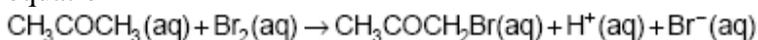


AIPMT 2008

Examination Paper Solutions

CHEMISTRY

58. The bromination of acetone that occurs in acid solution is represented by this equation



These kinetic data were obtained for given reaction concentrations

Initial concentrations, M		
$[\text{CH}_3\text{COCH}_3]$	$[\text{Br}_2]$	$[\text{H}^+]$
0.30	0.05	0.05
0.30	0.10	0.05
0.30	0.10	0.10
0.40	0.05	0.20
Initial rate, disappearance of Br_2 , M s^{-1}		
	5.7×10^{-5}	
	5.7×10^{-5}	
	1.2×10^{-4}	
	3.1×10^{-4}	

Based on these data, the rate equation is

- (1) Rate = $k[\text{CH}_3\text{COCH}_3][\text{Br}_2][\text{H}^+]$
- (2) Rate = $k[\text{CH}_3\text{COCH}_3][\text{H}^+]$
- (3) Rate = $k[\text{CH}_3\text{COCH}_3][\text{Br}_2]$
- (4) Rate = $k[\text{CH}_3\text{COCH}_3][\text{Br}_2][\text{H}^+]^2$

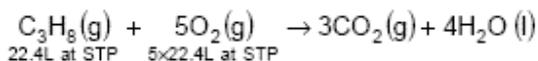
Sol. Answer (2)

In experiment (1) and (2), rate doesn't depend on the concentration of Br_2 . So, rate expression will not include $[\text{Br}_2]$.

59. What volume of oxygen gas (O_2) measured at 0°C and 1 atm, is needed to burn completely 1 L of propane gas (C_3H_8) measured under the same conditions?

- (1) 10 L
- (2) 7 L
- (3) 6 L
- (4) 5 L

Sol. Answer (4)



$\therefore 22.4 \text{ L C}_3\text{H}_8 \text{ at STP} \equiv 5 \times 22.4 \text{ L of O}_2 \text{ at STP}$

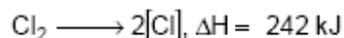
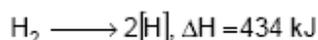
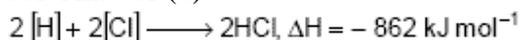
$\therefore 1 \text{ L C}_3\text{H}_8 \text{ at STP} \equiv \frac{5 \times 22.4}{22.4} \text{ of O}_2 \text{ at STP}$

$= 5 \text{ L of O}_2 \text{ at NTP}$

60. Bond dissociation enthalpy of H_2 , Cl_2 and HCl are 434, 242 and 431 kJ mol^{-1} respectively. Enthalpy of formation of HCl is

- (1) 245 kJ mol^{-1}
- (2) 93 kJ mol^{-1}
- (3) -245 kJ mol^{-1}
- (4) -93 kJ mol^{-1}

Sol. Answer (4)



$$\therefore \Delta H_f \text{ of HCl} = \frac{-186}{2} = -93 \text{ kJ mol}^{-1}$$

61. Which of the following statements is not correct?

- (1) The number of Bravais lattices in which a crystal can be categorized is 14
- (2) The fraction of the total volume occupied by the atoms in a primitive cell is 0.48
- (3) Molecular solids are generally volatile
- (4) The number of carbon atoms in a unit cell of diamond is 4

Sol. Answer (4)

Diamond has ZnS type structure. So, no. of atoms in a unit cell of diamond is 8.

Note : But option (2) is also incorrect because the fraction of the total volume occupied by the atoms in a cubic primitive cells is 0.524.

62. Equal volumes of three acid solutions of pH 3, 4 and 5 are mixed in a vessel. What will be the H^+ ion concentration in the mixture?

- (1) $1.11 \times 10^{-3} \text{ M}$
- (2) $1.11 \times 10^{-4} \text{ M}$
- (3) $3.7 \times 10^{-4} \text{ M}$
- (4) $3.7 \times 10^{-3} \text{ M}$

Sol. Answer (3)

$$N_1V_1 + N_2V_2 + N_3V_3 = N_mV_m$$

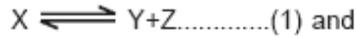
$$\text{or } 10^{-3} \times 1 + 10^{-4} \times 1 + 10^{-5} \times 1 = N_m \times 3$$

$$\text{or } 1.11 \times 10^{-3} = N_m \times 3$$

$$\text{or } N_m = 0.37 \times 10^{-3}$$

$$[H^+] = 3.7 \times 10^{-4} \text{ M}$$

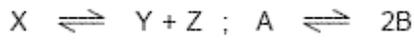
63. The values of K_{p1} and K_{p2} for the reactions



are in ratio of 9:1. If degree of dissociation of X and A be equal, then total pressure at equilibrium (1) and (2) are in the ratio

- (1) 1 : 1
- (2) 3 : 1
- (3) 1 : 9
- (4) 36 : 1

Sol. Answer (4)



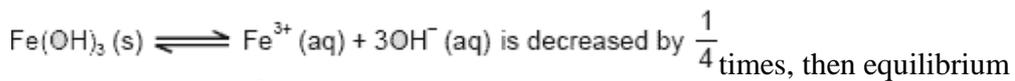
$$\begin{array}{cccccc} 1 & & 0 & 0 & 1 & & 0 \\ 1-x & & x & x & 1-x & & 2x \end{array}$$

$$\frac{K_{p1}}{K_{p2}} = \frac{\left(\frac{x}{1+x} \times P\right)^2}{\frac{1-x}{1+x} \times P} \div \frac{\left(\frac{2x}{1+x} \times P'\right)^2}{\frac{1-x}{1+x} \times P'}$$

$$\text{or } \frac{K_{p1}}{K_{p2}} = \frac{P}{4P'} \quad \text{or } \frac{9}{1} = \frac{P}{4P'}$$

$$\text{or } \frac{P'}{P} = 36 : 1$$

64. If the concentration of OH^- ions in the reaction



concentration of Fe^{3+} will increase by

- (1) 4 times
- (2) 8 times
- (3) 16 times
- (4) 64 times

Sol. Answer (4)

To maintain the constant value of K_c , the concentration of Fe^{3+} ion will increase by 64 times.

65. For the gas phase reaction, $\text{PCl}_5(\text{g}) \rightleftharpoons \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$ Which of the following conditions is correct?

- (1) $\Delta H > 0$ and $\Delta S < 0$
- (2) $\Delta H = 0$ and $\Delta S < 0$
- (3) $\Delta H > 0$ and $\Delta S > 0$
- (4) $\Delta H < 0$ and $\Delta S < 0$

Sol. Answer (3)

This is an endothermic reaction,

So, $\Delta H > 0$

Since, number of mole in the product side is more

So $\Delta S > 0$.

66. The rate constants k_1 and k_2 for two different reactions are $10^{16} \cdot e^{-2000/T}$ and $10^{15} \cdot e^{-1000/T}$ respectively. The temperature at which $k_1 = k_2$ is

- (1) $\frac{1000}{2.303} \text{K}$
- (2) 1000 K
- (3) $\frac{2000}{2.303} \text{K}$
- (4) 2000 K

Sol. Answer (1)

$$K_1 = 10^{16} e^{-\frac{2000}{T}}$$

$$\text{or } \log K_1 = 16 - \frac{2000}{2.303T}$$

$$K_2 = 10^{15} e^{-\frac{1000}{T}}$$

$$\text{or } \log K_2 = 15 - \frac{1000}{2.303T}$$

$$\text{If } T = \frac{1000}{2.303} \text{K, then } K_1 = K_2$$

67. Standard free energies of formation (in kJ/mol) at 298 K are -237.2, -394.4 and -8.2 for $\text{H}_2\text{O}(\text{l})$, $\text{CO}_2(\text{g})$ and pentane (g) respectively. The value of E°_{cell} for the pentane-oxygen fuel cell is

- (1) 0.0968 V
- (2) 1.968 V

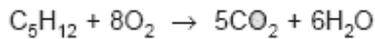
(3) 2.0968 V

(4) 1.0968 V

Sol. Answer (4)

After calculation ΔG° , use the formula, $\Delta G^\circ = -nFE^\circ$

Here, $n = 32$ is taken because balanced equation is



68. The dissociation equilibrium of a gas AB_2 can be represented as,

$2AB_2(g) \rightleftharpoons 2AB(g) + B_2(g)$. The degree of dissociation is 'x' and is small compared to 1. The expression relating the degree of dissociation (x) with equilibrium constant K_P and total pressure P is

(1) $\left(\frac{K_P}{P}\right)$

(2) $\left(\frac{2K_P}{P}\right)$

(3) $\left(\frac{2K_P}{P}\right)^{1/3}$

(4) $\left(\frac{2K_P}{P}\right)^{1/2}$

Sol. Answer (3)



$$1 \qquad \qquad 0 \qquad 0$$

$$1 - x \qquad \qquad x \qquad x/2$$

$$\text{Total mole at equi.} = 1 + \frac{x}{2}$$

$$\therefore K_P = \frac{\left(\frac{x}{1+x/2} \times P\right)^2 \left(\frac{x/2}{1+x/2} \times P\right)}{\left(\frac{1-x}{1+x/2} \times P\right)^2} \quad (\text{Here } x \text{ is degree of dissociation})$$

$$\text{or } K_P = \frac{x^3 P}{2}$$

$$\text{or } x^3 = \frac{2K_P}{P}$$

$$\text{or } x = \left(\frac{2K_P}{P}\right)^{1/3}$$

69. The sequence of ionic mobility in aqueous solution is

(1) $Na^+ > K^+ > Rb^+ > Cs^+$

- (2) $K^+ > Na^+ > Rb^+ > Cs^+$
 (3) $Cs^+ > Rb^+ > K^+ > Na^+$
 (4) $Rb^+ > K^+ > Cs^+ > Na^+$

Sol. Answer (3)

More the charge density of ion, more will be the ion-dipole interaction, so more will be hydration of ion and hence less will be the ionic mobility.

70. Percentage of free space in a body centred cubic unit cell is

- (1) 28%
 (2) 30%
 (3) 32%
 (4) 34%

Sol. Answer (3)

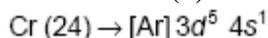
32%

In BCC, packing fraction is 68%.

71. The correct order of decreasing second ionisation enthalpy of Ti (22), V (23), Cr (24) and Mn (25) is

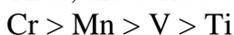
- (1) $Ti > V > Cr > Mn$
 (2) $Cr > Mn > V > Ti$
 (3) $V > Mn > Cr > Ti$
 (4) $Mn > Cr > Ti > V$

Sol. Answer (2)



After removing one electron from chromium, the resulting structure becomes more stable. Hence Cr has higher second ionisation enthalpy.

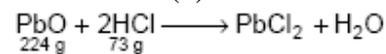
Thus, the correct order is



72. How many moles of lead (II) chloride will be formed from a reaction between 6.5 g of PbO and 3.2 g of HCl?

- (1) 0.029
 (2) 0.044
 (3) 0.333
 (4) 0.011

Sol. Answer (1)



Here, HCl is in excess, hence, PbO is the limiting reactant.

$\therefore 224 \text{ g PbO} \equiv 1 \text{ mole PbCl}_2$

$$\begin{aligned} \therefore 6.5 \text{ g PbO} &= \frac{6.5}{224} \text{ mole PbCl}_2 \\ &= 0.029 \text{ mole} \end{aligned}$$

73. Which of the following complexes exhibits the highest paramagnetic behaviour?

Where gly = glycine, en = ethylenediamine and bpy = bipyridyl moities). (At. number Ti = 22, V = 23, Fe = 26, Co = 27)

- (1) $[\text{Ti}(\text{NH}_3)_6]^{3+}$
- (2) $[\text{V}(\text{gly})_2(\text{OH})_2(\text{NH}_3)_2]^+$
- (3) $[\text{Fe}(\text{en})(\text{bpy})(\text{NH}_3)_2]^{2+}$
- (4) $[\text{Co}(\text{OX})_2(\text{OH})_2]^-$

Sol. Answer (4)

74. Volume occupied by one molecule of water (density = 1 g cm^{-3}) is

- (1) $5.5 \times 10^{-23} \text{ cm}^3$
- (2) $9.0 \times 10^{-23} \text{ cm}^3$
- (3) $6.023 \times 10^{-23} \text{ cm}^3$
- (4) $3.0 \times 10^{-23} \text{ cm}^3$

Sol. Answer (4)

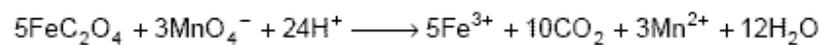
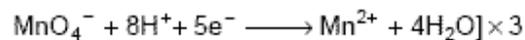
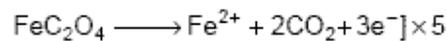
$$\text{Volume of 1 molecule of H}_2\text{O} = \frac{18 \text{ g}}{6.02 \times 10^{23} \times 1 \text{ g/cc}}$$

$$\cong 3.0 \times 10^{-23} \text{ cm}^3$$

75. Number of moles of MnO_4^- required to oxidize one mole of ferrous oxalate completely in acidic medium will be

- (1) 0.2 moles
- (2) 0.6 moles
- (3) 0.4 moles
- (4) 7.5 moles

Sol. Answer (2)



$$5 \text{ mol FeC}_2\text{O}_4 \cong 3 \text{ mol MnO}_4^-$$

$$\therefore 1 \text{ mol FeC}_2\text{O}_4 \cong \frac{3}{5} \text{ mol MnO}_4^-$$

$$= 0.6 \text{ mol MnO}_4^-$$

76. On the basis of the following E° values, the strongest oxidizing agent is



- (1) $[\text{Fe}(\text{CN})_6]^{3-}$
- (2) $[\text{Fe}(\text{CN})_6]^{4-}$
- (3) Fe^{2+}
- (4) Fe^{3+}

77. The alkali metals from salt-like hydrides by the direct synthesis at elevated

temperature. The thermal stability of these hydrides decreases in which of the following orders?

- (1) $\text{LiH} > \text{NaH} > \text{KH} > \text{RbH} > \text{CsH}$
- (2) $\text{CsH} > \text{RbH} > \text{KH} > \text{NaH} > \text{LiH}$
- (3) $\text{KH} > \text{NaH} > \text{LiH} > \text{CsH} > \text{RbH}$
- (4) $\text{NaH} > \text{LiH} > \text{KH} > \text{RbH} > \text{CsH}$

Sol. Answer (1)

78. Which one of the following arrangements does not give the correct picture of the trends indicated against it?

- (1) $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$: Electronegativity
- (2) $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$: Oxidizing power
- (3) $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$: Electron gain enthalpy
- (4) $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$: Bond dissociation energy

Sol. Answer (4)

79. With which one of the following elements silicon should be doped so as to give p-type of semiconductor?

- (1) Boron
- (2) Germanium
- (3) Arsenic
- (4) Selenium

Sol. Answer (1)

80. In which of the following coordination entities the magnitude of ΔO (CFSE in octahedral field) will be maximum (at. no. Co = 27)?

- (1) $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$
- (2) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$
- (3) $[\text{Co}(\text{NH}_3)_6]^{3+}$
- (4) $[\text{Co}(\text{CN})_6]^{3-}$

Sol. Answer (4)

81. The angular shape of molecule (O_3) consists of

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

Sol. Answer (1)

82. The correct order of increasing bond angles in the following triatomic species is

- (1) $\text{NO}_2^+ < \text{NO}_2^- < \text{NO}_2$
- (2) $\text{NO}_2^- < \text{NO}_2^+ < \text{NO}_2$
- (3) $\text{NO}_2^- < \text{NO}_2 < \text{NO}_2^+$
- (4) $\text{NO}_2^+ < \text{NO}_2 < \text{NO}_2^-$

Sol. Answer (3)

83. Four diatomic species are listed below the different sequences. Which of these presents the correct order of their increasing bond order?

- (1) $\text{He}_2^+ < \text{O}_2^- < \text{NO} < \text{C}_2^{2-}$
- (2) $\text{O}_2^- < \text{NO} < \text{C}_2^{2-} < \text{He}_2^+$
- (3) $\text{NO} < \text{C}_2^{2-} < \text{O}_2^- < \text{He}_2^+$
- (4) $\text{C}_2^{2-} < \text{He}_2^+ < \text{NO} < \text{O}_2^-$

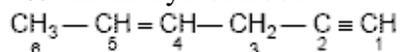
Sol. Answer (1)

84. Equimolar solutions of the following were prepared in water separately. Which one of the solutions will record the highest pH?

- (1) CaCl_2
- (2) SrCl_2
- (3) BaCl_2
- (4) MgCl_2

Sol. Answer (3)

85. In the hydrocarbon



The state of hybridization of carbons 1, 3 and 5 are in the following sequence

- (1) $\text{sp}^3, \text{sp}^2, \text{sp}$
- (2) $\text{sp}^2, \text{sp}, \text{sp}^3$
- (3) $\text{sp}, \text{sp}^3, \text{sp}^2$
- (4) $\text{sp}, \text{sp}^2, \text{sp}^3$

Sol. Answer (3)

86. Green chemistry means such reactions which

- (1) Study the reactions in plants
- (2) Produce colour during reactions
- (3) Reduce the use and production of hazardous chemicals
- (4) Are related to the depletion of ozone layer

Sol. Answer (3)

87. A strong base abstract an α -hydrogen from

- (1) Alkane
- (2) Alkene
- (3) Amine
- (4) Ketone

Sol. Answer (4)

88. How many stereoisomers does the molecules have?

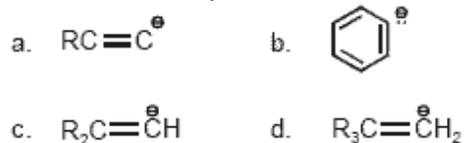


- (1) 2
- (2) 4

- (3) 6
(4) 8

Sol. Answer (2)

89. The stability of carbanions in the following

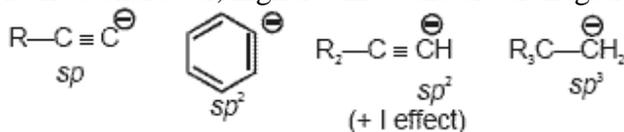


is in the order of

- (1) $a > c > b > d$
(2) $a > b > c > d$
(3) $b > c > d > a$
(4) $d > b > c > a$

Sol. Answer (2)

Higher is the electronegativity of atom higher will be stability of carbanion on it. Higher is the s-character, higher will be the electronegativity of atom.



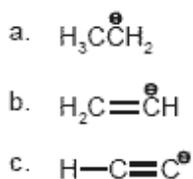
90. The relative reactivities of acyl compounds towards nucleophilic substitution are in the order of

- (1) Acyl chloride > Ester > Acid anhydride > Amide
(2) Acyl chloride > Acid anhydride > Ester > Amide
(3) Ester > Acyl chloride > Amide > Acid anhydride
(4) Acid anhydride > Amide > Ester > Acyl chloride

Sol. Answer (2)

Better is the leaving group higher will be the reactivity of acyl compounds towards nucleophilic acyl substitution. Weaker is the base, better is the leaving group. Weaker bases are derived from stronger acids.

91. Base strength of



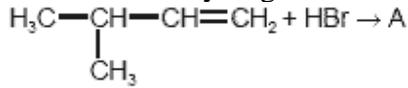
is in the order of

- (1) $a > b > c$
(2) $b > a > c$
(3) $c > b > a$
(4) $a > c > b$

Sol. Answer (1)

Stronger is the conjugate acid weaker will be corresponding conjugate base. Acidity of conjugate acids of given carbanions is $\text{c} < \text{b} < \text{a}$

Thus order of basicity of given carbanions will be $\text{a} > \text{b} > \text{c}$



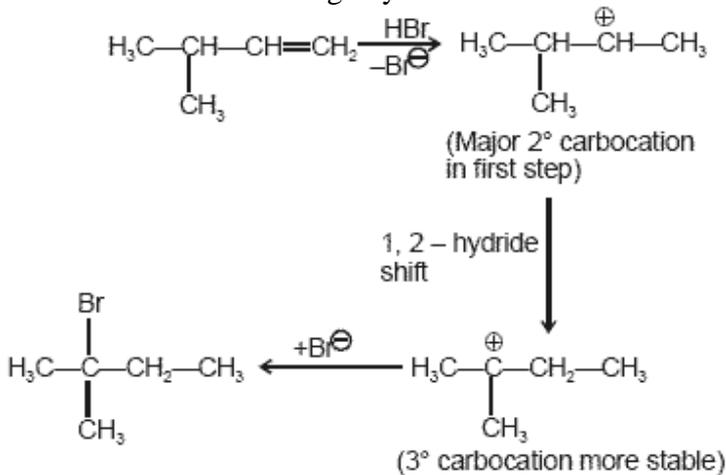
92.

A (predominantly) is

- (1) $\text{CH}_3-\underset{\text{CH}_3}{\text{CH}}-\underset{\text{Br}}{\text{CH}}-\text{CH}_3$
- (2) $\text{CH}_3-\underset{\text{CH}_3}{\text{CH}}-\text{CH}_2-\text{CH}_2\text{Br}$
- (3) $\text{CH}_3-\underset{\text{CH}_3}{\text{C}}(\text{Br})-\text{CH}_2\text{CH}_3$
- (4) $\text{CH}_3-\underset{\text{Br}}{\text{CH}}-\underset{\text{CH}_3}{\text{CH}}-\text{CH}_3$

Sol. Answer (3)

Reaction is electrophilic addition which proceeds through carbocation reaction intermediate which undergo hydride shift.



93. In DNA, the complimentary bases are

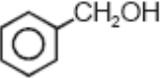
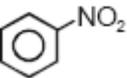
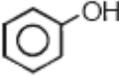
- (1) Uracil and adenine; cytosine and guanine
 (2) Adenine and thymine; guanine and cytosine
 (3) Adenine and thymine; guanine and uracil
 (4) Adenine and guanine; thymine and cytosine

Sol. Answer (2)

A === T

G === C

94. Which one the following is most reactive towards electrophilic attack?

- (1) 
- (2) 
- (3) 
- (4) 

Sol. Answer (4)

Hydroxy group is most activating group among given options, towards electrophilic attack.

95. An organic compound contains carbon, hydrogen and oxygen. Its elemental analysis gave C, 38.71% and H, 9.67%. The empirical formula of the compound would be

- (1) CH₄O
 (2) CH₃O
 (3) CH₂O
 (4) CHO

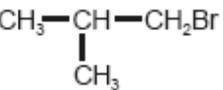
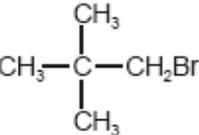
Sol. Answer (2)

<u>Element</u>	<u>Percentage</u>	<u>Molar ratio</u>	<u>Simple molar ratio</u>
C	38.71	3.22	1
H	9.67	9.67	3
O	51.62	3.22	1

96. In a S_N2 substitution reaction of the type



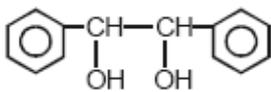
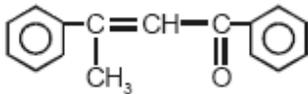
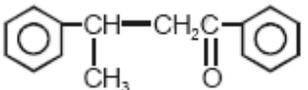
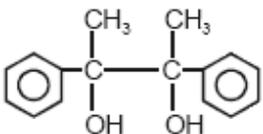
Which one of the following has the highest relative rate?

- (1) CH₃CH₂Br
- (2) CH₃-CH₂-CH₂Br
- (3) 
- (4) 

Sol. Answer (1)

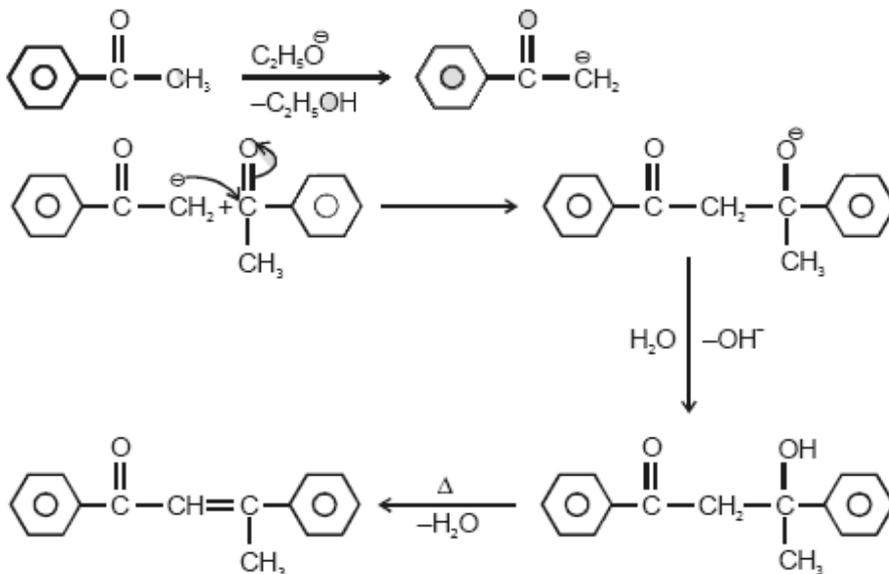
For S_N2 reaction, there should be low steric hinderance for better reactivity.

97. Acetophenone when reacted with a base, C₂H₅ONa, yields a stable compound which has the structure?

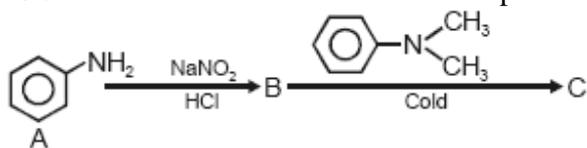
- (1) 
- (2) 
- (3) 
- (4) 

Sol. Answer (2)

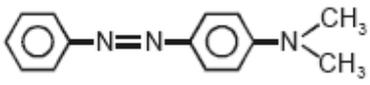
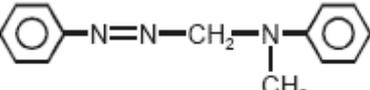
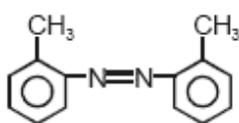
It show condensation reaction

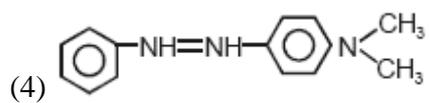


98. In a reaction of aniline a coloured product C was obtained.



The structure of C would be

- (1) 
- (2) 
- (3) 



Sol. Answer (1)

Diazotisation followed electrophilic substitution at para position.

