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Answer & Solutions

for

NEET 2022_(Re-Exam)

Chemistry

51. Match **List - I** with **List - II** :

List - I (quantum number)	**List- II (orbital)**
(a) n = 2, ℓ = 1	(i) 2 s
(b) n = 3, ℓ = 2	(ii) 3 s
(c) n = 3, ℓ = 0	(iii) 2 p
(d) n = 2, ℓ = 0	(iv) 3 d

Choose the **correct answer** from the options given below :

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

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

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

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

Sol. Answer (1)

ℓ = 0 $\Rightarrow$ s-subshell

ℓ = 1 $\Rightarrow$ p-subshell

ℓ = 2 $\Rightarrow$ d-subshell

ℓ = 3 $\Rightarrow$ f-subshell

$\therefore$ n = 2, ℓ = 1 $\Rightarrow$ 2 p

n = 3, ℓ = 2 $\Rightarrow$ 3 d

n = 3, ℓ = 0 $\Rightarrow$ 3 s

n = 2, ℓ = 0 $\Rightarrow$ 2 s

52. The density of the solution is 2.15 g mL^{-1}, then mass of 2.5 mL solution in correct significant figures is :

(1) 53.75 g (2) 5375×10^{-3} g

(3) 5.4 g (4) 5.38 g

Sol. Answer (3)

In case of multiplication and division, the final result should be reported as having the same number of significant digits as the number with least number of significant digits.

$\therefore$ Density = $\frac{\text{Mass}}{\text{Volume}}$

So, Mass = 2.15 × 2.5

= 5.375

$\approx$ 5.4 g

53. Given below are two statements : one is labelled as Assertion **(A)** and the other is labelled as Reason **(R)**.

Assertion (A) :

Chlorine is an electron withdrawing group but it is ortho, para directing in electrophilic aromatic substitution.

Reason (R) :

Inductive effect of chlorine destabilises the intermediate carbocation formed during the electrophilic substitution, however due to the more pronounced resonance effect, the halogen stabilises the carbocation at ortho and para positions.

In the light of the above statements, choose the most appropriate answer from the options given below :

(1) (A) is not correct but (R) is correct.

(2) Both (A) and (R) are correct and (R) is the correct explanation of (A).

(3) Both (A) and (R) are correct but (R) is not the correct explanation of (A).

(4) (A) is correct but (R) is not correct.

Sol. Answer (4)

Halogen are electron withdrawing groups due to high electronegativity. They have high electron withdrawing inductive effect. In electrophilic substitution reaction it shows both electron withdrawing inductive effect and electron donating resonance effect, but inductive effect overpowers resonance effect so, it deactivates benzene ring and directs the incoming electrophile to ortho and para positions. So, here assertion is correct and Reason is false.

54. Two half cell reactions are given below.

$$Co^{3+} + e^- \rightarrow Co^{2+} \quad , \quad E^{\circ}_{Co^{2+}/Co^{3+}} = -1.81\ V$$
$$2Al^{3+} + 6e^- \rightarrow 2Al(s) \quad , \quad E^{\circ}_{Al/Al^{3+}} = +1.66\ V$$

The standard EMF of a cell with feasible redox reaction will be :

(1) – 3.47 V (2) + 7.09 V

(3) + 0.15 V (4) + 3.47 V

Sol. Answer (4)

$E^0_{Cell} = \left(E^0_c - E^0_a\right)_{RP}$

= 1.81 – (–1.66)

= 1.81 + 1.66

= 3.47 V

55. Match **List - I** with **List - II** :

List - I (Compounds)	**List - II (Molecular formula)**
(a) Borax	(i) $NaBO_2$
(b) Kernite	(ii) $Na_2B_4O_7 \cdot 4\ H_2O$
(c) Orthoboric acid	(iii) H_3BO_3
(d) Borax bead	(iv) $Na_2B_4O_7 \cdot 10\ H_2O$

Choose the **correct answer** from the options given below :

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

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

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

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

Sol. Answer (2)

Borax $\rightarrow Na_2B_4O_7 \cdot 10H_2O$

Kernite $\rightarrow Na_2B_4O_7 \cdot 4H_2O$

Orthoboric acid $\rightarrow H_3BO_3$

Borax bead $\rightarrow NaBO_2$

56. The correct order of first ionization enthalpy for the given four elements is :

(1) C < F < N < O (2) C < N < F < O

(3) C < N < O < F (4) C < O < N < F

Sol. Answer (4)

C $\rightarrow 1s^2, 2s^2\ 2p^2$

N $\rightarrow 1s^2, 2s^2\ 2p^3$ (more stable EC)

O $\rightarrow 1s^2, 2s^2\ 2p^4$

F $\rightarrow 1s^2, 2s^2\ 2p^5$

$\therefore$ order of first IE is C < O < N < F

57. Match **List - I** with **List - II** :

List - I (Defects)	**List - II (shown by)**
(a) Frenkel defect	(i) non-ionic solids and density of the solid decreases
(b) Schottky defect	(ii) non-ionic solids and density of the solid increases
(c) Vacancy defect	(iii) ionic solids and density of the solid decreases
(d) Interstitial defect	(iv) ionic solids and density of the solid remains constant

Choose the **correct answer** from the options given below :

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

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

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

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

Sol. Answer (1)

Schottky and Frenkel defects are shown by ionic solids and in this density decreases and remains same respectively.

Vacancy and Interstitial defects are shown by non-ionic solid and in this density decreases and increases respectively.

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

58. Predict the order of reactivity of the following four isomers towards S_N2 reaction.

(I) $CH_3CH_2CH_2CH_2Cl$

(II) $CH_3CH_2CH(Cl)CH_3$

(III) $(CH_3)_2CHCH_2Cl$

(IV) $(CH_3)_3CCl$

(1) (IV) > (II) > (III) > (I)

(2) (IV) > (III) > (II) > (I)

(3) (I) > (II) > (III) > (IV)

(4) (I) > (III) > (II) > (IV)

Sol. Answer (4)

Greater the steric hindrance, lesser will be the rate of S_N2 reaction. So order of reactivity of S_N2 reaction is- (I) > (III) > (II) > (IV)

59. Match **List - I** with **List - II** :

List - I (molecules)	**List - II (shape)**
(a) NH_3	(i) square pyramidal
(b) ClF_3	(ii) trigonal bipyramidal
(c) PCl_5	(iii) trigonal pyramidal
(d) BrF_5	(iv) T-shape

Choose the **correct answer** from the options given below :

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

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

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

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

Sol. Answer (3)

$NH_3 \rightarrow$ Trigonal pyramidal

$ClF_3 \rightarrow$ T-shape

$PCl_5 \rightarrow$ Trigonal bipyramidal

$BrF_5 \rightarrow$ Square pyramidal

60 Which of the following reactions is a part of the large scale industrial preparation of nitric acid

(1) $Cu(NO_3)_2 + 2\ NO_2 + 2\ H_2O \xrightarrow[500\ K,9\ bar]{Pt} 4HNO_3 + Cu$

(2) $NaNO_3 + H_2SO_4 \xrightarrow[500\ K,9\ bar]{Pt} NaHSO_4 + HNO_3$

(3) $4\ NH_3 + 5\ O_2$ (from air) $\xrightarrow[500\ K,9\ bar]{Pt} 4\ NO + 6\ H_2O$

(4) $4\ HPO_3 + 2\ N_2O_5 \xrightarrow[500\ K,9\ bar]{Pt} 4\ HNO_3 + P_4O_{10}$

Sol. Answer (3)

On large scale, nitric acid is prepared by Ostwald's process.

(i) $4NH_{3(g)} + 5O_{2\ (air)} \xrightarrow[500K,9\ bar]{Pt/Rh\ gauge} 4NO_{(g)} + 6H_2O_{(g)}$

(ii) $2NO_{(g)} + O_{2(g)} \rightarrow 2NO_{2(g)}$

(iii) $3NO_{2(g)} + H_2O_{(\ell)} \rightarrow 2HNO_{3(aq)} + NO$

61. Match List - I with List - II :

List - I	**List - II**
(a) Sodium laurylsulphate	(i) Toilet soap
(b) Cetyltrimethyl ammonium chloride	(ii) Non-ionic detergent
(c) Sodium stearate	(iii) Anionic detergent
(d) Polyethyleneglycyl stearate	(iv) Cationic detergent

Choose the **correct answer** from the options give below :

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

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

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

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

Sol. Answer (4)

(a) Sodium laurylsulphate $\rightarrow$ Anionic detergent

(b) Cetyltrimethylammonium chloride $\rightarrow$ cationic detergent

(c) Sodium stearate $\rightarrow$ Toilet soap

(d) Polyethyleneglycyl stearate $\rightarrow$ Non-ionic detergent

62. Which among the following is a thermoplastic polymer ?

(1) Melamine polymer

(2) Bakelite

(3) Polythene

(4) Urea-formaldehyde resin

Sol. Answer (3)

Polythene, Polystyrene, polyvinyls etc. are thermoplastic polymers

63. $Na_2B_4O_7 \xrightarrow{heat} X + NaBO_2$

in the above reaction the product "X" is :

(1) NaB_3O_5 (2) H_3BO_3

(3) B_2O_3 (4) $Na_2B_2O_5$

Sol. Answer (3)

Borax on strong heating produces

Boric anhydride and sodium metaborate

$Na_2B_4O_7 \xrightarrow{heat} B_2O_3 + 2NaBO_2$

64. One mole of an ideal gas at 300 K is expanded isothermally from 1 L to 10 L volume. ΔU for this process is :

(Use R = 8.314 J K^{-1} mol^{-1})

(1) 0 J (2) 1260 J

(3) 2520 J (4) 5040 J

Sol. Answer (1)

In isothermal expansion/compression of ideal gas

$\Delta U = nC_v\Delta T$, ($\Delta T = 0$)

$\therefore \Delta U = 0$

65. Match **List - I** with **List - II** :

List - I (Complexes)		**List - II (Types)**
(a) $[Co(NH_3)_5NO_2]Cl_2$ and $[Co(NH_3)_5ONO]Cl_2$	(i)	ionisation isomerism
(b) $[Cr(NH_3)_6][Co(CN)_6]$ and $[Cr(CN)_6][Co(NH_3)_6]$	(ii)	coordination isomerism
(c) $[Co(NH_3)_5(SO_4)]Br$ and $[Co(NH_3)_5Br]SO_4$	(iii)	linkage isomerism
(d) $[Cr(H_2O)_6]Cl_3$ and $[Cr(H_2O)_5Cl]Cl_2\cdot H_2O$	(iv)	solvate isomerism

Choose the **correct answer** from the options given below :

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

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

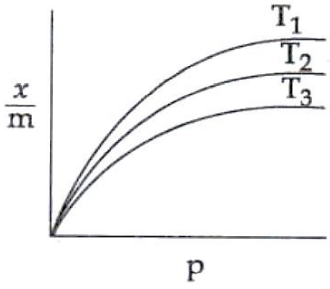
(3) (a) - (ii), (b) - (iii), (c) - (iv), (d) - (i)

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

Sol. Answer (4)

(a) $[Co(NH_3)_5NO_2]Cl_2$ and $[Co(NH_3)_5ONO]Cl_2$	(iii)	Linkage isomerism due to ambidentate ligand
(b) $[Cr(NH_3)_6][Co(CN)_6]$ and $[Cr(CN)_6][Co(NH_3)_6]$	(ii)	coordination isomerism due to exchange of ligands between coordination spheres
(c) $[Co(NH_3)_5(SO_4)]Br$ and $[Co(NH_3)_5Br]SO_4$	(i)	ionisation isomerism due to formation of different ions on ionisation
(d) $[Cr(H_2O)_6]Cl_3$ and $[Cr(H_2O)_5Cl]Cl_2\cdot H_2O$	(iv)	solvate isomerism as no. of water molecules as ligand and water of crystalisation is different

66. Shown below are adsorption isotherms for a gas 'X' at temperatures T_1, T_2 and T_3 :



p and $\frac{x}{m}$ represent pressure and extent of adsorption, respectively. The correct order of temperatures for the given, adsorption is :

(1) $T_1 = T_2 > T_3$

(2) $T_1 > T_2 > T_3$

(3) $T_3 > T_2 > T_1$

(4) $T_1 = T_2 = T_3$

Sol. Answer (3)

As the temperature increases the extent of adsorption of a gas on solid surfaces decreases.

$(T_3 > T_2 > T_1)$

67. 0.01 M acetic acid solution is 1% ionised, then pH of this acetic acid solution is :

(1) 1 (2) 3

(3) 2 (4) 4

Sol. Answer (4)

$$CH_3COOH \rightleftharpoons CH_3COO^- + H^-$$

$t = t_{eq}$ $C - C\alpha$ $C\alpha$ $C\alpha$

$[H^+] = C.\alpha$

$= 0.01 \times \frac{1}{100} = 10^{-4}$

$pH = -\log_{10}[H^+]$

$= 4$

68. The half life of a first order reaction is 2000 years. If the concentration after 8000 years is 0.02 M, then the initial concentration was:

(1) 0.04 M (2) 0.16 M

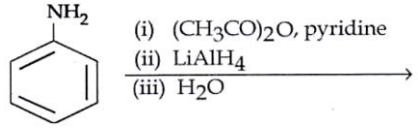
(3) 0.32 M (4) 0.08 M

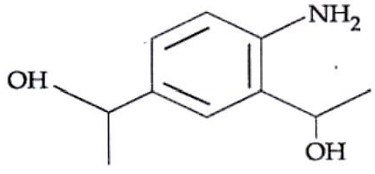
Sol. Answer (3)

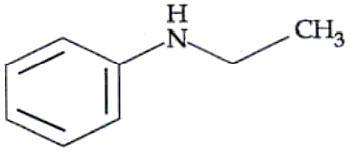
$$n = \frac{t}{t_{1/2}} = \frac{8000}{2000} = 4, \text{(no. of half lives)}$$

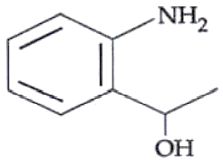
$$\frac{[A_0]}{[A_t]} = 2^n, [A_0] = 0.02 \times 2^4 = 0.32 \text{ M}$$

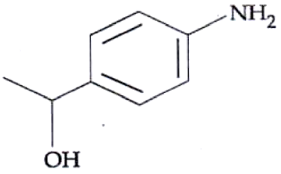
69. The product formed from the following reaction sequence is :



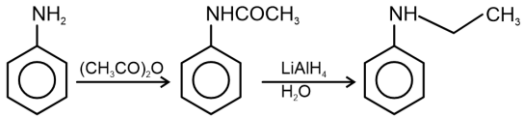
(1) 

(2) 

(3) 

(4) 

Sol. Answer (2)



70 The decreasing order of boiling points of the following alkanes is :

(a) heptane

(b) butane

(c) 2-methylbutane

(d) 2-methylpropane

(e) hexane

Choose the correct answer from the options given below :

(1) (a) > (e) > (c) > (b) > (d)

(2) (a) > (c) > (e) > (d) > (b)

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

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

Sol. Answer (1)

Boiling point of alkanes α molar mass.

Straight chain alkanes have more boiling point than branched alkanes.

Heptane has high molar mass and 2-methylpropane has low molar mass and is branched.

71. The element used for welding metals with high melting points is :

(1) He (2) Cl_2

(3) H_2 (4) Ne

Sol. Answer (3)

The oxy-hydrogen flame can produce the temperature of 4000 K. So atomic hydrogen is used for welding of metals with high melting point.

72. Decrease in size from left to right in actinoid series is greater and gradual than that in lanthanoid series due to :

(1) 5 f orbitals have greater shielding effect

(2) 4 f orbitals are penultimate

(3) 4 f orbitals have greater shielding effect

(4) 5 f orbitals have poor shielding effect

Sol. Answer (4)

Due to large size of 5f orbitals their shielding effect is poor.

73. Which of the following reactions is not an example for nucleophilic addition - elimination reaction ?

(1) $CH_3CHO + NH_3 \rightleftharpoons CH_3CH = NH + H_2O$

(2) $CH_3CHO + NaHSO_3$

$$\rightleftharpoons CH_3 - \underset{\displaystyle H}{\overset{\displaystyle OH}{\underset{|}{\overset{|}{C}}}} - OSO_2Na$$

(3) $CH_3CHO + NH_2OH$

$\rightleftharpoons CH_3CH = N - OH + H_2O$

(4) $CH_3CHO + C_6H_5NHNH_2$

$\rightleftharpoons CH_3CH = N–NHC_6H_5 + H_2O$

Sol. Answer (2)

In nucleophilic addition-elimination reactions along with the product water molecule is eliminated.

But in reaction of CH_3CHO and $NaHSO_3$ only addition takes place.

74. $CaCl_2$ and $Ca(OCl)_2$ are components of :

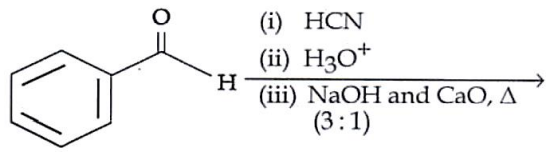
(1) lime water (2) gypsum

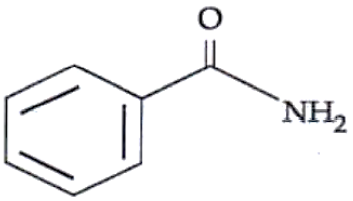
(3) Portland cement (4) bleaching powder

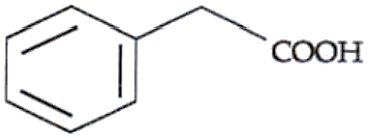
Sol. Answer (4)

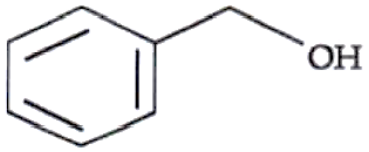
$CaCl_2$ and $Ca(OCl)_2$ are components of bleaching powder.

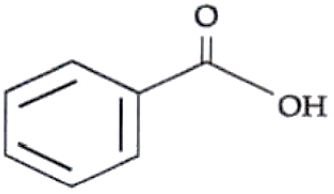
75. The product formed from the following reaction sequence is :



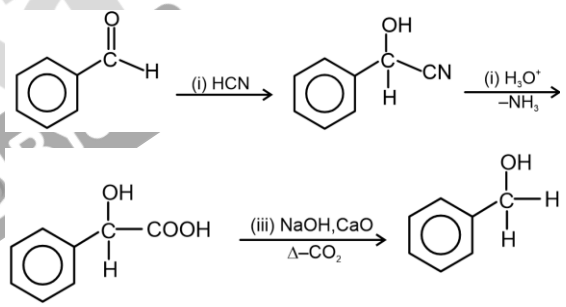
(1) 

(2) 

(3) 

(4) 

Sol. Answer (3)



(NaOH + CaO) Sodalime is a decarboxylating reagent.

76. Flourine is a stronger oxidising agent than chlorine because:

(a) F-F bond has a low enthalpy of dissociation.

(b) Flouride ion (F^-) has high hydration enthalpy.

(c) Electron gain enthalpy of flourine is less negative than chlorine.

(d) Flourine has a very small size.

Choose the **most appropriate** answer from the options given:

(1) (b) and (c) only

(2) (a) and (b) only

(3) (a) and (c) only

(4) (a) and (d) only

Sol. Answer (2)

$$X_{2(g)} \xrightarrow[\text{endothermic}]{\Delta H_{diss}} 2X_{(g)} \xrightarrow[\substack{\text{electron}\\ \text{gain enthalpy}\\ \text{(exothermic)}}]{e^-} X^-_{(g)} \xrightarrow[\substack{\Delta H\\ \text{hydration}\\ \text{energy}\\ \text{(exotharmic)}}]{H_2O} X^-_{aq}$$

By adding these values more energy is released for fluorine due to low bond dissociation enthalpy and high hydration enthalpy.

77. K_H value for some gases at the same temperature 'T' are given :

gas	**K_H/k bar**
Ar	40.3
CO_2	1.67
HCHO	1.83×10^{-5}
CH_4	0.413

where K_H is Henry's Law constant in water. The order of their solubility in water is :

(1) HCHO < CH_4 < CO_2 < Ar

(2) Ar < CO_2 < CH_4 < HCHO

(3) Ar < CO_2 < CH_4 < HCHO

(4) HCHO < CO_2 < CH_4 < Ar

Sol. Answer (2)

$$\text{Solubility of a gas} \propto \frac{1}{K_H \text{ value}}$$

78. Which of the following reactions is a decomposition redox reaction ?

(1) $P_4(s) + 3OH^-(aq) + 3H_2O(l)$

$\rightarrow PH_3(g) + 3H_2PO_2^-(aq)$

(2) $2\,Pb(NO_3)_2(s)$

$\rightarrow 2PbO(s) + 4\,NO_2(g) + O_2(g)$

(3) $N_2(g) + O_2(g) \rightarrow 2NO(g)$

(4) $Cl_2(g) + 2OH^-(aq)$

$\rightarrow ClO^-(aq) + Cl^-(aq) + 4H_2O(l)$

Sol. Answer (2)

Lead nitrate decomposed to give PbO, NO_2 and O_2. In this Nitrogen atom oxidation state changes from +5 to +4 and oxygen changes from –2 to zero.

79. What is the hybridization shown by C_1 and C_2 carbons, respectively in the given compound?

OHC —CH=CH —CH_2COOCH_3

(1) sp^3 and sp^3 (2) sp^2 and sp^3

(3) sp^2 and sp^2 (4) sp^3 and sp^2

Sol. Answer (2)

$$\overset{5}{OHC}-\overset{4}{CH}=\overset{3}{CH}-\overset{2}{CH_2}-\overset{1}{COOCH_3}$$

Ester group has more priority than aldehyde. So numbering should be done from left to right. C_1 has double bond and is sp^2 hybridised.

80. Match the reagents (**List - I**) with the product (**List - II**) obtained from phenol.

List-I	**List - II**
(a) (i) NaOH (ii) CO_2 (iii) H^+	(i) Benzoquinone
(b) (i) Aqueous NaOH + $CHCl_3$ (ii) H^+	(ii) Benzene
(c) Zn dust, Δ	(iii) Salicyl aldehyde
(d) $Na_2Cr_2O_7$, H_2SO_4	(iv) Salicylic acid

Choose the **correct answer** from the options given below:

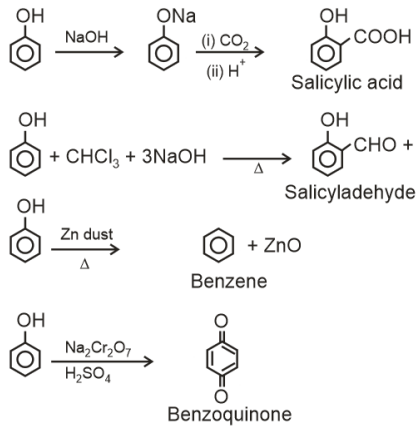
(1) (a) - (iv), (b) - (ii), (c) - (i), (d) - (iii)

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

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

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

Sol. Answer (4)



81. The correct order of bond angles in the following compounds/ species is :

(1) $CO_2 < NH_3 < H_2O < \overset{+}{N}H_4$

(2) $H_2O < NH_3 < \overset{+}{N}H_4 < CO_2$

(3) $H_2O < \overset{+}{N}H_4 < NH_3 < CO_2$

(4) $H_2O < \overset{+}{N}H_4 = NH_3 < CO_2$

Sol. Answer (2)

$CO_2 \rightarrow 180°$

$\overset{+}{N}H_4 \rightarrow 109.5°$

$\ddot{N}H_3 \rightarrow 107°$ (N atom has lone pair)

$H_2\ddot{O}: \rightarrow 104.5°$ (oxygen atom has two lone pairs)

Due to lone pair-lone pair repulsions the bond angle in water decreases more.

82. Match **List - I** with **List – II**:

List - I (Reaction)	**List - II (Product formed)**
(a) Gabriel synthesis	(i) Benzaldehyde
(b) Kolbe synthesis	(ii) Ethers
(c) Williamson synthesis	(iii) Primary amines
(d) Etard reaction	(iv) Salicylic acid

Choose the correct answer from the options given below

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

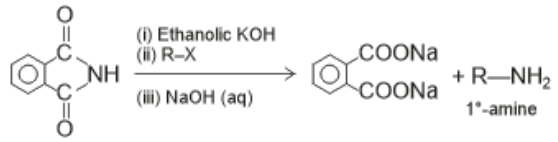
(2) (a) - (iii), (b) - (i), (c) - (ii), (d) - (iv)

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

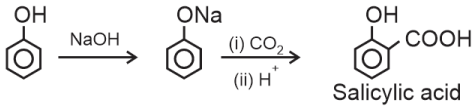
(4) (a) - (iv), (b) - (iii), (c) - (i), (d) - (ii)

Sol. Answer (1)

(a) Gabriel synthesis



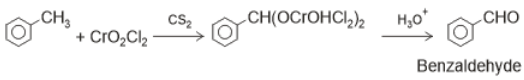
(b) Kolbe synthesis



(c) Williamson synthesis

$$R-X + R'ONa \longrightarrow \underset{\text{ether}}{R'OR} + NaX$$

(d) Etard reaction



83. If first ionization enthalpies of elements X and Y are 419 kJ mol^{-1} and 590 kJ mol^{-1}, respectively and second ionization enthalpies of X and Y are 3069 kJ mol^{-1} and 1145 kJ mol^{-1}, respectively.

Then **correct statement** is :

(1) Both X and Y are alkaline earth metals.

(2) X is an alkali metal and Y is an alkaline earth metal.

(3) X is an alkaline earth metal and Y is an alkali metal.

(4) Both X and Y are alkali metals.

Sol. Answer (2)

X-is alkali metal as it has large size, it's IE is less.

After loss of one electron, it gets inert gas configuration. So its IE_2 is very high.

Y is alkaline earth metal. It's IE is more than alkali metal due to stable ns^2 configuration. But its IE_2 is lower than alkali metal.

84. The **incorrect** statement about denaturation of proteins is :

(1) Uncoiling of the helical structure takes place.

(2) It results due to change of temperature and/ or pH

(3) It results in loss of biological activity of proteins.

(4) A protein is formed from amino acids linked by peptide bonds.

Sol. Answer (4)

Protein formation is not related to the denaturation of proteins.

85. Four gas cylinders containing He, N_2, CO_2 and NH_3 gases separately are gradually cooled from a temperature of 500 K. Which gas will liquify first ?

(Given T_c in K - He : 5.3, N_2 : 126, CO_2 : 304.1 and NH_3 : 405.5)

(1) NH_3

(2) He

(3) N_2

(4) CO_2

Sol. Answer (1)

Ease of Liquefaction $\propto$ Critical Temperature

So, NH_3 will liquify first.

Chemistry: Section-B (Q. No. 86 to 100)

86. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : The metal carbon bond in metal carbonyls possesses both σ and π character.

Reason (R): The ligand to metal bond is a π bond and metal to ligand bond is a σ bond.

In the Light of the above statements, choose the **most appropriate** answer from the options given below:

(1) (A) is not correct but (R) is correct

(2) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(3) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(4) (A) is correct but (R) is not correct

Sol. Answer (4)

Metal-carbon bond in metal carbonyls possesses both σ and π character, So the assertion is correct.

The ligand to metal bond is σ bond and metal to ligand bond is π bond, So the reason is correct.

87. Match List - I with List - II:

List – I	**List – II**
(a) Biochemical oxygen demand	(i) oxidising mixture
(b) Photochemical smog	(ii) polar stratospheric cloud
(c) Classical smog	(iii) organic matter In water
(d) Ozone layer depletion	(iv) reducing mixture

Choose the **correct answer** from the options given below:

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

Sol. Answer (4)

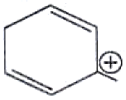
Biochemical oxygen demand – Organic matter in water

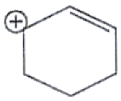
Photochemical smog – Oxidising in nature

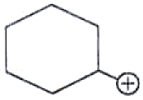
Classical smog – Reducing in nature

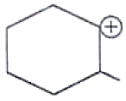
Ozone layer depletion – Polar stratospheric cloud

88. Which of the following is the most stable carbocation?

(1) 

(2) 

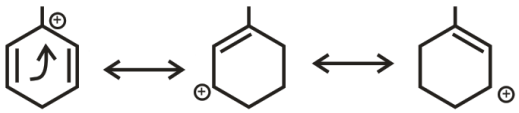
(3) 

(4) 

Sol. Answer (1)

Stability of carbocation $\propto$ No of α-H

$\propto$ No of resonating structures



89. Given below are two statements :

Statement I : Cr^{2+} is oxidising and Mn^{3+} is reducing in nature.

Statement II: Sc^{3+} compounds are repelled by the applied magnetic field.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

(1) Statement I is incorrect but Statement II is correct

(2) Both Statement I and Statement II are correct

(3) Both Statement I and Statement II are incorrect

(4) Statement I is correct but Statement II is incorrect

Sol. Answer (1)

Cr^{+2} : [Ar] $3d^4$

Cr^{+2} is reducing as its configuration changes from d^4 to d^3 (t_{2g}^3)

Mn^{+3} is oxidising in nature.

Mn^{+2}: [Ar] $3d^5$ (extra stability)

Statement I is incorrect

Sc^{+3}: [Ar]

diamagnetic – repelled by magnetic field.

Statement (II) is correct.

90. K_p for the following reaction is 3.0 at 1000 K.

$$CO_2(g) + C(s) \rightleftharpoons 2CO(g)$$

What will be the value of K_c for the reaction at the same temperature ?

(Given – R = 0.083 L bar K^{-1} mol^{-1})

(1) 3.6

(2) 0.36

(3) 3.6×10^{-2}

(4) 3.6×10^{-3}

Sol. Answer (3)

$$CO_2(g) + C(s) \rightleftharpoons 2CO(g)$$

$K_P = K_c (RT)^{\Delta n_g}$ ($\Delta n_g = 2 - 1$)

$3 = K_c (0.083 \times 1000)$

$$K_c = \frac{3}{0.083 \times 1000} = 3.6 \times 10^{-2}$$

91. A vessel contains 3.2 g of dioxygen gas at STP (273.15 K and 1 atm pressure). The gas is now transferred to another vessel at constant temperature, where pressure becomes one third of the original pressure. The volume of new vessel in L is:

(Given - molar volume at STP is 22.4 L)

(1) 67.2 (2) 6.72

(3) 2.24 (4) 22.4

Sol. Answer (2)

Moles of oxygen = $\frac{3.2}{32} = 10^{-1}$ mole

Volume at STP = $10^{-1} \times 22.4 = 2.24$ L

$P_1 = 1$ atm $V_1 = 2.24$ L

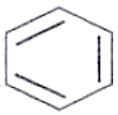
$P_2 = \frac{1}{3}$ atm $V_2 = ?$

$P_1V_1 = P_2V_2$

$$1 \times 2.24 \text{ L} = \frac{1}{3} \times V_2$$

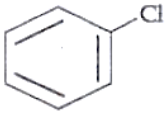
$V_2 = 3 \times 2.24$ L = 6.72 L

92. Which one of the following reaction sequence is **incorrect** method to prepare phenol?

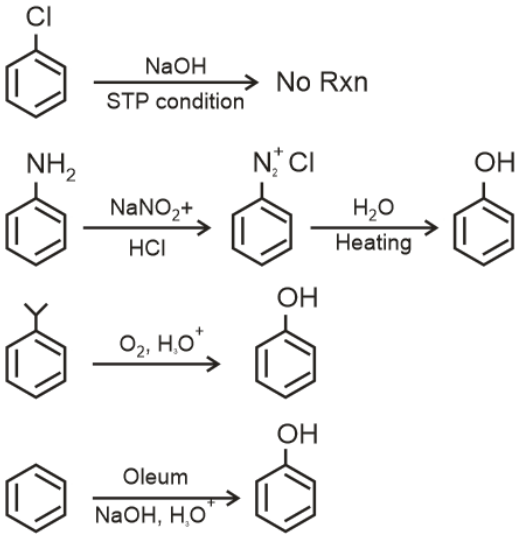
(1)  , oleum, NaOH, H_3O^+

(2) Aniline, $NaNO_2 + HCl$, H_2O, heating

(3) Cumene, O_2, H_3O^+

(4)  , NaOH, STP condition

Sol. Answer (4)



93. For a chemical reaction

$$4A + 3B \rightarrow 6C + 9D$$

rate of formation of C is 6×10^{-2} mol L^{-1} s^{-1} and rate of disappearance of A is 4×10^{-2} mol L^{-1} s^{-1}. The rate of reaction and amount of B consumed in interval of 10 seconds, respectively will be :

(1) 10×10^{-2} mol L^{-1} s^{-1}
and 30×10^{-2} mol L^{-1}

(2) 1×10^{-2} mol L^{-1} s^{-1}
and 30×10^{-2} mol L^{-1}

(3) 10×10^{-2} mol L^{-1} s^{-1}
and 10×10^{-2} mol L^{-1}

(4) 1×10^{-2} mol L^{-1} s^{-1}
and 10×10^{-2} mol L^{-1}

Sol. Answer (2)

$4A + 3B \rightarrow 6C + 9D$

$$r = -\frac{1}{4}\frac{d[A]}{dt} = +\frac{1}{6}\frac{d[C]}{dt}$$

$$r = \frac{1}{6} \times 6 \times 10^{-2} = 1 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$$

$$r = -\frac{1}{3}\frac{d[B]}{dt}$$

$\frac{-d[B]}{dt} = 3\times10^{-2}\ mol\ L^{-1}\ s^{-1}$

B consumed in 10 sec = $3 \times 10^{-2} \times 10$

$= 30 \times 10^{-2}$ mol L^{-1}

94. Standard electrode potential for the cell with cell reaction

$Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$

is 1.1 V. Calculate the standard Gibbs energy change for the cell reaction.

(Given F = 96487 C mol^{-1})

(1) –200.27 J mol^{-1} (2) –200.27 kJ mol^{-1}

(3) –212.27 kJ mol^{-1} (4) –212.27 J mol^{-1}

Sol. Answer (3)

$Zn(s) + Cu^{+2}(aq) \rightarrow Zn^{+2}(aq) + Cu(s)$ v

$E^{\circ}_{cell} = 1.1\ V$

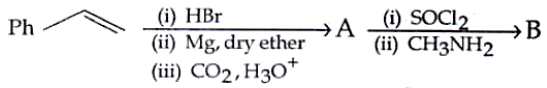
n = 2

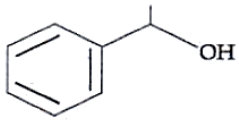
$\Delta G^{\circ} = -nFE^{\circ}_{cell}$

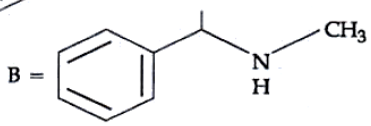
$= -2 \times 96487 \times 1.1$

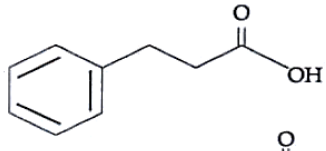
= – 212.27 kJ

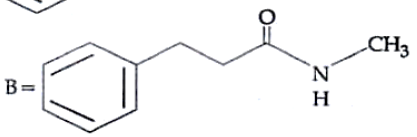
95. The products A and B in the following reaction sequence are :

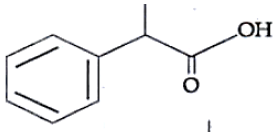


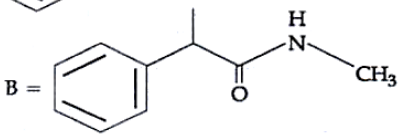
(1) A =  ;

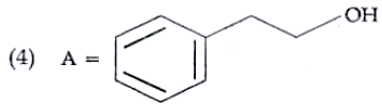
B = 

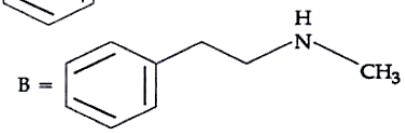
(2) A =  ;

B = 

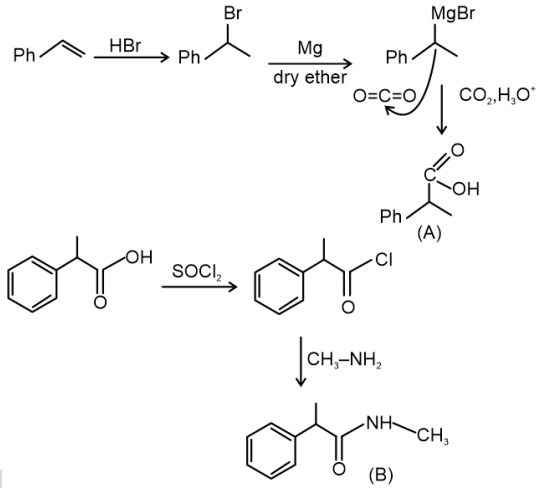
(3) A =  ;

B = 

(4) A =  ;

B = 

Sol. Answer (3)



96. Which one of the following is not a calcination reaction?

(1) $CaCO_3 + 2HCl \xrightarrow{\Delta} CaCl_2 + H_2O + CO_2$

(2) $ZnCO_3 \xrightarrow{\Delta} ZnO + CO_2$

(3) $Fe_2O_3 \cdot xH_2O \xrightarrow{\Delta} Fe_2O_3 + xH_2O$

(4) $CaCO_3 \cdot MgCO_3 \xrightarrow{\Delta} CaO + MgO + 2CO_2$

Sol. Answer (1)

Calcination involves heating in absence of air and the volatile matter escaped leaving behind the metal oxide

$ZnCO_{3(s)} \xrightarrow{\Delta} ZnO_{(s)} + CO_{2(g)}$

$Fe_2O_3 \cdot XH_2O \xrightarrow{\Delta} Fe_2O_{3(s)} + XH_2O_{(g)}$

$CaCO_3 \cdot MgCO_3 \xrightarrow{\Delta} CaO_{(s)} + MgO_{(s)} + 2CO_{2(g)}$

97. The **incorrect** method for the synthesis of alkenes is :

(1) treating vicinal dihalides with Zn metal

(2) treatment of alkynes with Na in liquid NH_3

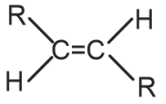
(3) heating alkyl halides with alcoholic KOH

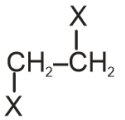
(4) treating alkyl halides in aqueous KOH solution

Sol. Answer (4)

(4) $R-Cl \xrightarrow{\text{aq KOH}} R-OH$

(3) $CH_3-CH_2-\underset{\displaystyle Cl}{\underset{|}{CH}}-CH_3 \xrightarrow[KOH]{alc} CH_3-CH=CH-CH_3 + CH_3-CH_2-CH=CH_2$

(2) $R-C\equiv C-R \xrightarrow[Liq\ NH_3]{Na}$ 

(1)  $\xrightarrow[Metal]{Zn} CH_2=CH_2$

98. When electromagnetic radiation of wavelength 300 nm falls on the surface of a metal, electrons are emitted with the kinetic energy of 1.68×10^5 J mol^{-1}. What is the minimum energy needed to remove an electron from the metal ?

($h = 6.626 \times 10^{-34}$ Js, $c = 3 \times 10^8$ ms^{-1}, $N_A = 6.022 \times 10^{23}$ mol^{-1})

(1) 2.31×10^5 J $mo1^{-1}$

(2) 2.31×10^6 J $mo1^{-1}$

(3) 3.84×10^4 J $mo1^{-1}$

(4) 3.84×10^{-19} J $mo1^{-1}$

Sol. Answer (1)

$E_P = \phi + K.E$

$E_P - K.E = \phi$

$E_P = \frac{hc}{\lambda} = 3.975 \times 10^5$ J mol^{-1}

K.E = 1.68×10^5 J mol^{-1}

$\phi = (3.975 - 1.68) \times 10^5$

$= 2.295 \times 10^5 \approx 2.31 \times 10^5$ J mol^{-1}

99. What fraction of Fe exists as Fe(III) in $Fe_{0.96}O$? (Consider $Fe_{0.96}O$ to be made up of Fe(II) and Fe(III) only)

(1) $\frac{1}{20}$ (2) $\frac{1}{12}$

(3) 0.08 (4) $\frac{1}{16}$

Sol. Answer (2)

$Fe_{0.96}O = Fe_{96}O_{100}$

Let us consider Fe in Fe^{+2} = x

Fe in Fe^{+3} = (96 – x)

Total +ve charge = total –ve charge

(96 – x) × 3 + 2x = 200

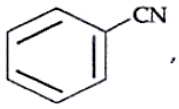
288 – 3x + 2x = 200

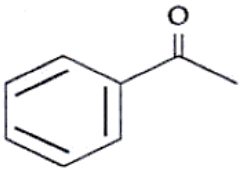
x = 88

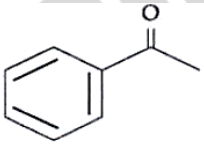
Fe^{+3} = 96 – 88 = 8

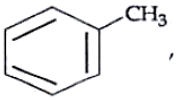
Fraction of $Fe^{+3} = \frac{8}{96} = \frac{1}{12}$

100. The incorrect method to synthesize benzaldehyde is :

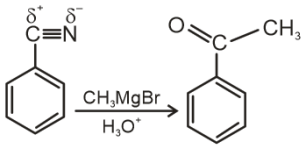
(1)  , CH_3MgBr, followed by H_3O^+

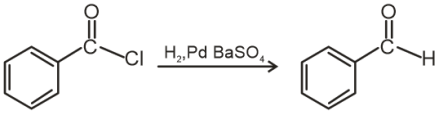
(2)  Cl, H_2, Pd-$BaSO_4$

(3)  OC_2H_5, DIBAL-H, followed by H_2O

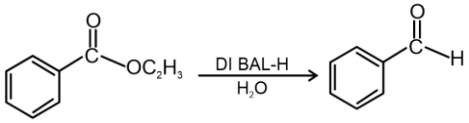
(4)  , CrO_2Cl_2, followed by H_3O^+ in CS_2

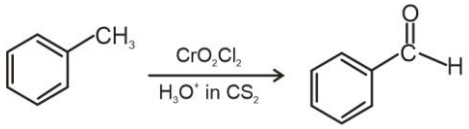
Sol. Answer (1)

(1) 

(2) 

Rosenmund Reaction

(3) 

(4) 

Etard reaction

❑ ❑ ❑