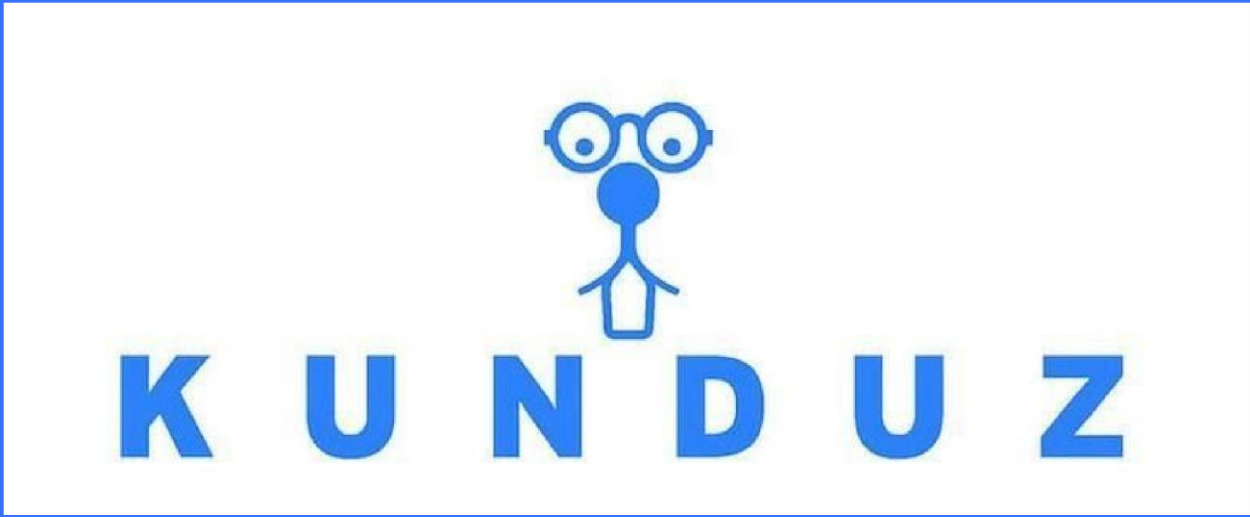


JEE Mains 5th September 2020 shift 1 Chemistry solutions prepared by KUNDUZ tutors

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Question number

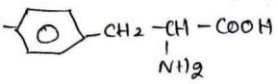
Question and Answers

1

1. which amino acid is not a essential amino acid.

(1) Tyrosine (2) Lysine (3) Valine (4) Threonine.

Soln: option (1)

Tyrosine  is a non-essential amino acid.

Note: Essential amino acids cannot be synthesized by human body. They are Histidine, Arginine, Isoleucine, Leucine, Lysine, Methionine, phenylalanine, Threonine, Tryptophan and Valine.

Non-essential amino acids are synthesized in our body. They are: Alanine. Asparagine, Aspartate, Glutamate, Glycine, Glutamine, Cysteine, Proline, Serine, Tyrosine.

2

2) When atmosphere become polluted.

(1) When CO_2 value is 0.03% in atmosphere

(2) When BOD value is 5 ppm

(3) Due to presence of Eutrophication

(4) If concentration of dissolved oxygen in water is greater than 6 ppm

Soln: Option (3)

(3) Eutrophication is a process wher the water body becomes enriched with minerals and nutrients which induce excessive growth of algae, thereby resulting in oxygen depletion of the water body.

Note: (2) Biological oxygen demand (B.O.D) of clean water is less than 5ppm whereas polluted water have B.OD value of 17 ppm or more.

(4) If the conc. of dissolved oxygen of water is below 6 ppm the growth of flesh get inhibited.

3

3. Which of the following is suggested to supress effect of Noradrenaline:

(1) Analgesic (2) Anti-depressant drugs (3) Antihistamine

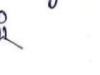
(4) Anti-inflammatory.

Soln: Option (2)

If the level of noradrenaline is low in the body, then the signal-sending activity (neurotransmitter) becomes low and the person suffers from depression. To supress the effect of Noradrenaline, antidepressant drugs are used.

4

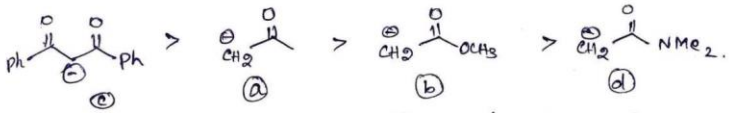
4) What is the correct order of acidity of α-Hydrogen of following compounds.

(a)  (b) (c)  (d) 

Options: (1) c > a > b > d (2) c > a > d > b

(3) a > b > c > d (4) b > a > d > c

Soln: option-(1) c > a > b > d.



+I effect decreases acidity. and -I effect increases acidity.

compound (c) is most acidic due to the presence of active methylene group (Methylene group attached to two functional groups on either side).

5

5) Correct structure of PCl_5 in solid state is :

(1) square pyramidal (2) Trigonal bipyramidal

(3) It exist as $\begin{cases} [PCl_4]^+ \text{ square planar} \\ [PCl_6]^- \text{ octahedral} \end{cases}$ (4) It exist as $\begin{cases} [PCl_4]^+ \text{ tetrahedral} \\ [PCl_6]^- \text{ octahedral} \end{cases}$

Soln: option (4)

$$2PCl_5(s) \longrightarrow \underset{\text{tetrahedral}}{[PCl_4]^+} \quad \underset{\text{octahedral}}{[PCl_6]^-}$$

$[PCl_4]^+$ = sp^3 hybridization - tetrahedral shape.

$[PCl_6]^-$ = sp^3d^2 hybridization - octahedral shape.

Note: Square planar shape - sp^2d hybridization.

6

6. What is the value of CFSE for complex having $3d^6$ configuration in high spin situation.

(1) $-0.4\Delta_o$, $-0.6\Delta t$ (2) $-0.8\Delta_o$, $-0.6\Delta t$

(3) $-0.4\Delta_o$, $-1.2\Delta t$ (4) $-0.4\Delta_o$, $-0.27\Delta t$

Soln: Option (1)

For d^6 configuration, high spin (weak ligand)

(i) Tetrahedral complex

$d^6 = e^{2,1}, t_2^{1,1,1}$

$CFSE = [-0.6ne + 0.4nt_2]\Delta t$

$= (-0.6\times 3 + 0.4\times 3)\Delta t$

$= -0.6\Delta t$

(ii) octahedral complex

$d^6 = t_{2g}^{2,1,1}, eg^{1,1}$

$CFSE = [-0.4nt_{2g} + 0.6ne_g]\Delta_o$

$= [-0.4\times 4 + 0.6\times 2]\Delta_o$

$= -0.4\Delta_o$

Ans: $-0.4\Delta_o$, $-0.6\Delta t$

7

7. for the following reaction at equilibrium

$$2NO_2(g) \rightleftharpoons N_2O_4(g) \qquad \Delta H = -58\ KJ/mole.$$

Following changes are made then identify in which direction reaction shift.

	Increase in Temperature	Increase in Pressure.
(1)	towards product side	towards product side
(2)	towards reactant side	towards product side
(3)	towards reactant side	towards reactant side
(4)	towards product side	towards reactant side

Soln: option (2)

The given reaction is exothermic (ΔH = -ve value) So increasing the temperature will shift the reaction equilibrium towards reactant side. On increasing the pressure, the reaction shifts in the direction where the no. of gaseous mole decreases (Δng).

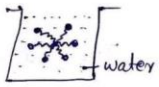
Δng for foward reaction $\Delta ng = 1 - 2 = -1$

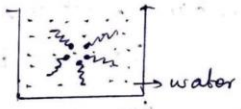
Δng for Reverse reaction $\Delta ng = 2 - 1 = 1$.

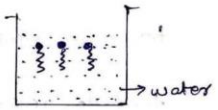
Since Δng decreases for the forward reaction, on increasing the pressure, equilibrium shifts towards product side.

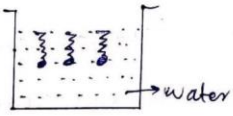
8

8. Above CMC correct diagram for micelle formation is. [Given : $COO^{\ominus}$ — hydrocarbon part]

(1) 

(2) 

(3) 

(4) 

Soln: option (1)

In micelle formation, above CMC (Critical Micelle concentration) hydrocarbon chains (tail) are pointing towards the centre of sphere. with $COO^{\ominus}$ part (head) remaining outward on the surface.

9

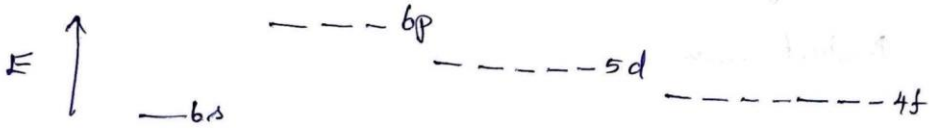
9. Identify the orbitals which are filled in 6th period.

(1) 6s, 4f, 5d, 6p (2) 6s, 6p, 5f, 6d (3) 6s, 6p, 6d, 6f

(4) 6s, 5f, 6p, 6d.

Soln: option (1)

In 6th period electrons are filled in 6s, 4f, 5d, 6p orbitals gradually.



10

10) what is the correct electronic configuration and magnetic moment (spin only) for $^{64}Gd^{3+}$ ion.

(1) $[Xe]^{54} 4f^7$, 7.93 BM (2) $[Xe]^{54} 4f^6, 6s^1$, 7.93 BM.

(3) $[Xe]^{54} 4f^5 6s^2$, .92 BM (4) $[Xe]^{54} 5f^7$, 7.93 BM

Soln: Option (1)

Electronic configuration of

$^{64}Gd = [Xe]^{54} 4f^7 5d^1 6s^2$

$^{64}Gd^{3+} = [Xe]^{54} 4f^7$

No. of unpaired electron = 7

magnetic moment (μ) = $\sqrt{n(n+2)}$ BM

$= \sqrt{7(7+2)} = \sqrt{63} = 7.93$ BM.

11

11) Difference in radius of 3rd and 4th orbit in He^+ ion is $(R_0)_1$ and in Li^{2+} ion is $(R_0)_2$. then Ratio of $(R_0)_1$ to $(R_0)_2$ is

(1) 1:2 (2) 2:1 (3) 3:2 (4) 2:3.

Soln: Option (3)

Formula: $r = 0.529 \frac{n^2}{z}$ Å. where z = atomic Number

For $He^{\oplus}$

$(r_{He^+})_4 - (r_{He^+})_3 = \frac{0.529}{2}[4^2 - 3^2] = (R_0)_1$

For Li^{2+}

$(r_{Li^{2+}})_4 - (r_{Li^{2+}})_3 = \frac{0.529}{3}(4^2 - 3^2] = (R_0)_2$

$\frac{(R_0)_1}{(R_0)_2} = \frac{\frac{0.529}{2}(4^2 - 3^2)}{\frac{0.529}{3}(4^2 - 3^2)} = \frac{3}{2}$.

12

12. For complete combustion of 1 mole of each propane and butane. Find sum of minimum ~~and~~ number of moles of O_2 required.

Soln: (1) combustion of propane

$$C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O$$

1 mole 5 mole

(2) Combustion of butane.

$$C_4H_{10} + \frac{13}{2}O_2 \longrightarrow 4CO_2 + 5H_2O$$

1 mole $13/2$ mole.

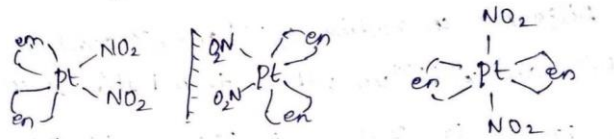
Total mole of O_2 required = $5 + 13/2 = 11.5$

Ans = 11.5

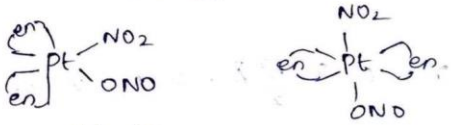
13

13. How many isomers are possible for complex $[Pt(en)_2(NO_2)_2]$

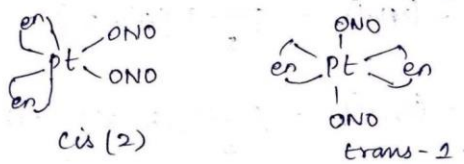
Soln:

① 

cis -(2) (trans)-1

② 

cis -(2) trans-(1)

③ 

cis (2) trans - 1.

Total - 9 isomers

14

14. Reaction A → Product and B → Product are 1st order reactions. Half life of 1st reaction is 180 sec and for 2nd reaction it is 300 sec. Initially [A] = [B], then after how much time (in min) concentration of B become 4 times of concentration of A.

Soln:

for first order reaction, $K = \frac{0.6931}{t_{1/2}}$.

$$K_A = \frac{0.6931}{180} = 3.85 \times 10^{-3}$$

$$K_B = \frac{0.6931}{300} = 2.31 \times 10^{-3}$$

formula: $C_t = C_0 e^{-Kt}$

$$\frac{(C_t)_B}{(C_t)_A} = \frac{(C_0)_B}{(C_0)_A} e^{(K_A - K_B)t}$$

Given: $C_B = 4C_A \Rightarrow \frac{C_B}{C_A} = 4$.

$$4 = e^{(K_A - K_B)t}$$

$$\ln 4 = (K_A - K_B)t$$

$$1.386 = (3.85 \times 10^{-3} - 2.31 \times 10^{-3})t$$

$$\frac{1.386}{1.539 \times 10^{-3}} = t$$

$$t = 900 \text{ secs} = 15 \text{ mins}$$

time = 15 mins

15

15. For Galvanic cell

$$M^{2+}(aq) + Zn(s) \longrightarrow M(s) + Zn^{2+}(aq)$$

The value of E°_{cell} (in V) is. $\Delta G^\circ = -386\ kJ/mole$

Soln:

$$\Delta G = -nFE^\circ_{cell}. \qquad n = 2 \text{ (no. of electrons involved)}$$

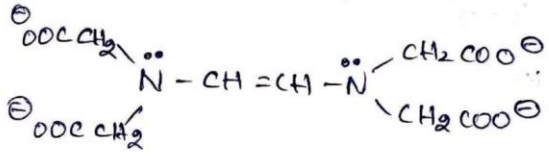
$$-386 \times 10^3 = -2 \times 96500 \times E^\circ$$

$$\boxed{E^\circ = 2\ V.}$$

16

16) What is the denticity of $[EDTA]^{4-}$

Soln:



denticity = 6 $(EDTA)^{4-}$ co-ordinates through 4 oxygen atom and 2 Nitrogen atom.

Ans: 6

17

17. A diatomic molecule crystallize in body center cubic structure with edge length of unit cell is 300 pm and density is 6.17 g/cm^3 then total number of molecule in 200 gm crystal of that molecule is.

(1) $4N_A$ (2) $8N_A$ (3) $40N_A$ (4) $400N_A$.

Soln: option (1) - $4N_A$

$$\text{Density} = \frac{Z \times M}{N_A \times \text{Volume}}$$

M - Molecular wt.

For BCC, $Z = 2$ (atoms / unit cell (Z))

$$6.17 = \frac{2 \times M}{6.02 \times 10^{23} \times (3 \times 10^{-8})^3}$$

$a = 300\text{pm} = 3 \times 10^{-8}\text{m}$

$V = a^3$

$M = 50$

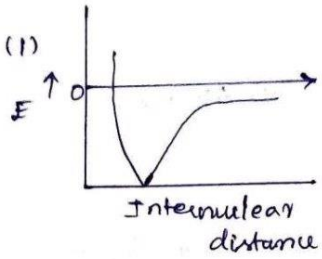
$$\text{No. of mole} = \frac{\text{Mass}}{\text{Mol. wt}} = \frac{200}{50} = 4$$

No. of molecule $= 4N_A$

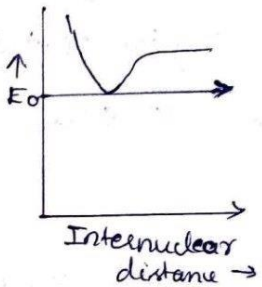
18

18) Identify the correct potential energy curve for the formation of H_2 molecule as a function of internuclear distance of the H atoms.

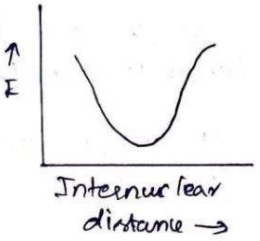
(1)



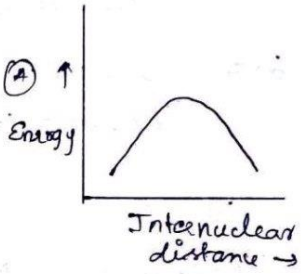
(2)



(3)

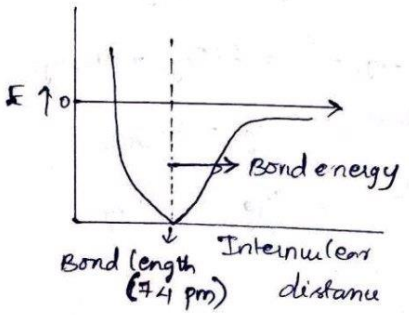


(4)



Soln: Option (1)

The potential energy curve for the formation of H_2 molecule as a function of internuclear distance of the H atoms. The minima in the curve corresponds to the most stable state of H_2.



19

19) Which of the following reaction is used for preparation of water gas on commercial scale.

(1) $C_{(s)} + H_2O_{(g)} \xrightarrow{1273K} CO_{(g)} + H_{2(g)}$

(2) $2C_{(s)} + O_{2(g)} + 4N_{2(g)} \xrightarrow{1273} 2CO_{(g)} + 2N_{2(g)}$

(3) $CH_{4(g)} + H_2O_{(g)} \xrightarrow{1273K} CO_{(g)} + 3H_{2(g)}$

(4) $CO_{2(g)} + H_{2(g)} \xrightarrow{1273} CO_{(g)} + H_2O_{(g)}$.

Soln: option (1)

$C_{(s)} + H_2O_{(g)} \xrightarrow{1273K} CO_{(g)} + H_{2(g)}$

water gas consists of CO and H_2, made by passing steam over coke. (carbon)

20

20) Arrange the following in increasing order of basicity:

(A) 
(B) 
(C) 
(D) 

(1) A < B < D < C (2) C < A < D < B (3) B < D < C < A

(4) C < A < B < D.

Soln: option (2)

$$\text{Basicity} \propto \frac{1}{\text{electronegativity}}$$

Basicity order: $sp^3 > sp^2 > sp$.

(A)  N-atom is sp^2 hybridized and delocalisation of lone pair takes place.

(B)  → sp^3, no delocalisation

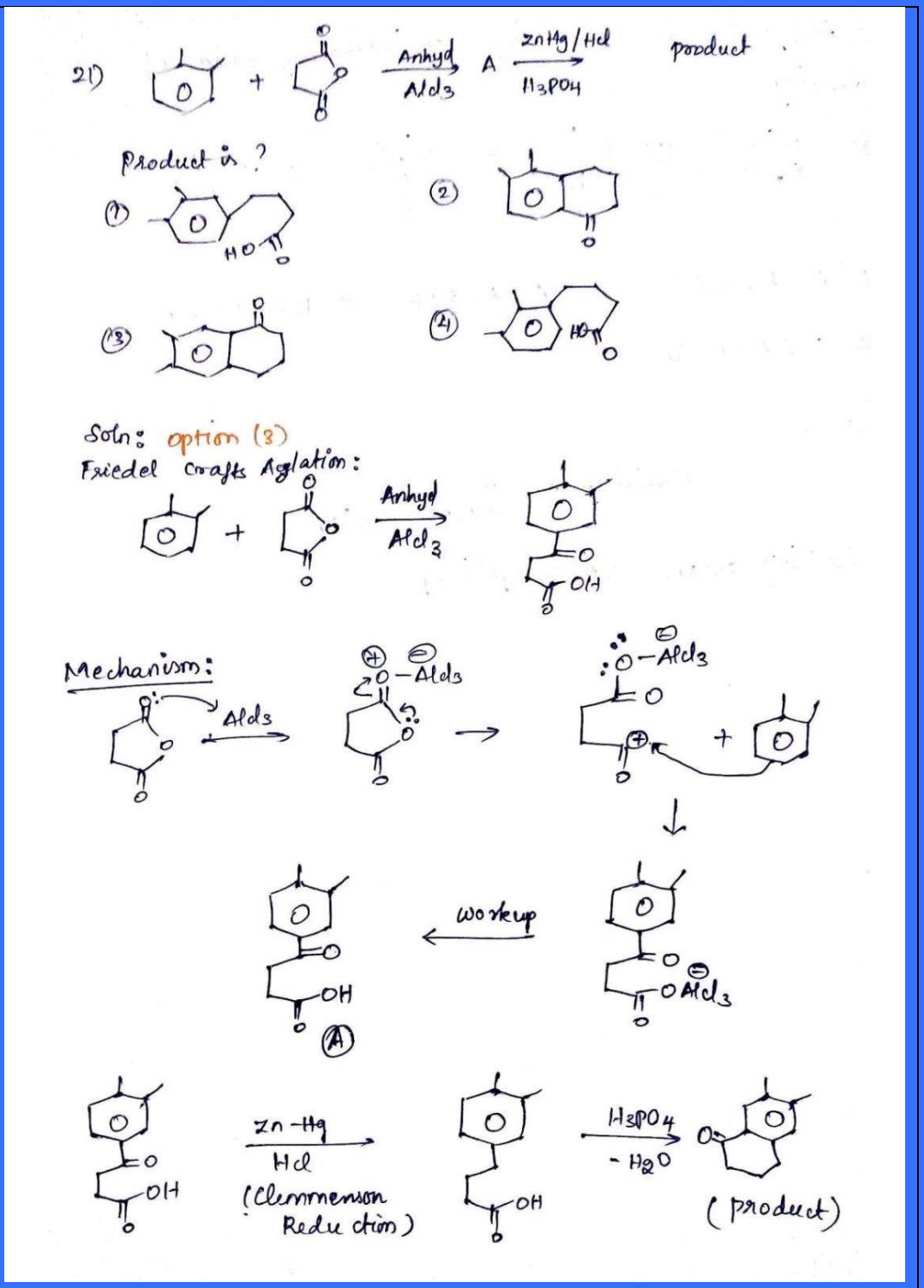
(C)  - sp^2, delocalisation.

(D)  sp^2, lone pair is localised with partial negative charge.

Order: B is more basic.

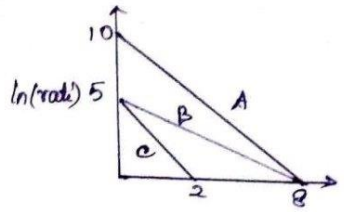
B > D > A > C.

21


21)
Anhyd
AlCl3
A
Zn Hg / Hcl
H3PO4
product
Product is ?
(1)
(2)
(3)
(4)
Soln: option (3)
Friedel Crafts Aglation:
Anhyd
AlCl3
Mechanism:
AlCl3
workup
(A)
Zn-Hg
Hcl
(Clemmenson Reduction)
H3PO4
- H2O
(product)

22

22)



Using the above graph the correct $T_{1/2}$ ratio of A,B,C is : (1) 2:4:1 (2) 2:4:3 (3) 3:2:4 (4) 2:3:4.

soln: option (1)

for 1st order reaction $C_t = C_0 e^{-Kt}$.

$$\text{rate} = -\frac{dc}{dt} = KC_0 e^{-kt}$$

$$\ln(\text{rate}) = \ln(KC_0) - Kt$$

This is of the form $y = mx + c$.

where slope $m = -k$.

Graph between ln (rate) and time will be straight line with negative slope $= -k$.

from graph $K_A = \frac{10}{8}$, $K_B = \frac{5}{8}$ $K_C = \frac{5}{2} \Rightarrow \frac{20}{8}$.

for first order reaction

$$T_{1/2} = \frac{0.6931}{K}.$$

$$T_A : T_B : T_C = \frac{1}{K_A} : \frac{1}{K_B} : \frac{1}{K_C}$$

$$= \frac{8}{10} : \frac{8}{5} : \frac{8}{20}$$

$$= 2:4:1$$

23

(23) Select the correct statement about Ellingham diagram.

(a) Ellingham diagram is graph between ΔH_f° and T if any metal or element oxide.

(b) Any metal will reduce the oxide of other metals which lie above it in the ellingham diagram.

(c) Any metal will reduce the oxide of other metals which lie lower it in the Ellingham diagram.

(d) Slope of ΔG° vs T plot of the reaction $C_{(s)} + \frac{1}{2}O_2 \rightarrow CO$ is negative

① b, d ② c, d ③ a, b, d ④ a, c, d

Soln: Option (1) - b, d

Ellingham diagram is a plot of ΔG_f Vs Temperature where ΔS is the slope and ΔH is the y-intercept.

Ellingham diagram represents the metal oxide formation

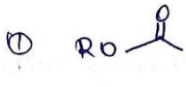
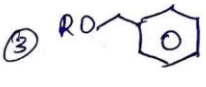
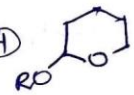
Metal + oxygen $\longrightarrow$ metal oxide

ΔH = -ve, ΔS = -ve for the above reaction

$\therefore$ slope for the reaction will be negative (ΔS is the slope).

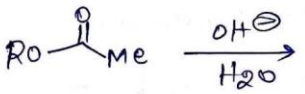
24

24) which of the following derivatives of alcohols is unstable in an aqueous base?

①  ② $RO-CMe_3$ ③  ④ 

Soln: option (1)

In presence of aqueous base esters are hydrolysed to alcohol and acid (saponification). So compound 1 is unstable, it will react immediately

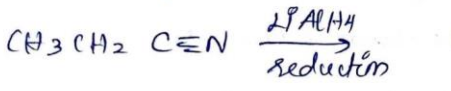


25

25) The most appropriate reagent for conversion of C_2H_5CN into $CH_3CH_2CH_2NH_2$ is.

① $NaBH_4$ ② $LiAlH_4$ ③ CaH_2 ④ $Na(CN)BH_3$

Soln: $LiAlH_4$ (option ②)



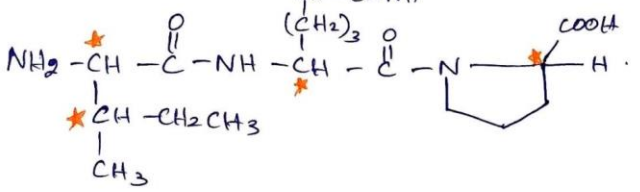
$NaBH_4$ is a mild reducing agent which doesnot reduce RCN. It will reduce, aldehyde, ketones and acid chlorides

26

26) The number of chiral carbons present in peptide, Ile-Arg-pro is.

Soln: 4 Chiral carbons.

Isoleucine – Argenine – Prolcine (Ile-Arg-Pro).



Chiral carbon is one to which 4 different groups are present.

Enrolling yourself for coaching classes has long been considered the first step towards cracking JEE. However, this trend is starting to slip. Recent studies show that, for the students who cleared the JEE Main/Advance, the number of students who had joined a coaching class is lower than the number of students who managed the feat with self-study.

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