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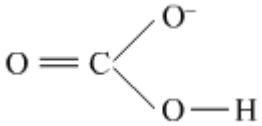
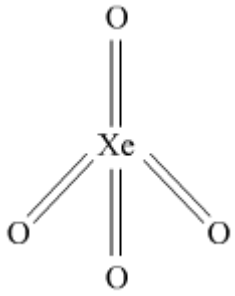
AIPMT 2015 (Code: E) – DETAILED SOLUTION

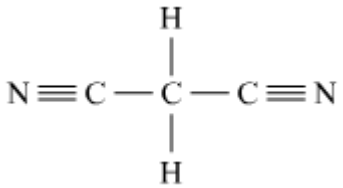
Chemistry

46. Which of the following species contains equal number of σ - and π – bonds?

(1) HCO_3
(2) XeO_4
(3) $(CN)_2$
(4) $CH_2(CN)_2$

Sol:

Species	Number of σ- bonds	Number of π- bonds
	4	1
	4	4
$N \equiv C - C \equiv N$	3	4

	6	4

Thus, among the given species XeO4 has equal number of σ- and π- bonds.

Hence, the correct option is (2).

47. The species Ar, K^+ and Ca^{2+} contain the same number of electrons. In which order do their radii increase?

(1) $Ar < K^+ < Ca^{2+}$
(2) $Ca^{2+} < Ar < K^+$
(3) $Ca^{2+} < K^+ < Ar$
(4) $K^+ < Ar < Ca^{2+}$

Sol:
Ar, K and Ca belong to third period of the modern periodic table. Ar being a noble gas, has the maximum radii among them. The ionic radii of isoelectronic ions decrease with increase in magnitude of the nuclear charge.

Thus, the correct order of increasing radii is:
$Ca^{2+} < K^{+} < Ar$

Hence, the correct option is (3).

48. The function of "Sodium pump" is a biological process operation in each and every cell of all animals. Which of the following biologically important ions is also a constituent of this pump?

(1) Ca^{2+}
(2) Mg^{2+}
(3) K^{+}
(4) Fe^{2+}

Sol:

Among the given biologically important ions, K^{+} is also a constituent of the "Sodium pump". The pump is used for the conduction of signals from brain to organs and vice versa.

Hence, the correct option is (3).

49. "Metals are usually not found as nitrates in their ores".
Out of the following two (*a* and *b*) reasons which is/are true for the above observation?
(a) Metal nitrates are highly unstable.
(b) Metal nitrates are highly soluble in water.

(1) *a* and *b* are true
(2) *a* and *b* are false
(3) *a* is false but *b* is true

(4) *a* is true but *b* is false

Sol:

Metals are usually not found as nitrates in their ores. This is because metal nitrates are highly soluble in water.

Hence, the correct option is (3).

50. Solubility of the alkaline earth's metal sulphates in water decreases in the sequence:

(1) Mg > Ca > Sr > Ba
(2) Ca > Sr > Ba > Mg
(3) Sr > Ca > Mg > Ba
(4) Ba > Mg > Sr > Ca

Sol:

The size of sulphate ion is so large that small increase in the sizes of the cations from Be to Ba does not make any appreciable difference to the magnitude of the lattice energy of the alkaline earth's metal sulphates. However, as the size of the cation increases down the group, the hydration energy decreases from Be^{2+} to Ba^{2+}. Hence, the solubility of sulphates of alkaline earth metals decreases in the sequence:
Mg > Ca > Sr > Ba

Hence, the correct option is (1).

51. Because of lanthanoid contraction, which of the following pairs of elements have nearly same atomic radii? (Numbers in the parenthesis are atomic numbers).
(1) Ti (22) and Zr (40)
(2) Zr (40) and Nb (41)

(3) Zr (40) and Hf (72)
(4) Zr (40) and Ta (73)

Sol:

Due to lanthanoid contraction, the elements belonging to the second and the third d series of the periodic table exhibit similar atomic radii. Among the given pairs of elements, Zr (40) and Hf (72) have nearly the same atomic radii.

Hence, the correct option is (3).

52. Which of the following processes does **not** involve oxidation of iron?

(1) Rusting of iron sheets
(2) Decolourization of blue $CuSO_4$ solution by iron
(3) Formation of $Fe(CO)_5$ from Fe
(4) Liberation of H_2 from steam by iron at high temperature

Sol:

The chemical reactions representing the given processes can be written as:
Rusting of iron sheets:

$$\overset{[0]}{Fe} \xrightarrow{\text{Moist air}} \underset{\text{Rust}}{\overset{[III]}{Fe_2O_3.xH_2O}}$$

Decolourisation of blue $CuSO_4$ solution by iron:

$$\overset{[0]}{Fe} + CuSO_4 \rightarrow \overset{[II]}{FeSO_4} + Cu$$

Formation of $Fe(CO)_5$ from Fe:

$$\overset{[0]}{Fe} + 5\,CO \rightarrow \overset{[0]}{Fe(CO)_5}$$

Liberation of H_2 from steam by iron at high temperature:

$$\overset{[0]}{3\,Fe} + 4\,H_2O \xrightarrow{1000\ K} \overset{[2.66]}{Fe_3O_4} + 4\,H_2$$

Thus, among the given processes, formation of $Fe(CO)_5$ from Fe does not involve oxidation of iron.

Hence, the correct option is (3).

53. Which of the following pairs of ions are isoelectronic and isostructural?

(1) CO_3^{2-}, SO_3^{2-}

(2) ClO_3^-, CO_3^{2-}

(3) SO_3^{2-}, NO_3^-

(4) ClO_3^-, SO_3^{2-}

Sol:

S. No.	Ion	Number of Electrons in the Ion	Geometry of the Ion
1.	CO_3^{2-}	32	Trigonal planar
2.	SO_3^{2-}	42	Trigonal pyramidal
3.	ClO_3^-	42	Trigonal pyramidal
4.	NO_3^-	32	Trigonal planar

Thus, among the given pairs of ions, ClO_3^- and SO_3^{2-} are isoelectronic and isostructural.

Hence, the correct option is (4).

54. Which of the following options represents the correct bond order?

(1) $O_2^- > O_2 > O_2^+$

(2) $O_2^- < O_2 < O_2^+$

(3) $O_2^- > O_2 < O_2^+$

(4) $O_2^- < O_2 > O_2^+$

Sol:

The molecular orbital configuration of O_2 is given as:

$\sigma 1s^2\ \sigma^* 1s^2\ \sigma 2s^2\ \sigma^* 2s^2\ \sigma 2p_z^2 \left[\pi 2p_x^2 = \pi 2p_y^2\right] \left[\pi^* 2p_x^1 = \pi^* 2p_y^1\right]$

Also the bond order is given as:

$$\text{B.O.} = \frac{N_b - N_a}{2}$$

Here,

N_b = Number of electrons in the bonding molecular orbitals

N_a = Number of electrons in the antibonding molecular orbitals

S. No.	Species	Bond Order
1.	O_2^-	1.5
2.	O_2	2
3.	O_2^+	2.5

Thus, the correct order of species in increasing bond order is $O_2^- < O_2 < O_2^+$.

Hence, the correct option is (2).

55. Nitrogen dioxide and sulphur dioxide have some properties in common. Which property is shown by one of these compounds, but not by the other?

(1) forms 'acid-rain'
(2) is a reducing agent
(3) is soluble in water
(4) is used as a food-preservative

Sol:

Upon decomposition of $NaHSO_3$, SO_2 is produced which prevents the oxidation of food. Thus, SO_2 has food preservation property while NO_2 has no such property.

Hence, the correct answer is (4).

56. Maximum bond angle at nitrogen is present in which of the following?

(1) NO_2

(2) NO_2^-

(3) NO_2^+

(4) NO_3^-

Sol:

S. No.	Species	Bond Angle
1.	NO_2	132^o
2.	NO_2^-	115^o
3.	NO_2^+	180^o
4.	NO_3^-	120^o

Thus, among the given species, maximum bond angle at nitrogen is present in NO_2^+.

Hence, the correct option is (3).

57. Magnetic moment 2.84 B.M. is given by:
(At. nos, Ni = 28, Ti = 22, Cr = 24, Co = 27)

(1) Ni^{2+}
(2) Ti^{3+}
(3) Cr^{2+}
(4) Co^{2+}

Sol:

Magnetic moment of a transition metal ion is given as:

$$\mu = \sqrt{n(n+2)}\ \text{B.M}$$

Here,
μ = Magnetic moment
n = Number of unpaired electrons

Given, μ = 2.84 B.M

$$\Rightarrow \sqrt{n(n+2)} = 2.84$$

$$\Rightarrow n \approx 2$$

Among the given metal ions, Ni^{2+} has d^8 valence electron configuration with two unpaired electrons.

Hence, the correct answer is (1).

58. Cobalt(III) chloride forms several octahedral complexes with ammonia. Which of the following will not give test for chloride ions with silver nitrate at 25°C?

(1) $CoCl_3 \cdot 3NH_3$

(2) $CoCl_3 \cdot 4NH_3$

(3) $CoCl_3 \cdot 5NH_3$

(4) $CoCl_3 \cdot 6NH_3$

Sol:

$[Co(NH_3)_6]Cl_3 \rightarrow [Co(NH_3)_6]^{3+} + 3\ Cl^-$

$[Co(NH_3)_5Cl]Cl_2 \rightarrow [Co(NH_3)_5Cl]^{2+} + 2\ Cl^-$

$[Co(NH_3)_4Cl_2]Cl \rightarrow [Co(NH_3)_4Cl_2]^{+} + Cl^-$

$[Co(NH_3)_3Cl_3] \rightarrow [Co(NH_3)_3Cl_3]$

So, among the given octahedral complexes of Co(III) with ammonia, $CoCl_3.3NH_3$ or $[Co(NH_3)_3Cl_3]$ doesn't ionise in solution to furnish Cl^- ions. Thus, $CoCl_3.3NH_3$ doesn't give the test for chloride ions with silver nitrate at 25 ^oC.
Hence, the correct answer is (1).

59. Which of these statements about $[Co(CN)_6]^{3-}$ is true?

(1) $[Co(CN)_6]^{3-}$ has no unpaired electrons and will be in a low-spin configuration.

(2) $[Co(CN)_6]^{3-}$ has four unpaired electrons and will be in a low-spin configuration.

(3) $[Co(CN)_6]^{3-}$ has four unpaired electrons and will be in a high-spin configuration.

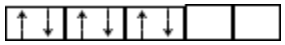
(4) $[Co(CN)_6]^{3-}$ has no unpaired electrons and will be in a high-spin configuration.

Sol:

$[Co(CN)_6]^{3-}$ has cobalt in +3 oxidation state with d^6 valence electronic configuration.

Co^{3+}: $[Ar]3d^6$

Since, cyanide is a strong field ligand, thus, it causes pairing up of electrons in d-orbitals of Co(III).



As a result, the complex $[Co(CN)_6]^{3-}$ has no unpaired electrons and low-spin configuration.

Hence, the correct answer is (1).

60. The activation energy of a reaction can be determined from the slope of which of the following graphs?

(1) $\ln K$ vs. T

(2) $\frac{\ln K}{T}$ vs. T

(3) $\ln K$ vs. $\frac{1}{T}$

(4) $\frac{T}{\ln K}$ vs. T

Sol:

The Arrhenius equation is represented by the expression:

$$k = Ae^{-\frac{E_a}{RT}} \quad .....(i)$$

Here,

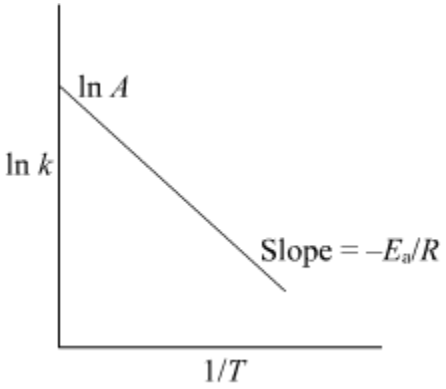
k = Rate constant for the reaction
A = Arrhenius factor
E_a = Activation energy for the reaction

R = Universal gas constant
T = Temperature

Taking natural logarithm on both sides of (i), we obtain

$$\ln k = \ln A - \frac{E_a}{RT} \quad .....(ii)$$

A plot of ln k vs. 1/T has slope equal to $-\frac{E_a}{R}$.



Hence, the correct answer is (3).

61. Which one is **not** equal to zero for an ideal solution ?

(1) ΔH_{mix}
(2) ΔS_{mix}
(3) ΔV_{mix}
(4) $\Delta P = P_{observed} - P_{Raoult}$

Sol:

In the formation of an ideal solution,

a) $P_{observed} = P_{Raoult}$, $\therefore \Delta P = 0$

b) $\Delta H_{mix} = 0$

c) $\Delta V_{mix} = 0$

d) ΔS_{mix} = +ve

Hence, the correct option is (2).

62. A mixture of gases contains H_2 and O_2 gases in the ratio of 1 : 4 (w/w). What is the molar ratio of the two gases in the mixture?

(1) 1 : 4

(2) 4 : 1

(3) 16 : 1

(4) 2 : 1

Sol:

Let the mass of H2 in the gaseous mixture be *x* g.

Hence, the mass of O2 in the gaseous mixture will be 4*x* g.

Molar mass of H_2 = 2 g/mol

Molar mass of O_2 = 32 g/mol

Molar ratio, $\frac{n_{H_2}}{n_{O_2}} = \frac{x/2}{4x/32} = \frac{4}{1}$

Hence, the correct option is (2).

63. A given metal crystallizes out with a cubic structure having edge length of 361 pm. If there are four metal atoms in one unit cell, what is the radius of one atom ?

(1) 40 pm
(2) 127 pm
(3) 80 pm
(4) 108 pm

Sol:

Since, there are four metal atoms in one unit cell, thus, it is an fcc crystal lattice.

Edge length, a = 361 pm

The relation between edge length and atomic radius for an fcc lattice is given as:

$$r = \frac{a}{2\sqrt{2}}$$

$$\Rightarrow r = \frac{361}{2\sqrt{2}} = 127.65 \text{ pm} \approx 127 \text{ pm}$$

Hence, the correct answer is (2).

64. When initial concentration of a reactant is doubled in a reaction, its half-life period is not affected. The order of the reaction is :

(1) Zero
(2) First
(3) Second
(4) More than zero but less than first

Sol:

For a first order reaction, the half-life is given by the expression:

$$t_{1/2} = \frac{0.693}{k}$$

Thus, it is independant of the initial concentration of the reactants.

Hence, the correct option is (2).

65. If the value of an equilibrium constant for a particular reaction is 1.6×10^{12}, then at equilibrium the system will contain :

(1) all reactants.
(2) mostly reactants.
(3) mostly products.
(4) similar amounts of reactants and products.
Sol:

For a general equilibrium reaction $A \rightleftharpoons B$

$$\text{Equilibrium constant, } K = \frac{[B]_{eq}}{[A]_{eq}}$$

$$\Rightarrow 1.6 \times 10^{12} = \frac{[B]_{eq}}{[A]_{eq}}$$

$$\therefore [B]_{eq} >> [A]_{eq}$$

Thus, at equilibrium the system will contain mostly products in the mixture.

Hence, the correct option is (3).

66. A device that converts energy of combustion of fuels like hydrogen and methane, directly into electrical energy is known as :

(1) Fuel Cell
(2) Electrolytic Cell
(3) Dynamo
(4) Ni-Cd cell

Sol:

In a fuel cell, the energy of combustion of fuels like hydrogen and methane is directly converted into electrical energy.

Hence, the correct answer is (1).

67. The boiling point of 0.2 mol kg^{-1} solution of *X* in water is greater than equimolal solution of *Y* in water. Which one of the following statements is **true** in this case ?

(1) *X* is undergoing dissociation in water.
(2) Molecular mass of *X* is greater than the molecular mass of *Y*.
(3) Molecular mass of *X* is less than the molecular mass of *Y*.
(4) *Y* is undergoing dissociation in water while *X* undergoes no change.

Sol:

Given, molality of solution of *X* = molality of solution of *Y* = 0.2 mol/kg

The elevation in boiling point of a solution is given by the relation
$\Delta T_b = iK_b m$

Here,
ΔT_b = Elevation in boiling point
i = van't Hoff factor
K_b = Molal elevation constant
m = Molality

In other words,
$\Delta T_b \propto i$

Since, ΔT_b of solution of *X* is greater than that of *Y*, as a result, van't Hoff factor of solution *X* is greater than that of *Y*.

Thus, solute *X* is undergoing dissociation in water.

Hence, the correct answer is (1).

68. Which one of the following electrolytes has the same value of van't Hoff's factor (*i*) as that of $Al_2(SO_4)_3$ (if all are 100% ionised)?

(1) K_2SO_4
(2) $K_3[Fe(CN)_6]$
(3) $Al(NO_3)_3$
(4) $K_4[Fe(CN)_6]$

Sol:

$$Al_2(SO_4)_3 \rightleftharpoons 2\,Al^{3+} + 3\,SO_4^{2-}$$

Thus, the value of van't Hoff factor for $Al_2(SO_4)_3$ is 5.

Among the given electrolytes, $K_4[Fe(CN)_6]$ also has a van't Hoff factor of 5.

$$K_4[Fe(CN)_6] \rightleftharpoons 4\,K^+ + [Fe(CN)_6]^{4-} \quad (i = 5)$$

Hence, the correct answer is (4).

69. The number of d=electrons in Fe^{2+} (Z=26) is **not** equal to the number of electrons in which one of the following ?

(1) s-electrons in Mg (Z=12)
(2) p-electrons in Cl (Z=17)

(3) d-electrons in Fe (Z=26)
(4) p-electrons in Ne (Z=10)

Sol:

Species	Electronic Configuration
Fe^{2+}	[Ar] $3d^6\ 4s^0$
Ne	$1s^2\ 2s^2\ 2p^6$
Mg	$1s^2\ 2s^2\ 2p^6\ 3s^2$
Cl	$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$
Fe	[Ar] $3d^6\ 4s^2$

Fe^{2+} has six d-electrons, whereas Cl has 11 p-electrons.

Hence, the correct option is (2).

70. The correct bond order in the following species is :

(1) $O_2^{2+} < O_2^{+} < O_2^{-}$
(2) $O_2^{2+} < O_2^{-} < O_2^{+}$
(3) $O_2^{+} < O_2^{-} < O_2^{2+}$
(4) $O_2^{-} < O_2^{+} < O_2^{2+}$

Sol:

The molecular orbital configuration of O_2 is given as:

$$\sigma 1s^2\ \sigma^* 1s^2\ \sigma 2s^2\ \sigma^* 2s^2\ \sigma 2p_z^2\ \left(\pi 2p_x^2 = \pi 2p_y^2\right)\left(\pi^* 2p_x^1 = \pi^* 2p_y^1\right)$$

Also the bond order is given as:

$$\text{B.O.} = \frac{N_b - N_a}{2}$$

Here,

N_b = Number of electrons in the bonding molecular orbitals

N_a = Number of electrons in the antibonding molecular orbitals

S. No.	Species	Bond Order
1.	O_2^-	1.5
2.	O_2^{2+}	3
3.	O_2^+	2.5

Thus, the correct order of species in increasing bond order is $O_2^- < O_2^+ < O_2^{2+}$.

Hence, the correct option is (4).

71. The angular momentum of electron in 'd' orbital is equal to :

(1) $\sqrt{6}\ \hbar$

(2) $\sqrt{2}\ \hbar$

(3) $2\sqrt{3}\ \hbar$

(4) 0 $\hbar$

Sol:

Angular momentum of electron in an orbital = $\sqrt{l(l+1)}\frac{h}{2\pi}$

Here,
l = Azimuthal quantum number of the subshell

For *d*-orbital, $l = 2$, thus,
Angular momentum of an electron in 'd' orbital = $\sqrt{2(2+1)}\ \hbar = \sqrt{6}\ \hbar$

Hence, the correct option is (1).

72. The Ksp of Ag_2CrO_4' AgCl, AgBr and AgI are respectively, 1.1×10^{-12}, 1.8×10^{-10}, 5.0×10^{-13}, 8.3×10^{-17}. Which one of the following salts will precipitate last if $AgNO_3$ solution is added to the solution containing equal moles of NaCl, NaBr, NaI and Na_2CrO_4 ?

(1) AgI
(2) AgCl
(3) AgBr
(4) Ag_2CrO_4

Sol:

Salt	K_{sp}	Solubility
AgI	8.3×10^{-17}	$\sqrt{K_{sp}} = 0.9 \times 10^{-8}$
AgCl	1.8×10^{-10}	$\sqrt{K_{sp}} = 1.34 \times 10^{-5}$
AgBr	5×10^{-13}	$\sqrt{K_{sp}} = 0.71 \times 10^{-6}$

Ag_2CrO_4	1.1×10^{-12}	$\sqrt[3]{\frac{K_{sp}}{4}} = 0.65 \times 10^{-4}$

Among the given salts, solubility of Ag_2CrO_4 is highest. Thus, it will precipitate last.

Hence, the correct option is (4).

73. Which property of colloidal solution is independent of charge on the colloidal particles ?

(1) Coagulation
(2) Electrophoresis
(3) Electro-osmosis
(4) Tyndall effect

Sol:

Among the given properties of colloidal solution, Tyndall effect is independent of charge on the colloidal particles.

Hence, the correct option is (4).

74. Which of the following statements is correct for a reversible process in a state of equilibrium ?

(1) $\Delta G = -2.30\ RT \log K$
(2) $\Delta G = 2.30\ RT \log K$
(3) $\Delta G^\circ = -2.30\ RT \log K$
(4) $\Delta G^\circ = 2.30\ RT \log K$

Sol:

It is known that

$\Delta G = \Delta G^{\circ} + 2.303\ RT \log Q$

At equilibrium, $\Delta G = 0$ and $Q = K$.

Thus,

$\Delta G^{\circ} = -2.303\ RT \log K$

Hence, the correct option is (3).

75. Bithional is generally added to the soaps as an additive to function as a/an :

(1) Softener
(2) Dryer
(3) Buffering agent
(4) Antiseptic

Sol:

Bithional is generally added to the soaps as an additive to function as an antiseptic.

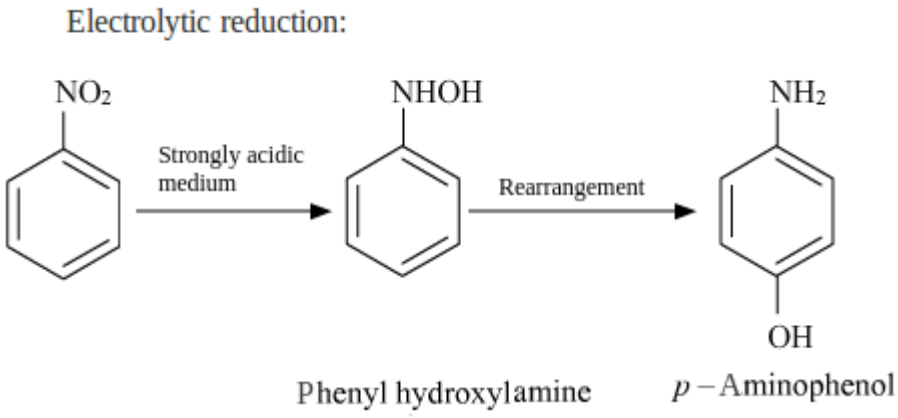
Hence, the correct option is (4).

76. The electrolytic reduction of nitrobenzene in strongly acidic medium produces :

(1) p-Aminophenol
(2) Azoxybenzene
(3) Azobenzene
(4) Aniline

Sol:

Under strongly acidic conditions, nitrobenzene on electrolytic reduction gives p-aminophenol.



Hence, the correct option is (1).

77. In Duma's method for estimation of nitrogen, 0.25 g of an organic compound gave 40 mL of nitrogen collected at 300 K temperature and 725 mm pressure. If the aqueous tension at 300 K is 25 mm, the percentage of nitrogen in the compound is :

(1) 17.36
(2) 18.20
(3) 16.76
(4) 15.76

Sol:

Given that,
V = 40 mL
Molar mass of N_2, M = 28 g

T = 300 K

Pressure can be calculate as

$$P_{N_2} = P_{Total} - P_{H_2O} = 725 - 25 = 700 \text{ mm}$$

$$W_{N_2} = \frac{PVM}{RT} = \frac{700 \times 40 \times 28}{760 \times 1000 \times 300 \times 0.0821}$$

$$= 0.042 \text{ g}$$

Therefore,

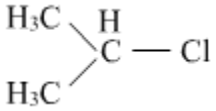
$$\% \text{ of Nitrogen} = \frac{0.042}{0.25} \times 100$$

$$= 16.80\%$$

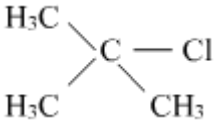
Hence, the correct option is (3).

78. In which of the following compounds, the C - Cl bond ionisation shall give most stable carbonium ion ?

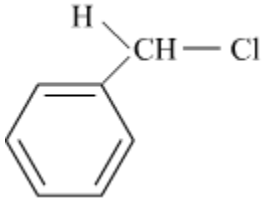
(1)



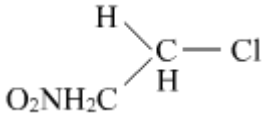
(2)



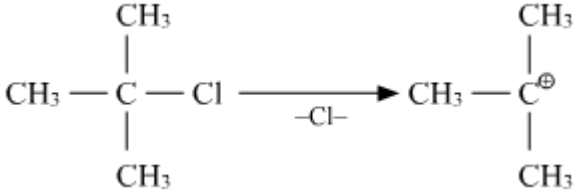
(3)



(4)



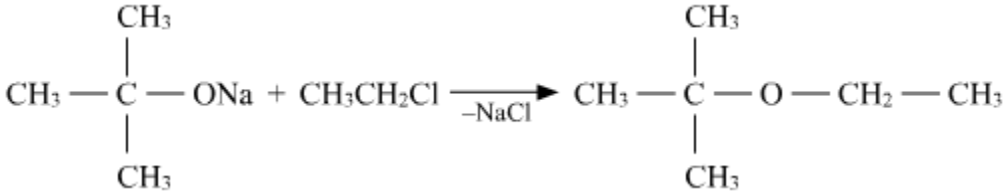
Sol:



Among the given compounds, in 2-chloro-2-methylpropane, C−Cl bond ionisation shall give most stable carbonium ion. Such stability is due to presence of nine hyper conjugation structures and three +I groups.

Hence, the correct option is (2).

79. The reaction



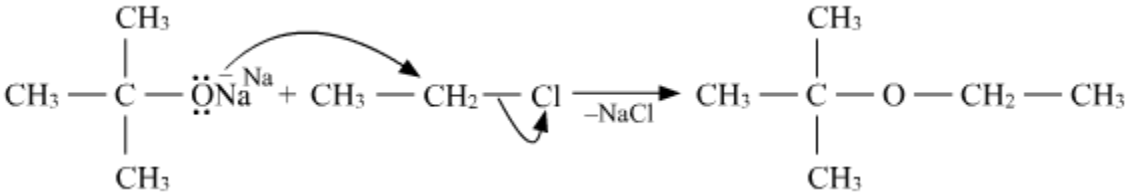
is called :

(1) Williamson Synthesis
(2) Williamson continuous etherification process
(3) Etard reaction
(4) Gatterman - Koch reaction

Sol:

The given reaction is called Williamson synthesis. The reaction involves S_N2 attack of an alkoxide ion on primary alkyl halide.

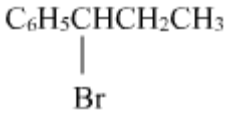
Reaction mechanism



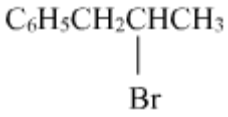
Hence, the correct option is (1).

80. The reaction of $C_6H_5CH = CHCH_3$ with HBr produces :

(1)



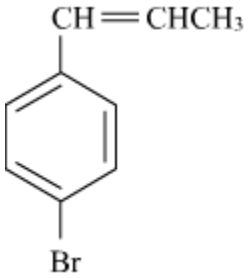
(2)



(3)

$C_6H_5CH_2CH_2CH_2Br$

(4)



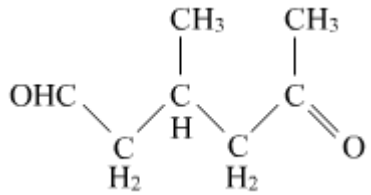
Sol:

$$C_6H_5-CH=CH-CH_3 + HBr \rightarrow C_6H_5-\underset{\underset{Br}{|}}{CH}-CH_2-CH_3$$

This is the electrophilic addition reaction in which addition takes place via more stable carbocation according to the Markovnikov's rule.

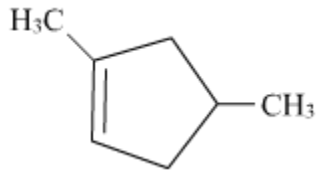
Hence, the correct option is (1).

81. A single compound of the structure

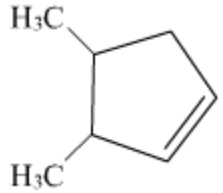


is obtainable from ozonolysis of which of the following cyclic compounds ?

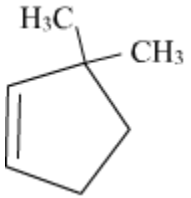
(1)



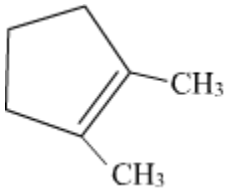
(2)



(3)

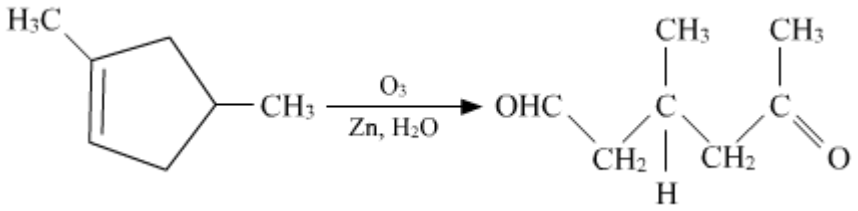


(4)



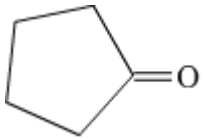
Sol:

Reaction



Hence, the correct option is (1).

82. Treatment of cyclopentanone



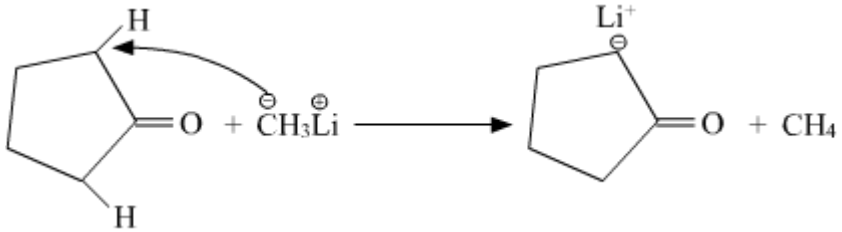
with methyl lithium gives which of the following species ?

(1) Cyclopentanonyl anion
(2) Cyclopentanonyl cation
(3) Cyclopentanonyl radical
(4) Cyclopentanonyl biradical

Sol:

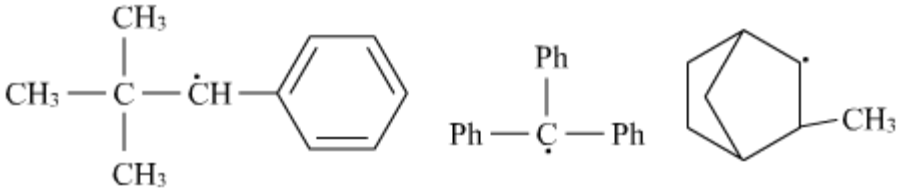
Methyl lithium (CH_3Li) is strong base which have property to abstract proton from organic compound and form carbanion. When cyclopentanone treated with CH_3Li it gives cyclopentanonyl anion.

Reaction



Hence, the correct option is (1).

83. Consider the following compounds



(I) (II) (III)

Hyperconjugation occurs in:

(1) I only
(2) II only
(3) III only
(4) I and III

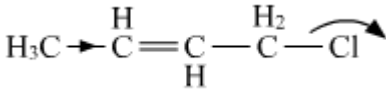
Sol:

Hyperconjugation occurs due to the presence of α−H(s) in the structure. Among the given structures of organic compounds, structure I and II have absence of α−H. Only structure III has available α−Hs. Therefore, hyperconjugation occurs in only compound III.

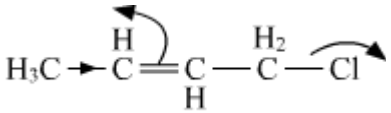
Hence, the correct option is (3).

84. Which of the following is the most correct electron displacement for a nucleophilic reaction to take place ?

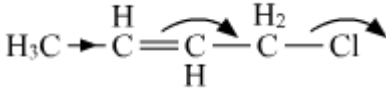
(1)



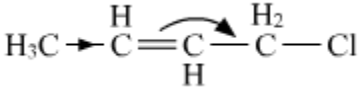
(2)



(3)

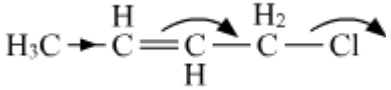


(4)



Sol:

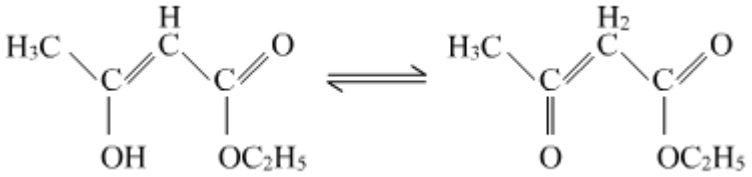
Among the given electron displacements for a nucleophilic reaction, the electron displacement shown as



represents the most correct electron displacement.

Hence, the correct option is (3).

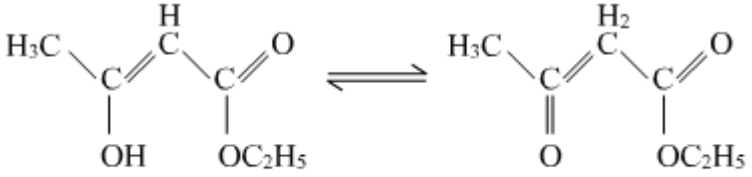
85. The enolic form of ethyl acetoacetate as below has :



(1) 18 sigma bonds and 2 pi - bonds
(2) 16 sigma bonds and 1 pi - bond
(3) 9 sigma bonds and 2 pi - bonds
(4) 9 sigma bonds and 1 pi - bond

Sol:

Keto-enol structure of ethyl acetoacetate as below has:

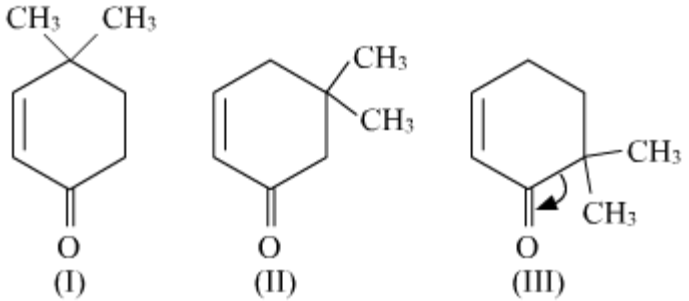


Enol form Keto form

The enolic form of ethyl acetoacetate possess16 sigma bonds (single bonds) and 2 pi bonds (double bonds).

Hence, the correct option is (2).

86. Given :



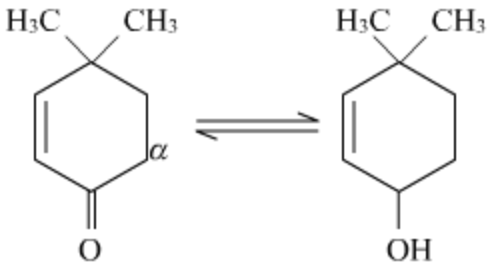
Which of the given compounds can exhibit tautomerism ?

(1) I and II
(2) I and III
(3) II and III
(4) I, II and III

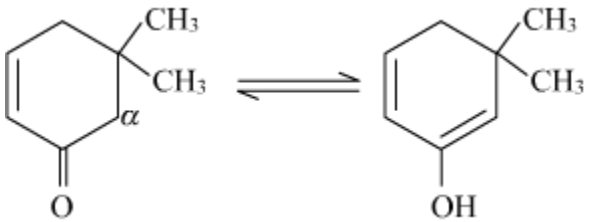
Sol:

For keto-enol tautomerism, the keto form must possess α−hydrogen. In some case absence of α−hydrogen, y−hydrogen also participate in tautomerism.

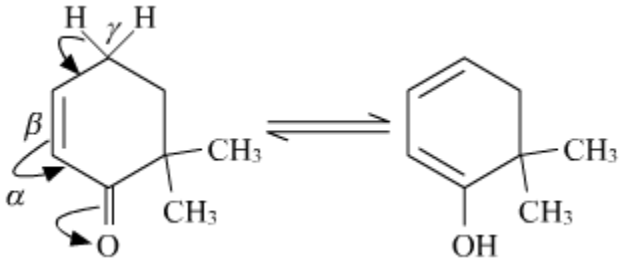
(I)



(II)

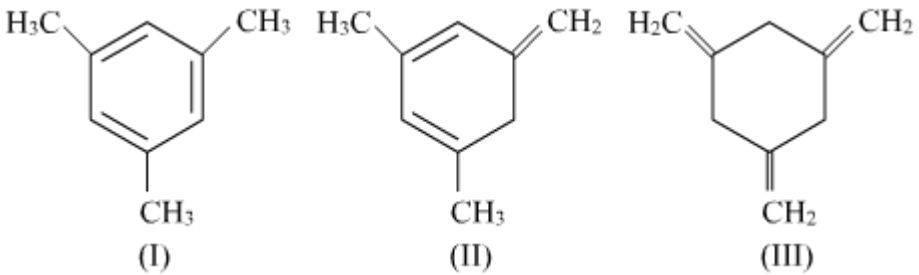


(III)



Hence, the correct option is (4).

87. Given :



(I) (II) (III)

The enthalpy of hydrogenation of these compounds will be in the order as :

(1) I>II>III

(2) III>II>I
(3) II>III>I
(4) II>I>III

Sol:

Enthalpy of hydrogenation can be predict on the basis of stability of alkene. Enthalpy of hydrogenation is inversely proportional to stability of alkene. Therefore, the correct order of enthalpy of hydrogenation of the given compound is *III* > *II* > *I*.

Hence, the correct option is (2).

88. Biodegradable polymer which can be produced from glycine and aminocaproic acid is :

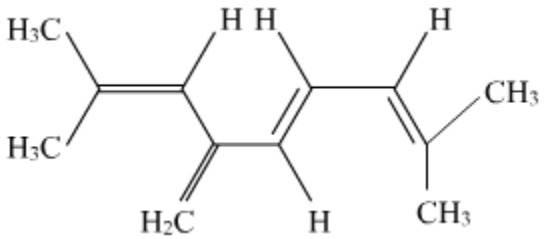
(1) Nylon 2 - nylon 6
(2) PHBV
(3) Buna - N
(4) Nylon 6, 6

Sol:

It is an alternating polyamide copolymer of glycine *COOH*) and amino caproic acid] and is biodegradable
Biodegradable polymer nylon-2-nylon-6 can be produced by the polymerisation of glycine ($H_2N{-}CH_2{-}$COOH) and aminocaproic acid ($H_2N\ (CH_2)_5\ COOH$.

Hence, the correct option is (1).

89. The total number of π - bond electrons in the following structure is :



(1) 4
(2) 8
(3) 12
(4) 16

Sol:

In the given organic compound, 4π bond's, therefore total number of π-electrons are 8.

Hence, the correct option is (2).

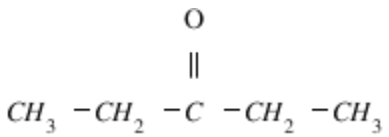
90. An organic compound '*X*' having molecular formula $C_5H_{10}O$ yields phenyl hydrazone and gives negative response to the Iodoform test and Tollen's test. It produces n-pentane on reduction. '*X*' could be :

(1) pentanal
(2) 2-pentanone
(3) 3-pentanone
(4) n-amyl alcohol

Sol:

Condition for iodoform test, must present terminal $-CH_3$ group. Similarly condition for Tollen's test, $-CHO$ group is required. So, organic compound *X* is 2-pentanone.

Therefore, as per question the structure would be



Hence, the correct option is (2).