Target IIT-JAM-2019

Test Series-7

FULL LENGTH TEST SERIES-1 **Booklet Code: G**

Duration: 3:00 Hours **CHEMISTRY-CY** **Date: 20-01-2019**

Maximum Marks: 100

Read the following instructions carefully:

1 Attempt all the questions.

2. **Section-A** contains **30** Multiple Choice Questions (MCQ). Each question has 4 choices (a), (b), (c) and (d), for its answer, out of which **ONLY ONE** is correct. From **Q.1 to Q.10** carries 1 Marks and **Q.11 to Q.3**0 carries 2 Marks each.

3. **Section-B** contains **10** Multiple Select Questions(MSQ). Each question has 4 choices (a), (b), (c) and (d) for its answer, out of which **ONE or MORE than ONE** is/are correct. For each correct answer you will be awarded **2 marks.**

4. Section-**C** contains **20** Numerical Answer Type (NAT) questions. From **Q.41 to Q.50** carries **1 Mark** each and **Q.51 to Q.60** carries **2 Marks** each. For each NAT type question, the value of answer in between 0 to 9.

5. In all sections, questions not attempted will result in zero mark. In Section–A (MCQ), wrong answer will result in negative marks. For all **1 mark** questions, **1/3 marks** will be deducted for each wrong answer. For all **2 marks** questions, **2/3 marks** will be deducted for each wrong answer. In Section–B (MSQ),there is no negative and no partial marking provision. There is no negative marking in Section –C (NAT) as well.

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Section-A : Multiple Choice Questions (MCQ)

Q.1 to Q.10: Carry 1 Mark each.

1. In the following atomic orbital which one having two radial node and two angular node is
   (a) 2d (b) 3s (c) 5d (d) 2p

2. The ΔH for the reversible isothermal expansion of one-mole of an ideal gas at 27°C from a volume of 10 dm^3 to a volume of 20 dm^3 is
   (a) –10 joule (b) –1000 joule (c) zero (d) all of these

3. Which of the following complex has maximum value of wavelength of absorption (λ_{max})?
   (a) $[Rh(CN)_6]^{3-}$ (b) $[RhI_6]^{3-}$ (c) $[CoI_6]^{3-}$ (d) $[Ir(CN)_6]^{3-}$

4. The number of microstates for Cr^{3+} is
   (a) 120 (b) 45 (c) 60 (d) 210

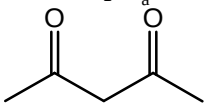
5. In the following decay process,

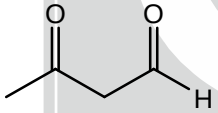
   $$^{238}_{92}U \xrightarrow{-\alpha} A \xrightarrow{-\alpha} B \xrightarrow{-\beta^0_{-1}} C$$

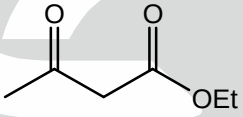
   The number of neutrons in C is
   (a) 144 (b) 142 (c) 141 (d) 146

6. Total number of non-planar species among the following NO_3^-, AsO_3^{3-}, ClO_3^-, SO_3^{2-}, CO_3^{2-} are
   (a) 2 (b) 5 (c) 4 (d) 3

7. Correct pK_a values order of the given compounds is


(A)


(B)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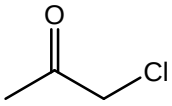
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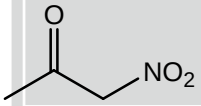
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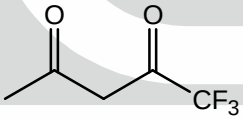
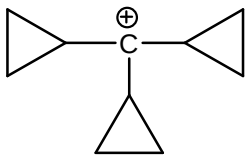
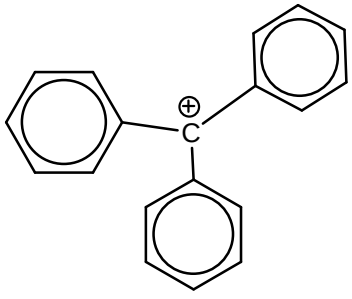
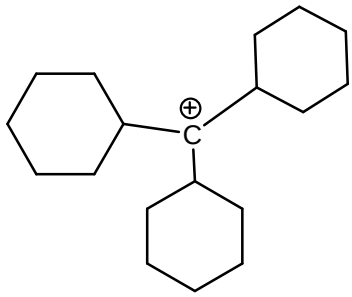

(F)

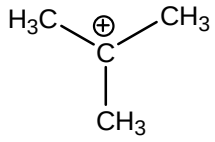
   (a) A > B > C > D > E > F (b) D > C > A > B > E > F
   (c) F > E > B > A > C > D (d) D > C > A > B > F > E

8. Which one among the following carbocation has the longest half-life?

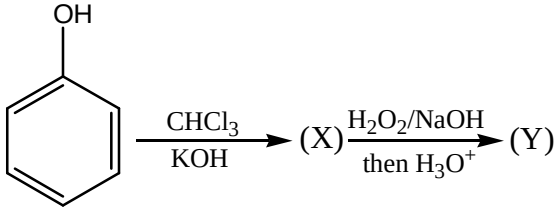
(a) 

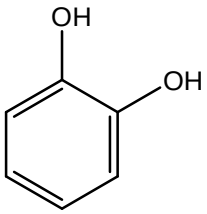
(b) 

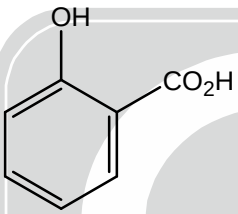
(c) 

(d) 

9. The major product (Y) is



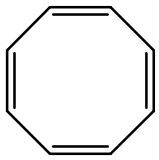
(a) 

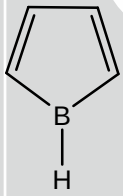
(b) 

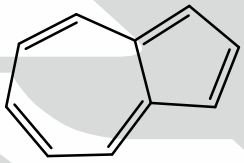
(c) 

(d) 

10. Antiaromatic compound among the following is

(a) 

(b) 

(c) 

(d) 

Q.11 to Q.30: Carry 2 Marks each.

11. Nitrous oxide $N_2O(g)$ decomposes into $N_2(g)$ and $O_2(g)$. If the reaction is first order then the rate constant in term of initial pressure (P_i) and total pressure (P_T) is

(a) $kt = \ln\left(\frac{P_i}{2P_T - 2P_i}\right)$ (b) $kt = \ln\left(\frac{P_i}{3P_i - 2P_T}\right)$ (c) $kt = \ln\left(\frac{P_i}{P_i + P/2}\right)$ (d) None of these

12. If the position of the electron is measured within an accuracy of $\pm 0.0025\ nm$, then the minimum uncertainty in the momentum of the electron is

(a) $105.51\times10^{-25}\,kgms^{-1}$ (b) $211.02\times10^{-25}\,kgms^{-1}$

(c) $422.04\times10^{-25}\,kgms^{-1}$ (d) zero

13. The commutator $\left[p_x, x^2\right]$ is equal to

(a) $(-i\hbar)2x$ (b) $(i\hbar)2x$ (c) $2x$ (d) $(i\hbar)2$

14. Which of the following statement(s) is/are correct when a molecule behave like anharmonic oscillator
(a) Ground state energy is zero
(b) Energy levels are equally spaced
(c) Anharmonicity constant is zero
(d) At high vibrational quantum number oscillator does not exist.

15. If $d_{hk\ell}$ is the spacing of successive lattice planes in a simple cubic crystal for Miller indices (*hkl*). Which of the following is true?

(a) $d_{123} > d_{213}$ (b) $d_{101} > d_{111}$ (c) $d_{310} < d_{320}$ (d) $d_{121} > d_{211}$

16. Which of the following is/are not assumption(s) of kinetic theory of gases?
(a) Particles moves in all directions in straight line
(b) Collisions of gas molecules are elastic
(c) Particles may have different average kinetic energies
(d) μ_{rms} for any gaseous moleucle is proportional to its mass.

17. Which of the following nitrosyl complex has least value of $\bar{\nu}_{NO}(cm^{-1})$?

(a) $[NiCp(NO)]$ (b) $[Co(CO)_3NO]$ (c) $[Mn(CO)_4(NO)]$ (d) $[Cr(Cp)_2(NO)_2]$

18. The ground state term for low spin d^5 and high spin d^5s^1 are :

(a) ^6S and ^7S (b) ^2I and ^7S (c) ^6S and ^4F (d) ^2I and ^4F

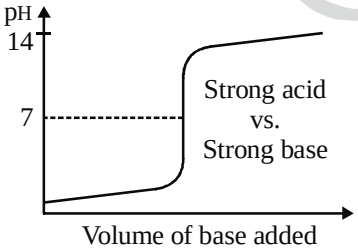
19. Which of the following statement is incorrect for hemerythrin ?
(a) The two Fe(III) ions present in oxyhemerythrin are in same environment.
(b) Oxyhemerythrin is diamagnetic and EPR inactive
(c) The proton form the hydroxo bridge shifts to the bound peroxide resulting in HO_2^- group.
(d) It consist of the two iron active site connected by three bridging groups.

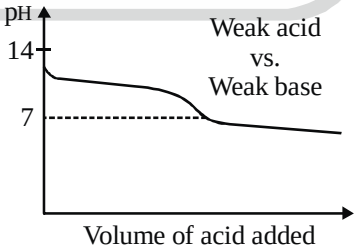
20. Out of the following trichlorides the pair which will hydrolysed to give oxychloride as product is :

(a) NCl_3, $SbCl_3$ (b) $SbCl_3$, $BiCl_3$ (c) PCl_3, $AsCl_3$ (d) $AsCl_3$, $BiCl_3$

21. Which of the following statement is INCORRECT ?
(a) H_2S is a stronger acid as compared to water.
(b) $(H_2F)^+$ and $(HF_2)^-$ are self - ionizable products of HF in liquid state.
(c) $SbF_5 \cdot HF$ is a weaker acid as compared to HSO_3F.
(d) Acetic acid behaves as a base in sulphuric acid.

22. Which of the following acid-base titration curve is incorrect ?

(a)


(b)


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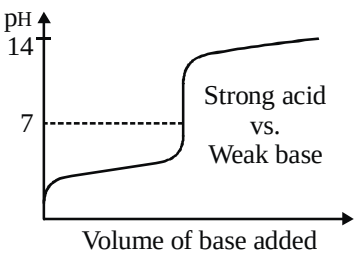
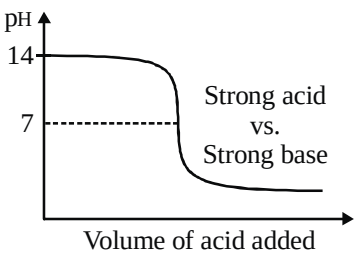
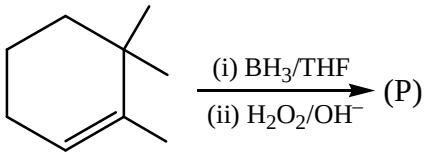


(d)


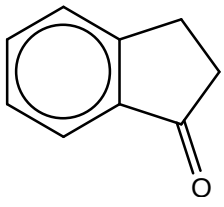
23. The correct major product (P) formed in the following reaction sequence is

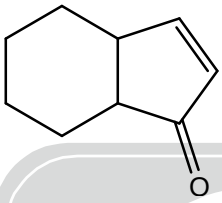


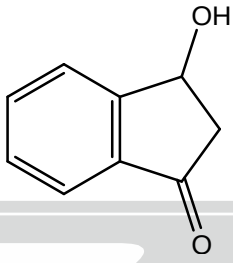
(a) (1R, 2S)-2, 3, 3-trimethyl cyclohexanol (b) (R)-1, 2, 2-trimethylcyclohexanol

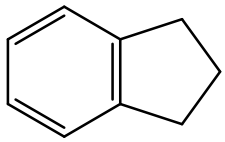
(c) (1S, 2S)-2, 3, 3-trimethylcyclohexanol (d) (S)-1, 2, 2-trimethylcyclohexanol

24. Treatment of benzene with CO/HCl in the presence of anhydrous $AlCl_3$/CuCl followed by reaction with Ac_2O/NaOAc gives compound (X) as the major product. The Compound (X) upon reaction with Br_2/Na_2CO_3, followed by heating at 473K with moist KOH furnishes Y as the major product. The reaction of (X) with H_2/Pd-C followed by H_3PO_4 treatment gives Z as the major product. The compound (Z) is

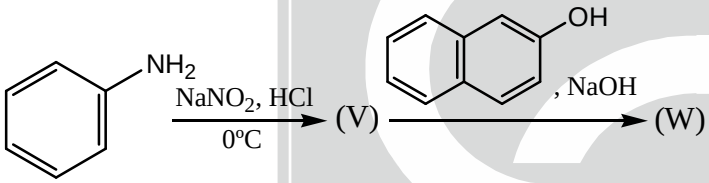
(a) 

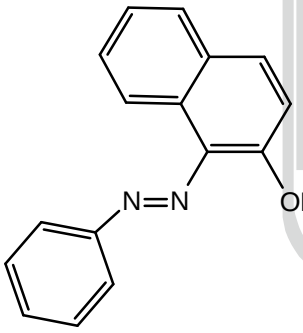
(b) 

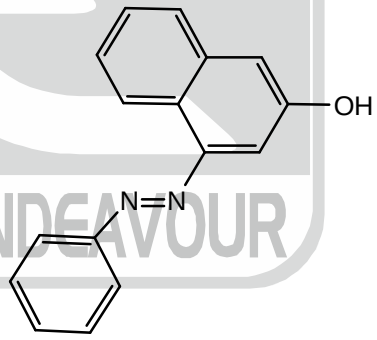
(c) 

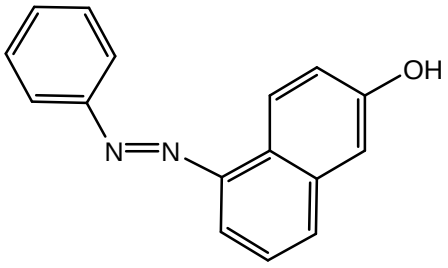
(d) 

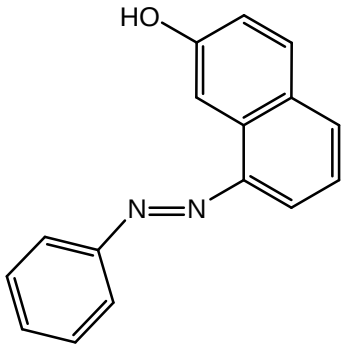
25. In the following reaction, the major product (W) is



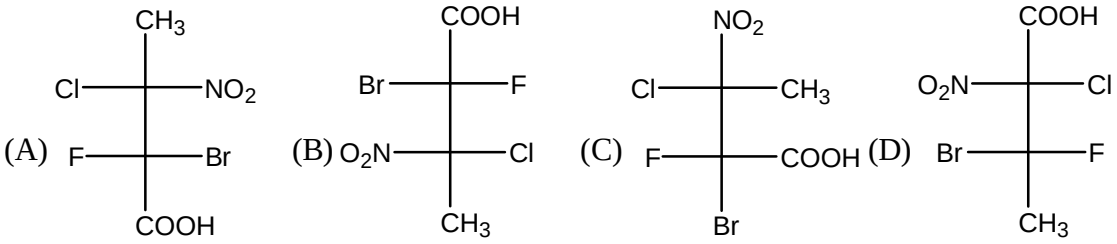
(a) 

(b) 

(c) 

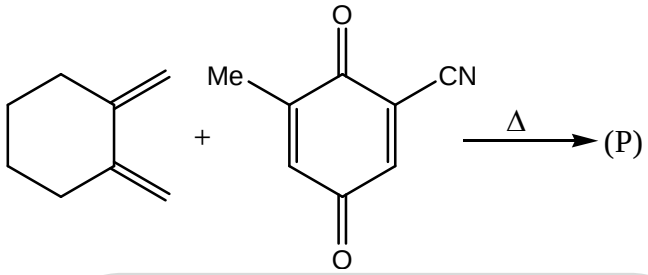
(b) 

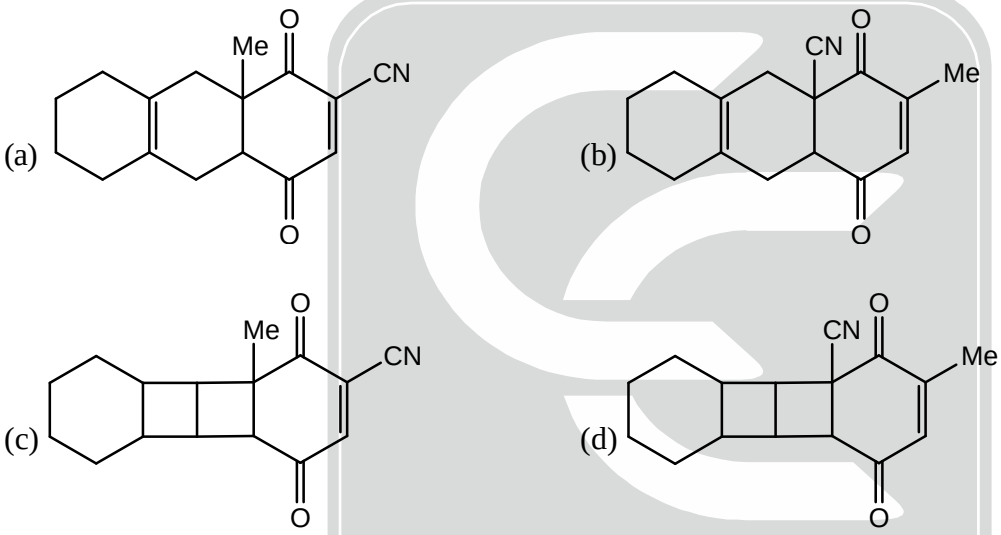
26. The incorrect option regarding the compound (A-D) is



(a) A and B are homomer
(b) A and C are enantiomers
(c) A and D are constitutional isomers
(d) B and C are diastereoisomers

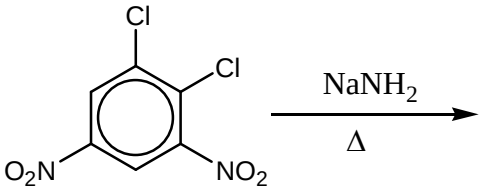
27. The major product (P) formed in the following reaction

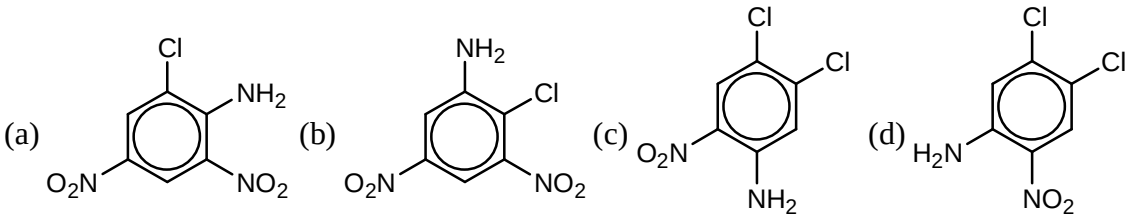




28. Which of the following is the example of epimers?
(a) Glucose and Galactose
(b) Glucose and Ribose
(c) Sucrose and Glucose
(d) Fructose and Glucose

29.



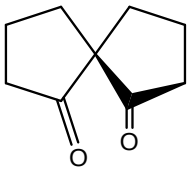


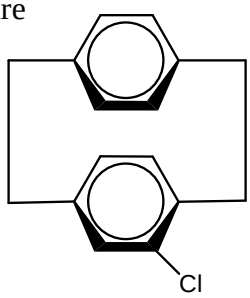
30. A compound of formula C_5H_{12} gives 1 signal in the ^1H NMR and 2-signal in the ^{13}C NMR. The compound is
(a) n-pentane
(b) 2-methyl butane
(c) 2, 2-dimethylpropane
(d) 2-pentene

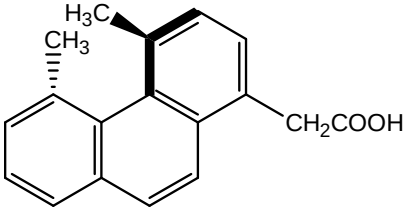
Section-B : Multiple Select Questions (MSQ)

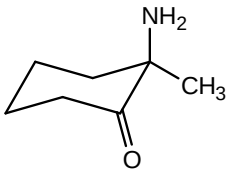
Q.31 to Q.40: Carry 2 Marks each.

31. Correct statement among the following is/are

(P) 

(Q) 

(R) 

(S) 

(a) Compound (P) having (R) configuration
(b) Compound (Q) having (S) configuration
(c) Compound (R) having (M) configuration
(d) Compound (S) having (R) configuration

32. Which of the following statements are not correct
(a) The cell potential becomes half if the cell reaction is divided by 2 throughout
(b) The dependence of electrode potential for the electrode $M^{+n}|M$ with conc. under STP conditions is given by the expression, $E = E^0 + \frac{0.059}{n}\log\left[M^{+n}\right]$

(c) $\Delta G = \Delta H - nFT\left(\frac{\partial E}{\partial T}\right)_P$

(d) The cell potential $Na^+ + e^- \longrightarrow Na$ is negative.

33. An ideal gas is compressed reversibly and adiabatically. The correct statement(s) is/are
(a) Temperature will increases (b) Internal energy will increases
(c) Entropy will increases (d) Pressure will increases

34. The reaction(s) is/are correct among the following :

(a) $P_4 + 3NaOH + 3H_2O \rightarrow 3NaH_2PO_2 + PH_3$

(b) $P_2O_3 + 3H_2O \rightarrow 2H_3PO_3$

(c) $B_2H_6 + 2NH_3 \rightarrow [BH_2(NH_3)_2]^+ + BH_4^-$

(d) $B_2H_6 + 2NMe_3 \rightarrow [BH_2(NMe_3)_2]^+ + BH_4^-$

35. Which of the following order is/are correct for given properties?

(a) $NEt_3 < C_2H_4 < C_2F_4 < CO$ (π – acidity order)

(b) $CO > NO_2^- > Cl^- > NH_3$ (Trans – effect)

(c) $d_{x^2-y^2} > d_{z^2} > d_{xy} > d_{yz} = d_{xz}$ (tetragonal elongation splitting)

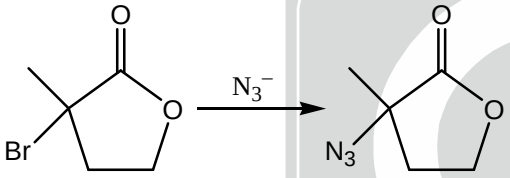
(d) phen > en > gly > OH^- (value of Δ_0)

36. Which statement(s) is/are correct regarding the catalysis reaction?
(a) Rate of hydrogenation of cis-alkenes is greater than that of trans alkenes
(b) CuCl is used as cocatalyst which reoxidizes Pd(0) back to Pd(II)
(c) In hydroformylation process, the actual catalyst is 16 electron system
(d) Steric hinderance increases the rate of hydrogenation

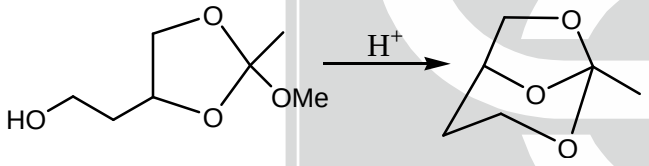
37. Which of the following option(s) is/are correct ?
(a) During O_2^+ formation, one electron is removed from the gerade molecular orbital.
(b) During N_2^+ formation, one electron is removed from the ungerade molecular orbital.
(c) During O_2^- formation, one electron is added to ungerade molecular orbital.
(d) During N_2^- formation, one electron is added to gerade molecular orbital.

38. Which of the following statement(s) is/are true regarding qualitative analysis?
(a) Conc. HCl can't be used in place of dil HCl as group reagent of Gp-I cations.
(b) If H_2S is used alone, then sulphides of Gp-IV cations will also get precipitated along with the precipitate of sulphides of Gp-II cations.
(c) $(NH_4)_2SO_4$ and NH_4NO_3 can be used in place of NH_4Cl with NH_4OH in the group reagent of Gp-III cations.
(d) NaOH can be used in place of NH_4OH with H_2S in the group reagent of Gp-IV cation.

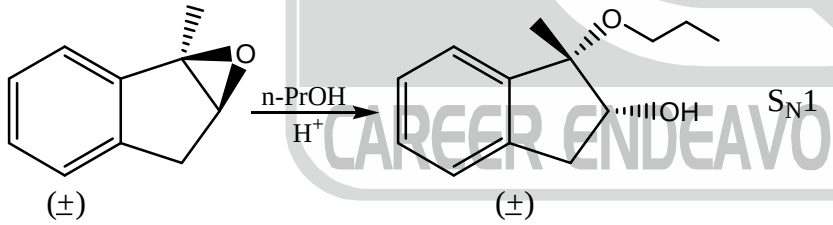
39. In the following reaction sequence, the major product formed with their respective mechanism(S_N1 or S_N2)

(a) 

S_N2

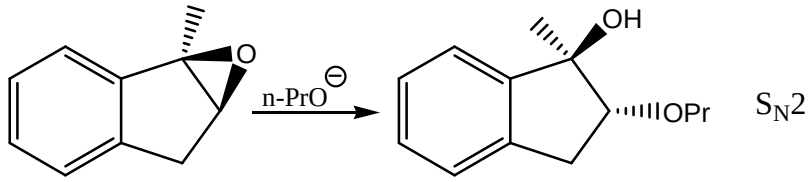
(b) 

S_N1

(c) 

S_N1

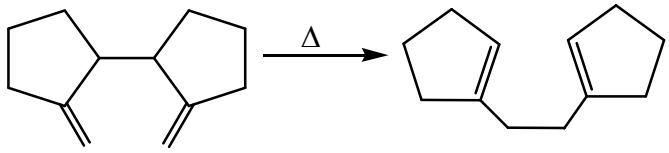
(±) (±)

(d) 

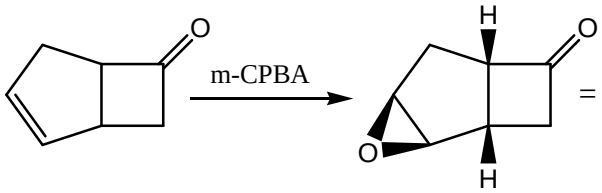
S_N2

(±) (±)

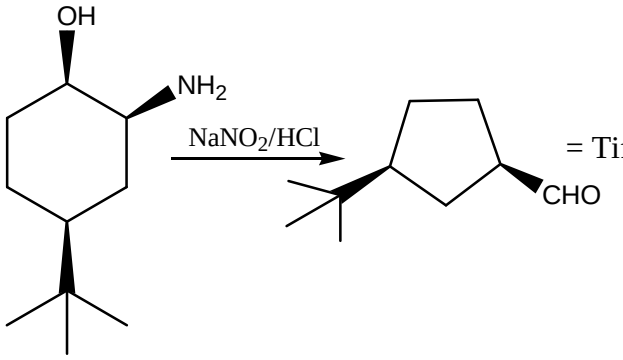
40. In the following, correct major product formed with their mentioned named reaction, respectively.

(a) 

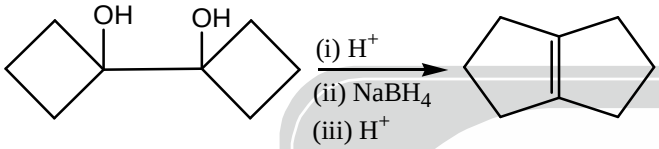
= Claisen rearrangement

(b) 

= Baeyer villiger oxidation

(c) 

= Tiffeneau Demjanov rearrangement

(d) 

= Pinacol-Pinacolone rearrangement

Section-C : Numerical Answer Type (NAT)

Q.41 to Q.50: Carry 1 Mark each.

41. In a given cell, solution A transmits 42% and solution B transmits 85% of radiation having a certain wavelength. The transmittance at the same wavelength of a solution made by mixing 35 cm^3 solution A and 55 cm^3 solution B if no reaction occurs is _____(Upto three decimal places)

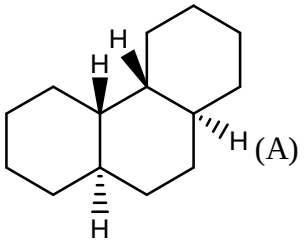
42. On the basis of Langmuir monolayer adsorption isotherm, the plot of P/V vs P will give a straight line having slope 0.009 and intercept 9. The value of constant k is _____$\times 10^{-3}$ torr. (answer should be integer).

43. A certain engine which operates in a carnot cycle absorb 3.347 kJ at 400°C. The amount of work done by the engine per cycle at 100°C is _____kJ. (Upto two decimal places).

44. The mobilities of Na^+ (aq) and Cl^- (aq) at 298K are 4.26×10^{-8} and 6.80×10^{-8} $m^2V^{-1}s^{-1}$ respectively. The molar conductance at infinite dilution of an aqueous solution of NaCl at 298K is _____$\times10^{-2}Sm^2mol^{-1}$. (Upto two decimal places)

45. An aqueous dilute solution of 2.5% non-volatile solute exerts a pressure of 1.005 bar at the normal boiling point of the solvent. The molar mass of solute _____$gmol^{-1}$. (Upto two decimal places)

46. ^{13}C NMR signals in the following compound (A) is/are _____(answer should be an integer)



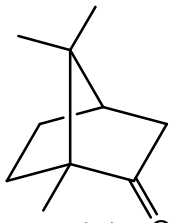
(A)

47. The number of optically active isomers for $[Co(en)(NH_3)_2Cl_2]^+$ is _____. (answer should be an integer).

48. The number of M – M bonds per metal in $Ru_3(CO)_{12}$ is _____. (answer should be an integer).

49. The ionisation potential of Be^{x+} is 217.6 eV/atom. The value of x is _____. (answer should be an integer).

50. Specific rotation of the given compound (X) is _____(Rounded upto one decimal place)



(X)

$a = 4.42^o$
$c = 0.1$ g/ml
$l = 10$ cm

Q.51 to Q.60: Carry 2 Marks each.

51. The reaction, $N_2O_5(g) \rightleftharpoons 2NO_2(g) + \frac{1}{2}O_2(g)$ is started with initial pressure of $N_2O_5(g)$ equal to 600 mm Hg. The fraction of $N_2O_5(g)$ decomposed when the total pressure of system is 960 mmHg is _____%. (Upto two decimal places).

52. The observed cell potential of the cell:

$$Pt\,|\,H_2(1\,atm)\,|\,H^+(3\times10^{-4}M)\,||\,H^+(C_1)\,|\,H_2(1\,atm)\,|\,Pt$$

at 298K is 0.154. The value of C_1 is _____M. (Upto three decimal places)

53. One mole of napthalene was burnt in oxygen gas at constant volume to give carbon dioxide gas and liquid water at 25°C. The heat evolved was found to be 5138.8 kJ. The enthalpy of reaction is _____$\times10^2$ kJ. (Upto two decimal places)

54. Copper has an FCC structure. If the atomic radius is 129.5 pm, then the lattice parameter is _____Å. (Upto two decimal places).

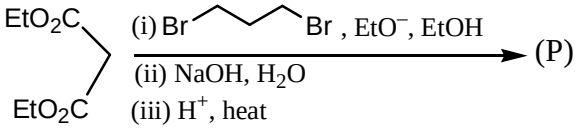
55. Out of the following sulphur based acids, $H_2S_2O_5$, $H_2S_2O_7$, $H_2S_2O_8$, $H_2S_2O_6$, H_2SO_5.
The total number of acids which produce H_2SO_4 as a product of hydrolysis is _____. (answer should be an integer).

56. For a metal ion having d^6 configuration in an octahedral complex, the magnitude of crystal field splitting is 32200 cm^{-1} and the electron pairing energy is 17600 cm^{-1}, the CFSE(in cm^{-1}) if strong field ligand environment is there will be _____(answer should be an integer).

57. 3-methyl-pent-2-ene on reaction with HBr in presence of peroxide forms an addition product. The number of possible stereoisomers for the product is/are _____(answer should be an integer).

58. The number of oxygen molecules in a one litre flask at 27°C and 5.78×10^{-3} mm of Hg pressure is _____$\times10^{17}$ (Upto two decimal places).

59. The total number of ^1H NMR signals in the major product (P) formed in the following reaction sequence is _____ (Answer should be an integer).



60. Reduction of D-xylose with $NaBH_4$ yield a product (X). The number of secondary alcohol present in compound (X) is/are _____(answer should be an integer).

******* END OF QUESTION PAPER *******

Space for Rough Work

IIT-JAM CHEMISTRY-CY

TEST SERIES - 7
(FULL LENGTH TEST-I)

Date : 19-01-2019

Booklet : G

ANSWER KEY

Section-A : Multiple Choice Questions (MCQ)

1. (.c)	**2.** (c)	**3.** (c)	**4.** (a)	**5.** (c)
6. (d)	**7.** (d)	**8.** (a)	**9.** (a)	**10.** (b)
11. (b)	**12.** (b)	**13.** (a)	**14.** (d)	**15.** (b)
16. (d)	**17.** (d)	**18.** (b)	**19.** (a)	**20.** (b)
21. (c)	**22.** (c)	**23.** (c)	**24.** (a)	**25.** (a)
26. (d)	**27.** (b)	**28.** (a)	**29.** (a)	**30.** (c)

Section-B : Multiple Select Questions (MSQ)

31. (a),(b),(d)	**32.** (a),(b)	**33.** (a),(b),(d)	**34.** (a),(b),(c)
35. (a),(b),(c),(d)	**36.** (a),(c)	**37.** (a),(b),(d)	**38.** (a),(b)
39. (a),(b),(c),(d)	**40.** (c),(d)		

Section-C : Numerical Answer Type (NAT)

41. (0.640 to 0.650)	**42.** (1)	**43.** (1.45 to 1.55)	**44.** (1.04 to 1.08)
45. (58.20 to 52.65)	**46.** (7)	**47.** (2)	**48.** (2)
49. (3)	**50.** (44.0 to 44.5)	**51.** (0.20 to 0.30)	**52.** (0.110 to 0.130)
53. (-51.50 to -51.40)	**54.** (3.60 to 3.70)	**55.** (4)	**56.** (-42080)
57. (4)	**58.** (1.80 to 1.90)	**59.** (4)	**60.** (3)