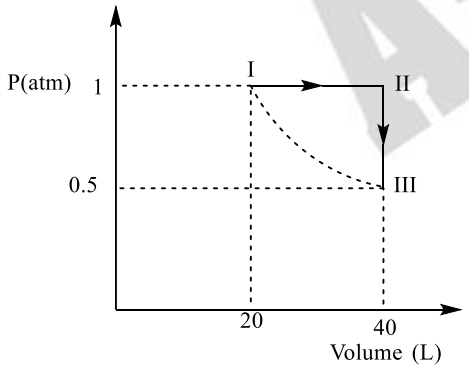
Answer (8)

Sol.

Electronic configuration of Br atom is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^5$

Therefore No of s – electrons in a Br atom is 8.

17.



I →II : Isobaric

II →III : Isochoric

III →I : Isothermal

All process are reversible

Find out the work done by the Gas for complete cyclic process (In atm.Lit)

(Report your answer to closest integer)

Answer (6.00)

Sol.

$W_{I \rightarrow II} = -P\Delta V$ = -1 X (40 – 20) = -20 atm.it

$W_{II \rightarrow III} = 0$

$W_{III \rightarrow I} = 2.303nRT.log\frac{V2}{V1} = 2.303PVlog\frac{V2}{V1} = 2.303(1X20)Xlog22$

= +13.818

$W_{I \rightarrow II \rightarrow III \rightarrow IV}$ = -20 + 13.818

= -6.182 atm.lit

Work done by the gas = + 6.182 atm.lit

18. Find the sum of number of unpaired electrons in the following diatomic molecules: N_2, N_2^+, O_2, O_2^+?

Answer (4.00)

Sol.

No. of unpaired electrons in N_2= 0

No. of unpaired electrons in N_2^+= 1

No. of unpaired electrons in O_2 = 2

No. of unpaired electrons in O_2^+ = 1

Sum= 0+1+2+1= 4

19. pK_a of lactic acid is 4, Find the pH of 0.005 M calcium lactate at 27°C is?

Answer (8)

Sol.

$p^H = \frac{1}{2}(pK_w + pK_a + logC)$

$= \frac{1}{2}(14 + 4 + \log(0.01) = \frac{1}{2}(18 - 2) = \frac{1}{2}(16) = 8$

20. Find the sum of number of π bonds in peroxydisulphuric acid and pyrosulphuric acid ?

Answer (8)

Sol.

Peroxydisulphuric acid ($H_2S_2O_8$) has 4 π bonds

Pyrodisulphuric ($H_2S_2O_7$) acid has 4 π bonds

Total number of π bonds = 8

21. How many of the following concentration terms are temperature independent?

Mole fraction,

Mass percent (% w/w),

Molarity (M)

Molality (m)

ppm

volume percent (%V/V)

Answer (4:00)

Sol.

Temperature independent concentration terms are :

Mole fraction

Molality (m)

Parts Per Million (ppm)

Mass percentage (%w/w)

22. One atom of X has 25 MeV energy. The energy in 102 g of X is P x 10^{25} MeV. Then find the value of 'P'?
Given : X has molar mass = 61 g and N_A = 6 x 10^{23}

Answer (3)

Sol.

Total energy = 25 x $\frac{102}{61}$x 6 x 10^{23} = 3 x 10^{25} MeV

23. If the ratio $\frac{C_p}{C_v}$ for monoatomic gases is r_1 and similar ratio for diatomic gas is r_2. Then the value of $\frac{r_1}{r_2}$ x 21 is

Answer (25)

Sol.

$r_1 = \frac{5}{3}$

$r_2 = \frac{7}{5}$

$\frac{r_1}{r_2} = \frac{25}{21}$

$\frac{r_1}{r_2}$ x 21= 25