Note: ***FIITJEE solutions to IIT–JEE, 2005 Screening Test is based on Screening Test paper created using memory retention of select FIITJEE students appeared in this test and hence may not exactly be the same as the original paper. However, every effort has been made to reproduce the original paper in the interest of the aspiring students.***

FIITJEE *solutions to IIT–JEE, 2005 Screening*

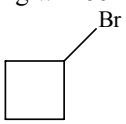
CHEMISTRY

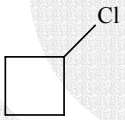
29. When Phenyl Magnesium Bromide reacts with tert. butanol, which of the following is formed?
(A) Tert. butyl methyl ether (B) Benzene
(C) Tert. butyl benzene (D) Phenol

Ans. **B**

Sol. $PhMgBr + Me_3COH \longrightarrow Ph - H + Me_3COMgBr$

30. 1–bromo–3–chlorocyclobutane when treated with two equivalents of Na, in the presence of ether which of the following will be formed?

(A) 

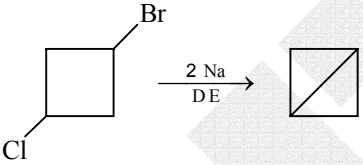
(B) 

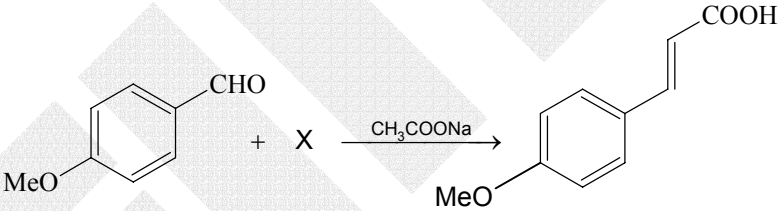
(C) 

(D) 

Ans. **D**

Sol. It is an intramolecular Wurtz reaction.



31. 

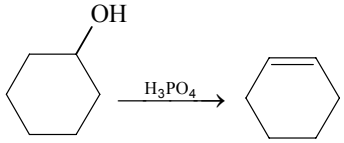
What is X?
(A) CH_3COOH (B) $BrCH_2.COOH$
(C) $(CH_3CO)_2O$ (D) CHO – COOH

Ans. **C**

Sol. $p-MeO-Ph-CHO + (AcO)_2O \xrightarrow{CH_3COONa} p-MeO-Ph(CH=CH-COOH)$

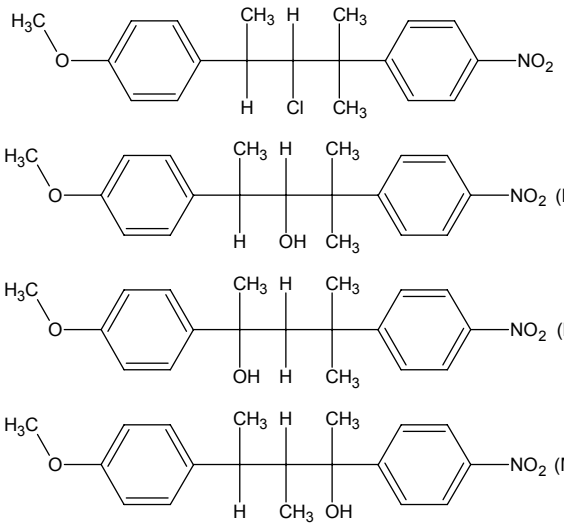
32. Cyclohexene is best prepared from cyclohexanol by which of the following:
(A) conc. H_3PO_4 (B) conc. HCl / $ZnCl_2$
(C) conc. HCl (D) conc. HBr

Ans. **A**

Sol. 

H_3PO_4 acts as dehydrating agent.

IIT-JEE-2005-S-2

33.  on hydrolysis in aqueous acetone gives,

It mainly gives:

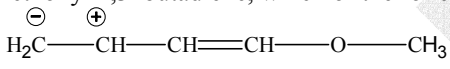
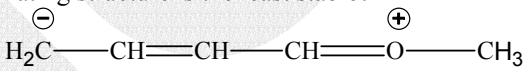
(A) K and L (B) Only K

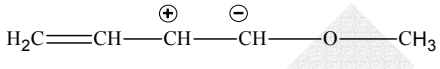
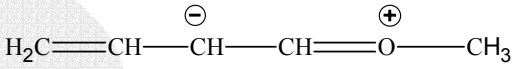
(C) L and M (D) Only M

Ans. **A**

Sol. S_N1 and S_N2, both reactions are possible due to aqueous acetone solution.

34. For 1–methoxy–1,3–butadiene, which of the following resonating structure is the least stable?

(A)  (B) 

(C)  (D) 

Ans. **C**

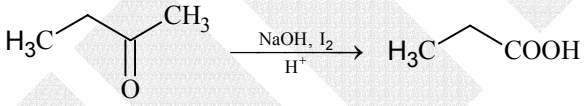
Sol. Point of difference is nature of carbanion. 2^o carbanions are less stable than 1^o – carbanions generally.

35. But–2–one can be converted to propanoic acid by which of the following:

(A) NaOH, NaI / H^+ (B) Fehling Solution

(C) NaOH, I_2 / H^+ (D) Tollen's reagent

Ans. **C**

Sol. 

Iodoform test.

36. Two forms of D – glucopyranose, are called.

(A) Enantiomers (B) Anomers

(C) Epimers (D) Diastereomers

Ans. **B**

Sol. D – glucopyranose is cyclic form of glucose. Around C – 1 (Newly formed chiral centre, due to cycle formation) two isomers are observed. They are called as α and β – Anomers.

37. Which of the following pair is expected to exhibit same colour in solution?

(A) $VOCl_2$; $FeCl_2$ (B) $CuCl_2$; $VOCl_2$

(C) $MnCl_2$; $FeCl_2$ (D) $FeCl_2$; $CuCl_2$

Ans. **B**

Sol. V^{4+} and Cu^{2+} both have one unpaired electron available.

38. Which of the following isomers of phosphorus is thermodynamically most stable?

(A) Red (B) White

(C) Black (D) Yellow

Ans. **C**

Sol. Due to layered structure in Black phosphorous, it is most stable.

39. A metal nitrate gives black ppt. with KI and on adding excess of KI it gives orange colour. It is:
(A) Hg^{+2} (B) Bi^{+3}
(C) Sn^{+2} (D) Pb^{+2}

Ans. **B**

Sol. $Bi^{+3} + KI \longrightarrow BiI_3 \downarrow$
Black

$BiI_3 + KI \longrightarrow K[BiI_4]$
Orange solution

40. Which of the following will not be oxidised by O_3?
(A) KI (B) $FeSO_4$
(C) $KMnO_4$ (D) K_2MnO_4

Ans. **C**

Sol. $KMnO_4$ can't be oxidised by any oxidising agents. Mn is in maximum possible oxidation state of VI.

41. Which type of isomerism is shown by $Co(NH_3)_4Br_2Cl$?
(A) Geometrical and Ionisation (B) Optical and Ionisation
(C) Geometrical and Optical (D) Geometrical only

Ans. **A**

Sol. $[Co(NH_3)_4(Br)_2]Cl$ can show both Geometrical and Ionisation isomerism.

42. Which of the following FCC structure contains cations in alternate tetrahedral voids?
(A) NaCl (B) ZnS
(C) Na_2O (D) CaF_2

Ans. **B**

Sol. In ZnS, Anions (S^{-2}) are placed in fcc manner and cations (Zn^{+2}) are placed in alternate tetrahedral voids.

43. The elevation in boiling point, when 13.44 g of freshly prepared $CuCl_2$ are added to one kilogram of water, is. [Some useful data, Kb = 0.52 kg K mol^{-1}, molecular weight of $CuCl_2$ = 134.4 gm].
(A) 0.05 (B) 0.1
(C) 0.16 (D) 0.21

Ans. **C**

Sol. $\Delta T_b = i \times K_b \times m = 3 \times 0.52 \times \left(\frac{13.44}{134.4} \times \frac{1000}{1000}\right) = 0.16$

44. The half cell reactions for rusting of iron are:

$2H^+ + \frac{1}{2}O_2 + 2e^- \longrightarrow H_2O; E^0 = +1.23V$, $Fe^{2+} + 2e^- \longrightarrow Fe_{(S)}; E^0 = -0.44V$

ΔG^0 (in kJ) for the reaction is:
(A) – 76 (B) –322
(C) – 122 (D) – 176

Ans. **B**

Sol. $2H^+ + \frac{1}{2}O_2 + 2e^- \longrightarrow H_2O;\ E^o = +1.23\ V$

$Fe^{+2} + 2e^- \longrightarrow Fe_{(s)};\ E^o = -0.44\ V$

$Fe_{(s)} + 2H^+ + \frac{1}{2}O_2 \longrightarrow Fe^{+2} + H_2O;\ E^o_{cell} = 1.67\ V$

$\Delta G^o = -n\,F\,E^o_{cell} = -2 \times 96.500 \times 1.67 = -322\ kJ$

45. The number of radial nodes in 3s and 2p respectively are:
(A) 2 and 0 (B) 1 and 2
(C) 0 and 2 (D) 2 and 1

Ans. **A**

Sol. Number of radial nodes $= n - \ell - 1$
so, for 3s: 3 – 0 – 1 = 2
For 2p: 2 – 1 – 1 = 0

46. Which of the following ore contains both Copper and Iron?
(A) Cuprite (B) Chalcocite
(C) Chalcopyrite (D) Malachite

Ans. **C**

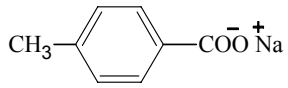
Sol. Chalcopyrite ($CuFeS_2$)

47. A pale blue liquid which obtained by equi molar mixture of two gases at -30^oC is:
(A) N_2O (B) N_2O_3
(C) N_2O_4 (D) N_2O_5

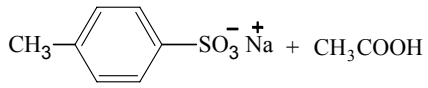
Ans. **B**

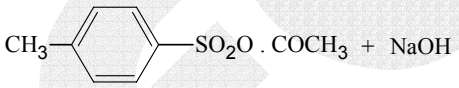
Sol. $NO + NO_2 \xrightarrow{-30^oC} N_2O_3$
Pale blue colour

48. Which of the following is obtained when 4 – Methylbenzenesulphonicacid is hydrolysed with excess of sodium acetate?

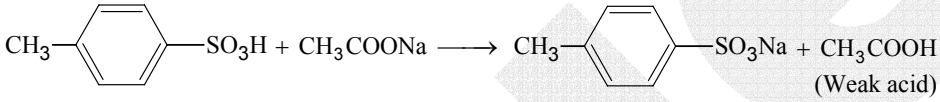
(A) 

(B) 

(C) 

(D) 

Ans. **C**

Sol. 
(Strong acid) (Weak acid)

Above reaction is acid base reaction.

49. $CH_3.NH_2$ (0.1 mole, $K_b = 5 \times 10^{-4}$) is added to 0 .08 moles of HCl and the solution is diluted to one litre, resulting hydrogen ion concentration is:
(A) 1.6×10^{-11} (B) 8×10^{-11}
(C) 5×10^{-5} (D) 8×10^{-2}

Ans. **B**

Sol.

$$CH_3NH_2 + HCl \longrightarrow CH_3\overset{\oplus}{N}H_3 + Cl^-$$

Initially	0.1	0.08	–
In solution	0.02	–	0.08

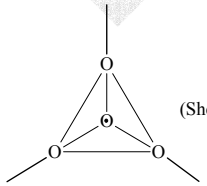
$$[OH^-] = K_b \frac{[CH_3NH_2]}{[CH_3NH_3^+]}$$

$$[OH^-] = \frac{5\times10^{-4}\times0.02}{0.08} = \frac{5}{4}\times10^{-4}$$

$$[H^+] = \frac{K_w}{[OH^-]} = \frac{10^{-14}\times4}{5\times10^{-4}} = 8\times10^{-11}$$

50. Which silicates is formed from $[SiO_4]^{4-}$, tetrahedral units by sharing 3 oxygen atoms?
(A) Sheet silicates (B) Pyro silicates
(C) Linear chain silicates (D) 3 dimensional silicates

Ans. **A**

Sol. 
(Sheet structure)

51. Which gas is evolved when PbO_2 is treated with conc. HNO_3?
(A) NO_2 (B) O_2
(C) N_2 (D) N_2O

Ans. **B**

Sol. $PbO_2 + 2HNO_3 \longrightarrow Pb(NO_3)_3 + H_2O + \frac{1}{2}O_2$

52. If helium and methane are allowed to diffuse out of the container under the similar conditions of temperature and pressure, then the ratio of rate of diffusion of helium to methane is:

(A) 2.0 (B) 1.0

(C) 0.5 (D) 4.0

Ans. **A**

Sol. $\frac{r_{He}}{r_{CH_4}} = \sqrt{\frac{16}{4}} = 2:1$

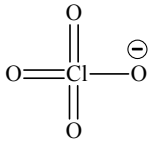
53. Which of the following contains maximum number of lone pairs on the central atom?

(A) ClO_3^- (B) XeF_4

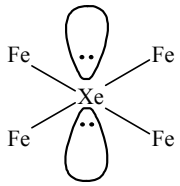
(C) SF_4 (D) I_3^-

Ans. **D**

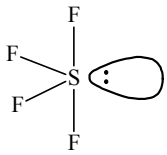
Sol.



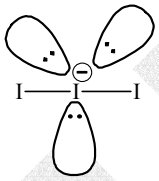
, (No lone pair)



, (Two lone pair)



, (One lone pair)



, (Three lone pair)

54. Which of the following is correct for lyophilic sols?

(A) They are irreversible

(B) They are formed by inorganic substances

(C) They are readily coagulated by addition of electrolytes

(D) They are self stabilized

Ans. **D**

Sol. Lyophilic sols are solvent loving in nature. Due to this property, such kind of sols are self stabilised.

55. Which of the following statement is incorrect about order of reaction?

(A) Order of reaction is determined experimentally

(B) It is the sum of power of concentration terms in the rate law expression

(C) It does not necessarily depend on stoichiometric coefficients

(D) Order of the reaction can not have fractional value.

Ans. **D**

Sol. Order of reaction is determined experimentally. It may be fractional.

56. One mole of monoatomic ideal gas expands adiabatically at initial temperature T against a constant external pressure of 1 atm. from one litre to two litre. Find out the final temperature (R = 0.0821 lt. atm K^{-1} $mole^{-1}$)

(A) T (B) $\frac{T}{(2)^{\frac{5}{3}-1}}$

(C) $T-\frac{2}{3\times 0.0821}$ (D) $T+\frac{2}{3\times 0.0821}$

Ans. **C**

Sol. Work done against constant external pressure $= P_{ext}(V_2 - V_1)$

In adiabatic condition $\Delta q = 0$ therefore $w = \Delta u$

$\therefore -P_{ext}(V_2 - V_1) = \frac{3}{2}R(T_2 - T_1)$ [Expansion work is negative]

On solving, $T_2 = T_1 - \frac{2}{3\times 0.0821}$.