TEST SERIES GATE 2019

BOOKLET SERIES D

FULL LENGTH TEST SERIES

Paper Code: CY

Test Type: TEST SERIES

Duration: 3:00 Hours

CHEMISTRY-CY

Date: 23-01-2019

Maximum Marks: 100

Read the following instructions carefully:

1. Attempt all questions.
2. This question paper consists of **2 sections**, General Aptitude (GA) for **15 marks** and the subject specific GATE paper for **85 marks**. Both these sections are compulsory. The GA section consists of **10** questions. Question numbers 1 to 5 are of 1-mark each, while question numbers 6 to 10 are of 2-mark each.
   The subject specific GATE paper section consists of **55** questions, out of which question numbers 11 to 35 are of 1-mark each, while question numbers 36 to 65 are of 2-mark each.
3. The question paper may consist of questions of **multiple choice type** (MCQ) and **numerical answer type**.
4. Multiple choice type questions will have four choices against (a), (b), (c), (d), out of which only **ONE** is the correct answer.
5. For numerical answer type questions, each question will have a numerical answer and there will not be any choices.
6. All questions that are not attempted will result in zero marks. However, wrong answers for multiple choice type questions (MCQ) will result in **NEGATIVE** marks. For all MCQ questions a wrong answer will result in deduction of ⅓ marks for a **1-mark** question and ⅔ marks for a **2-mark** question.
7. There is **NO NEGATIVE MARKING** for questions of **NUMERICAL ANSWER TYPE**.
8. Non-programmable type Calculator is allowed

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Q.1-Q. 5 carry ONE mark each.

1. A two digit number becomes 175 % of itself when its digits are reversed. If the two digits differ by three, then the number is _____.

2. Population of a village in 2001 was 30,000. In the next year population of men increased by 15% and population of female increased by 20% and and the total population became 35, 000. Waht was the initial population of female of the village ?
(a) 15,000 (b) 10,000 (c) 12,000 (d) 8,000

3. In a private hostel there is food stock for 210 students. In day 1 there is one student, in day 2, there are two students, and each next day one new student continues to join the hostel, for how many days the hostel would be able to provide food for the students ?
(a) 15 (b) 12 (c) 21 (d) 20

4. The word 'errata' means
(a) in harmony (b) list of errors (c) last resort (d) to infinity

5. An expert judge in matters of taste is called
(a) cosmopolitan (b) nomad (c) connoisseur (d) agnostic

Q.6-Q. 10 carry TWO marks each.

6. If $x+\frac{1}{x}=1$, then what is the value of $\left(x^{12}+\frac{1}{x^{12}}\right)$
(a) 0 (b) 2 (c) 1 (d) –1

7. If in a certain code
'do' is coded as '35'
'her' is coded as '50'
What will be the code for 'him' ?
(a) 62 (b) 51 (c) 45 (d) 55

8. Mahesh drives from his house in motor bike and travels 8 km towards the north, then 6 km towards east and next he decides to travel 10 km after turning to his right. Next he turns to his left and walks 4 km and after that he again takes a left turn and walks for 10 km more to complete his journey. As compared to his starting point in which direction he is standing now?
(a) North-east (b) South east (c) North (d) South-West

9. In the following question, out of the four alternatives, select the alternative which best expresses the meaning of the idiom/phrase.
To keep the wolf away from the door
(a) Be safe from an evil person
(b) Have enough money to avert hunger or starvation
(c) Be afraid to take up challenges
(d) When poverty comes from the door, love flies out from the window

10. The act of killing for compassionate reasons is called _____
(a) Euthanasia (b) Vespacide (c) Avicide (d) Feticide

Q.11-Q.35 carry one mark each.

11. An organic molecule gives mass signals at m/z 178 (50%), 179 (8%) and 180 (0.6%). The approximate number of carbon in the molecule should be.
(a) Twelve (b) Fourteen (c) Twenty (d) Eighteen

12. The HCl molecule is well described by Morse potential with D_e (depth of the potential minima) = 5.33 eV, $\overline{\nu}_e = 2989.7\ cm^{-1}$ (wave number) and $\overline{\nu}_e x_e$ (Anharmonicity) $= 52.05\ cm^{-1}$. The depth of the potential minima De for DCl will be _____(in cm^{-1}). (answer should be an integer).

13. The number of microstates that are possible, when 4 particles are distributed in 6 states such that the resulting wave functions are antisymmetric with respect to exchange of the particles is _____(answer should be an integer).

14. The experimental ionisation energies of hydrogen and lithium atoms in their ground states are respectively 13.6 eV and 27.6 eV. The ground state energy of Li^{2+} ion atom in eV is _____(Upto one decimal places)

15. 2 mole of Helium is mixed with 3 moles of O_2 at 298K. The change in Gibbs free energy is _____kJ. (Upto two decimal places)

16. Match the items in Column-A with appropriate items in Column-B

Column-A	**Column-B**
(A) Urease	(I) Hemoglobin
(B) Vitamin B_{12}	(II) Nickel dependent enzymes
(C) PS-II	(III) Conversion of CO_2 to carbohydrate
(D) Bohr's effect	(IV) Myoglobin
	(V) Reduction of RNA-CH_2OH group to DNA –CH_2 group.
	(VI) Conversion of H_2O to O_2

(a) A-V, B-VI, C-III, D-I (b) A-II, B-VI, C-III, D-I
(c) A-II, B-V, C-VI, D-IV (d) A-II, B-V, C-VI, D-I

17. Which of the following sets represent the super acids:

(a) $SbF_6^- + H_2F^+, H_2SO_3F^+ + F_5SbOSO_2F^-$ (b) $SbF_6^- + H_2F^+, H_3SO_4^+ + SbF_6^-$

(c) $SbF_6^- + H_2F^+, H_3SO_4^+ + HF_2^-$ (d) $SbF_6^- + H_2F^+, H_2NO_3^+ + HF_2^-$

18. The statement which is not true with respect to boron nitride is
(a) Hexagonal boron nitride show similarity in structure and properties to graphite
(b) Cubic boron nitride show similarity in structure and properties to diamonds
(c) Boron nitride is white in colour
(d) Hexagonal boron nitride is electrical conductor like graphite

19. The pair of Lanthanoids that give blue colour in liq. NH_3?
(a) Eu and Ce (b) Eu and Yb (c) Yb and Ho (d) La and Lu

20. The low temperature ^{19}F NMR spectrum of IF_5 molecule in solution exhibit which of the following pattern? (Ignore any magnetic coupling effect to the iodine nucleus)
(a) One singlet (b) One doublet and one quintet
(c) One singlet and one quintet (d) One quartet and one triplet

21. The structure type and shape of $Os_5C(CO)_{15}$ is
(a) closo and octahedral (b) Nido and square pyramidal
(c) Arachano and octahedral (d) Nido and trigonal bipyramidal

22. Radon undergoes radioactive decay to ½ of its initial amount in 3.8 days. The time required for its decay to 1/8 of its initial amount is _____days. (Upto two decimal places).

23. The point group for AB_3X_3 molecule in facial form and meridonial form are
(a) C_{3v} and C_{2v} (b) C_{2v} and C_{4v} (c) C_{4h} and C_{4v} (d) C_{4h} and D_{4h}

24. Consider this data for LWBP

$k_m = 2\times10^{-4}\ moldm^{-3}$

$k_2 = 2\times10^{-2}\ s^{-1}$

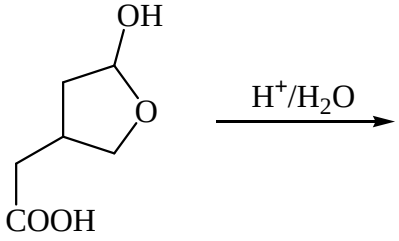
$[E]_0 = 10^{-4}\ moldm^{-3}$

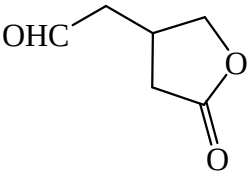
The value of reciprocal of slope is _____(in sec^{-1}).

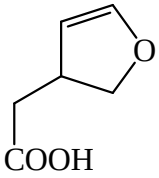
25. In a rigid rotor of mass M if the energy of the second excited state is 10 MeV then the fifth excited state energy (in MeV) is _____(answer should be an integer).

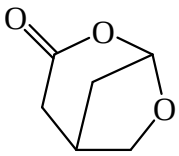
26. The structure factor in a BCC lattice for (111) planes is
(a) 4 (b) 3 (c) 2 (d) 0

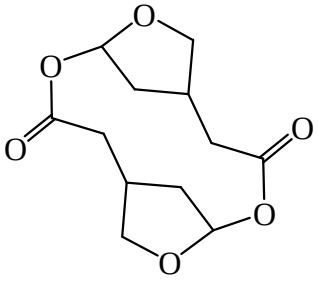
27. The major product formed in the following reaction is



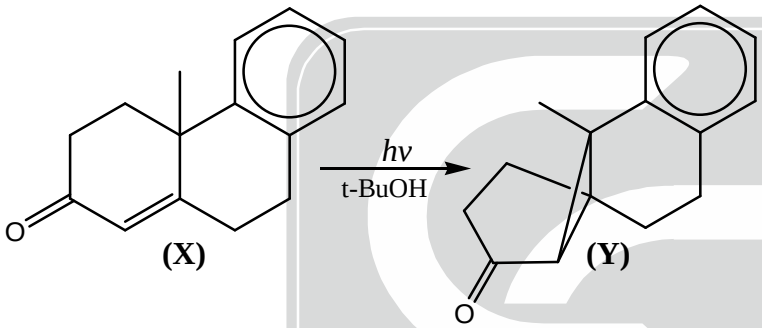
(a) 

(b) 

(c) 

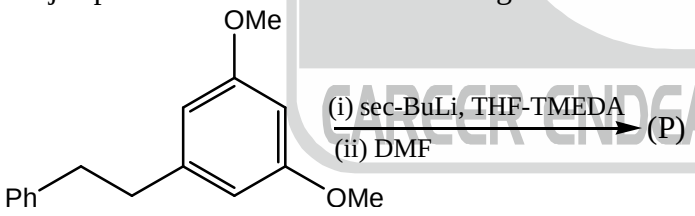
(d) 

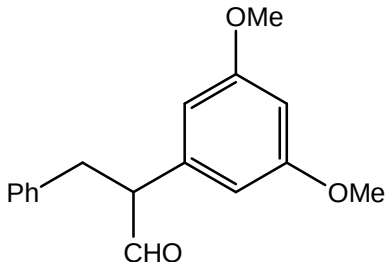
28. In the following, compound (X) converted into product (Y), the conversion is known as

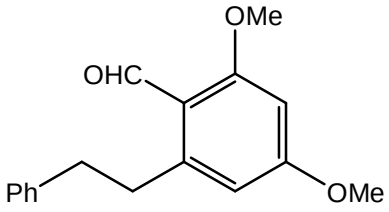


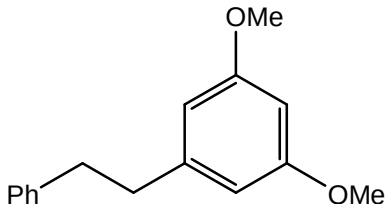
(a) Di-π-methane rearrangement (b) Oxo-Di-π-methane rearrangement
(c) Enone rearrangement (d) Lumiketone rearrangement

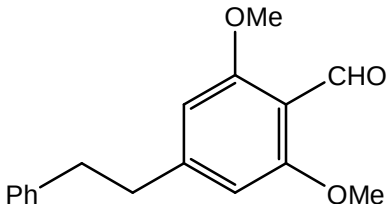
29. The major product formed in the following reaction is



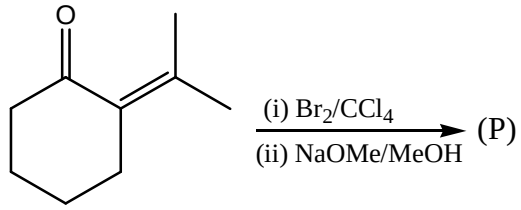
(a) 

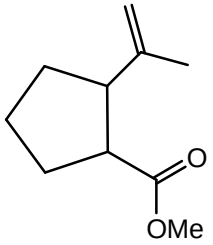
(b) 

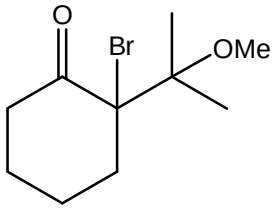
(c) 

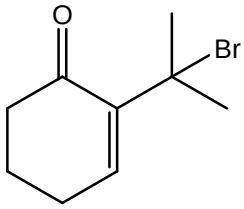
(d) 

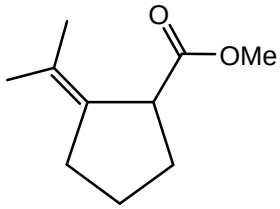
30. The major product formed in the following reaction is,



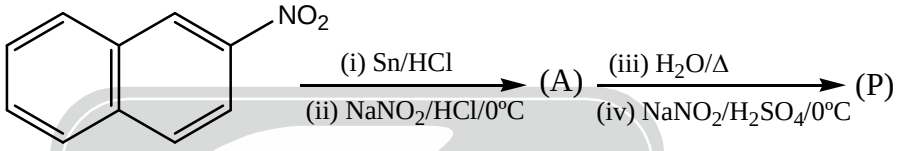
(a) 

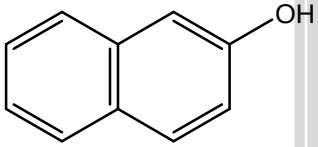
(b) 

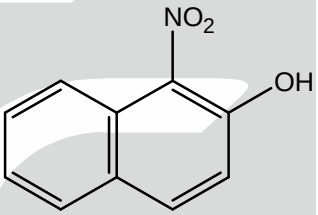
(c) 

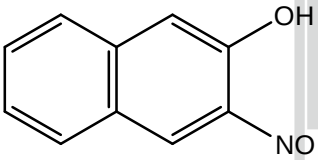
(d) 

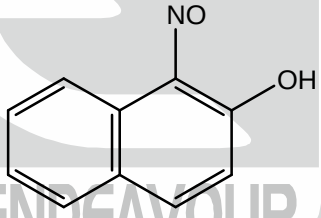
31. The final major product (P) is



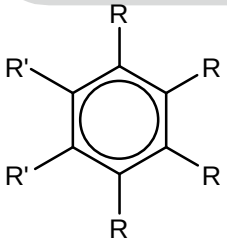
(a) 

(b) 

(c) 

(d) 

32. The suitable pahtway for the synthesis of compound (X) is



(X)

(a) LnM, $2R-C\equiv C-R$ and $R'-C\equiv C-R'$

(b) LnM, $2R-C\equiv C-R$ and $R'-C\equiv N$

(c) LnM, $2R-C\equiv C-R$ and RNCO

(d) LnM, $2R'-C\equiv C-R'$ and $R-C\equiv C-R$

33. One unpaired electron in Cu^{2+} (I=3/2) gives ESR spectrum at 3810 G using 9600 MHz microwave frequency. The signal should be of multiplicity _____(in one digit). (answer should be an integer).

34. Which of the following statement is not true

(a) $\left[Cp^{*}Fe\left(C_6Me_6\right)\right]\left[SbF_6\right]_2$ is a powerful one-electron oxidant

(b) $\left[Cp_2Co\right]$ is a powerful reaductant

(c) Unsaturated complex $\left(\leq 16\ e^{-}\right)$ complex can give associative substitution where the incoming ligand L_2 initially binds to the metal and the rate of reaction depends upon L_2.

(d) Saturated 18 electron complex can be dissociative substitution and rate of substiution is depend upon incoming ligand.

35. 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).

Q.36-Q.65 carry TWO marks each.

36. For elementary reaction, $A + B \longrightarrow P$

	σ	mass$(g/mole)$
A	1.2Å	5
B	2.4Å	15

The square of pre-exponential factor in rate constant is _____10^{-9}(in units of $m^6\ mole^{-2}s^{-2}$). (Upto two decimal places).

37. Three α-amino acid in which one is acidic (I), one is neutral (II) and rest one is basic (III) are given. The decreasing order of their isoelectric point will be

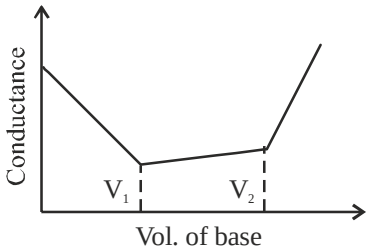
(a) I > III > II (b) III > II > I (c) III > I > II (d) I > II > III

38. One mole of an ideal gas is expanded from 10L to 20L adiabatically. If the initial temperature of gas is 273K, then the work done is _____$kJmol^{-1}$. [Given: $\gamma_{gas} = 1.67$]. (Upto two decimal places).

39. At 300K, the Debye screening length $\left(\kappa^{-1}\right)$ of 0.1M $CaCl_2$ in 10Å. The temperature at which the Debye screening length of 0.3M $CaCl_2$ become same as that of 0.1 M $CaCl_2$ solution is _____K. [Answer should be integer].

40. Buffer solution of 0.1M CH_3COOH and 0.2M CH_3COONa is diluted from 20 mL to 50 mL. The pH of new buffer solution is _____[Given: $pK_a = 4.75$] (Upto two decimal places).

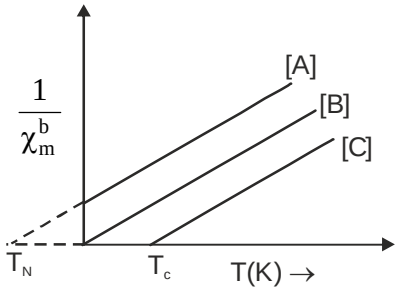
41. The conductometric titration plot of a 40 mL mixture of strong acid (HCl) and weak acid, CH_3COOH with strong base $Ca(OH)_2$ is as follow.



If V_1 = 5 mL and V_2 = 15 mL. The concentration of acetic acid in a mixture is _____$molL^{-1}$. [Given : $Ca(OH)_2$ = 0.2 M] (Upto one decimal places).

42. For a metal cation having d^6 configuration in an octahedral complex. The value of crystal field splitting energy $\left(\Delta_0\right)$ is 32200 cm^{-1} and the electron pairing energy (P) is 17600 cm^{-1}. The crystal field energy (CFSE) is _____cm^{-1} . [Answer should be an integer].

43. In the following graph, the lines A, B and C represent, respectively



(a) Curie-weise law, curie law, curie-weiss law
(b) Curie law, curie law, curie-weiss law
(c) Curie-weiss law, curie-weiss law, curie law
(d) All curie law

44. The royal blue colour of $Re_2Cl_8^{2-}$ and bright yellow colour of $Mn_2(CO)_{10}$ are due to respectively

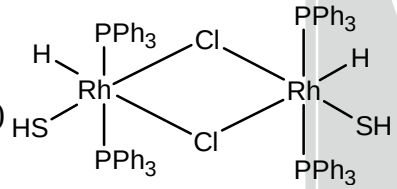
(a) δ and δ^* and MLCT transitions (b) δ and δ^* and LMCT transitions

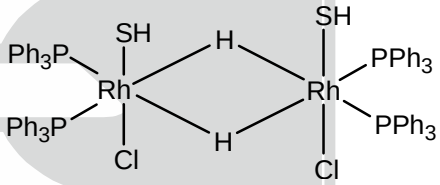
(c) δ and δ^* and σ and σ^* transitions (d) δ and δ^* and d-d transitions.

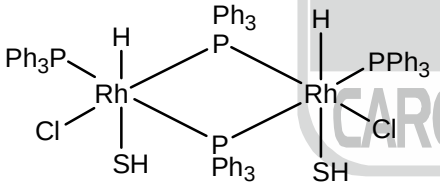
45. Which of the following statement is not true for KC_8.
(a) It is made by melting potassium over powdered grpahite
(b) It is very strong reducing agent especially for dehalogenation reactions.
(c) Unlike graphite it does not conduct electricity
(d) The potassium increases the interlayer distance of graphite layer.

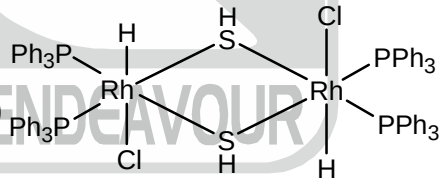
46. $H_2S \xrightarrow{RhCl(PPh_3)_3} (P)$

The product (P) is

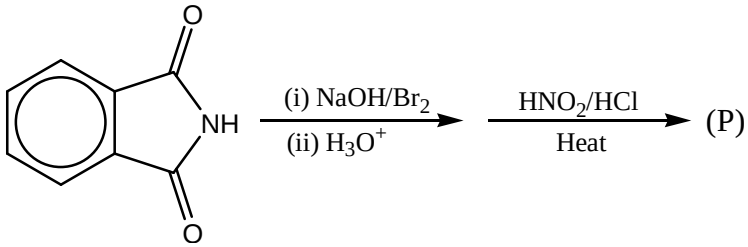
(a) 

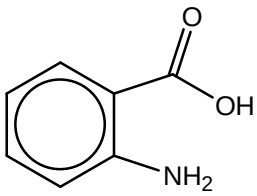
(b) 

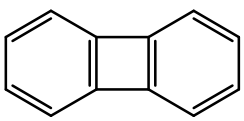
(c) 

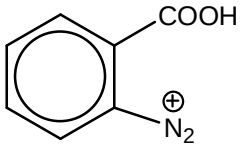
(d) 

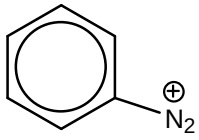
47. The major product (P) formed in the following reaction sequence is



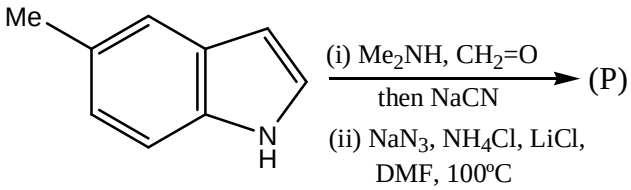
(a) 

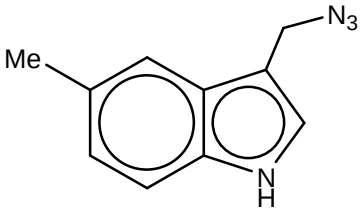
(b) 

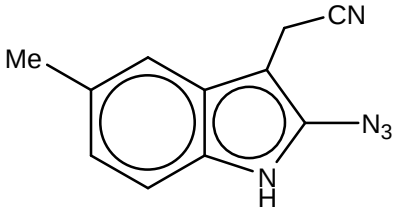
(c) 

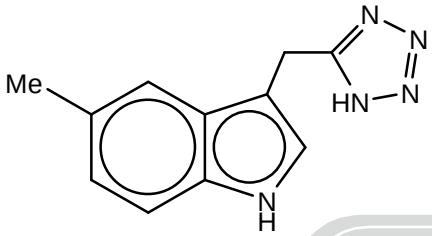
(d) 

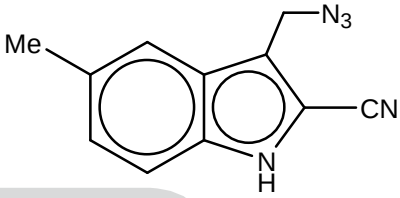
48. The major product (P) formed in the following reaction sequence is



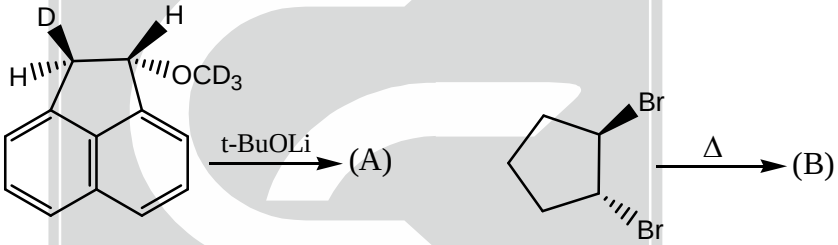
(a) 

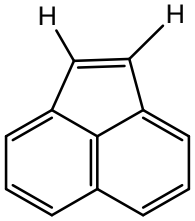
(b) 

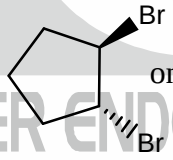
(c) 

(d) 

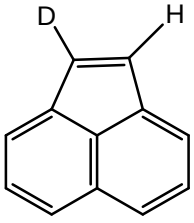
49. The products (A) and (B) obtained in the following transformations are

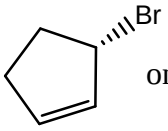


(a) A = 

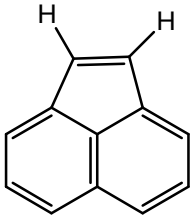
only ; B = 

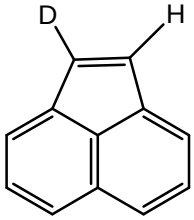
only

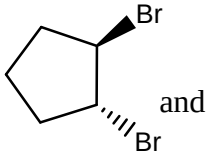
(b) A = 

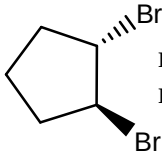
only ; B = 

only

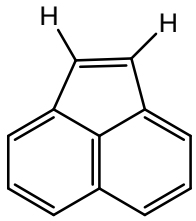
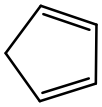
(c) A = 

and 

both; B = 

and 

racemic mixture

(d) A =  only; B =  only

50. For a system containing H_2 gas in thermodynamic equilibrium fraction of molecule present in ground state is, if molecule is only undergoing rotational motion is _____(Upto two decimal places).
[Given : T = 300K, B = 5 cm^{-1}]

51. A heteronuclear diatomic molecule gives microwave spectrum with approximately equally spaced lines. The spacing between respective lens is 20 cm^{-1}. If the same molecule is exposed to 340 nm light then the position of first stoke line in rotational Raman spectra will be _____(in cm^{-1}). (answer should be an integer).

52. For first excited state, the wavefunction for a quantum mechanical particle in a 1-D box of length $-a$ to $+a$ is given by $B\sin\frac{\pi x}{a}$. The value of B for a box of length 400 nm is

(a) $0.70\times10^{-1}(nm)^{-1/2}$ (b) $0.05(nm)^{-1/2}$

(c) $2\times10^{-2}(nm)^{1/2}$ (d) $4\times10^{-2}(nm)^{1/2}$

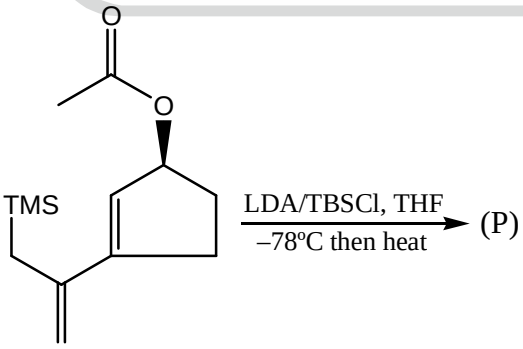
53. For a particle of mass m confined in a rectangular box with sides $3a$ and $2a$. The energy of the first excited state is _____(eV). (answer should be an intger).

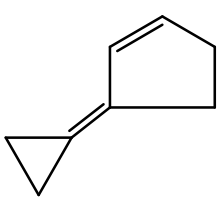
54. At 400K the thermal expansion coefficient and the isothermal compressibility of liquid water are $5\times10^{-6}\ K^{-1}$ and $8\times10^{-8}\ bar^{-1}$, respectively. $\left(\frac{\partial U}{\partial V}\right)_T$ (in kbar) for water at 420 K and 1 bar will be _____(Upto two decimal places).

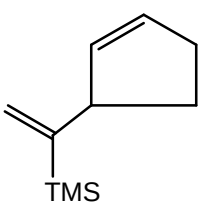
55. Ab crystallises in a rock salt structure with A : B = 1 : 1. The shortest distance between A and B is $Y^{1/3}$ Å. The formula mass of AB is 12.046 Y a.m.u., where Y is an arbitrary constant. The value of density in kgm^{-3} is _____(answer should be an integer).

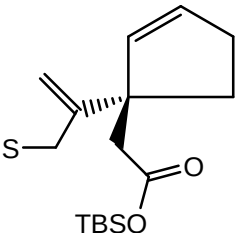
56. In a double stranded DNA, if the sequence 5'TGCCATGC3'appears on one strand of DNA, what sequence will be on complementary strand
(a) 5'GCATGGCA3' (b) 5'ACGGTACG3' (c) 5'ACGGATCG3' (d) 5'GCAAGGCA3'

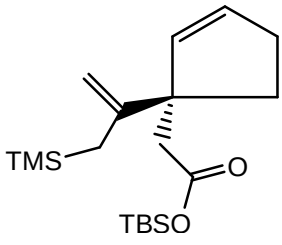
57. The major product (P) formed in the following reaction sequence is



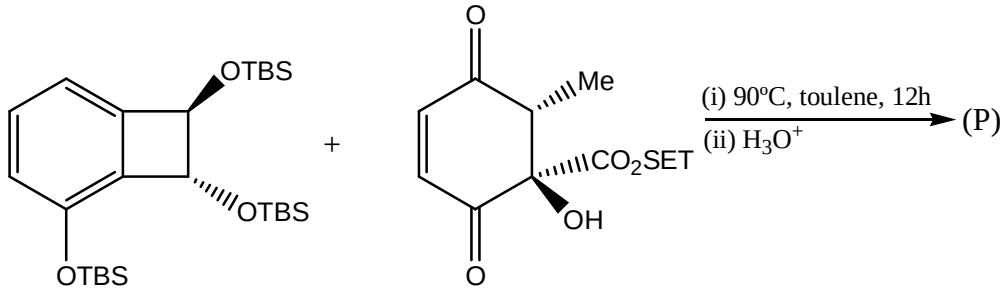
(a) 

(b) 

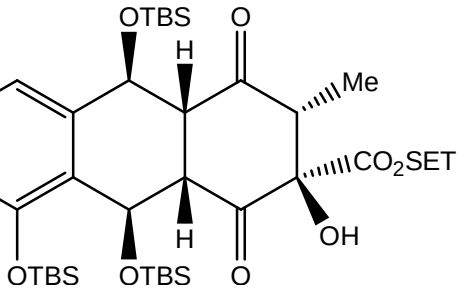
(c) 

(d) 

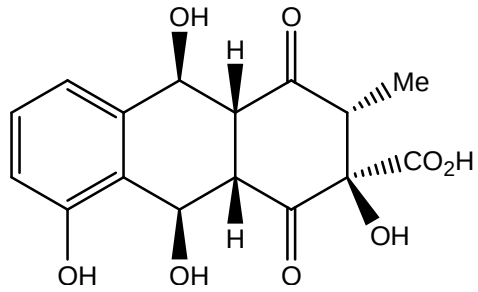
58. The major product (P) formed in the following reaction



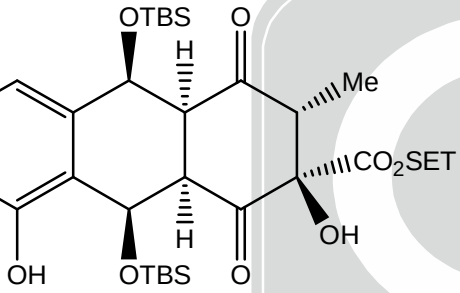
(a)



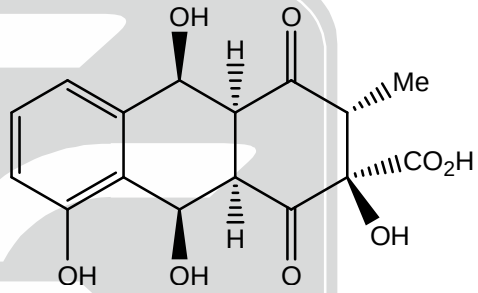
(b)



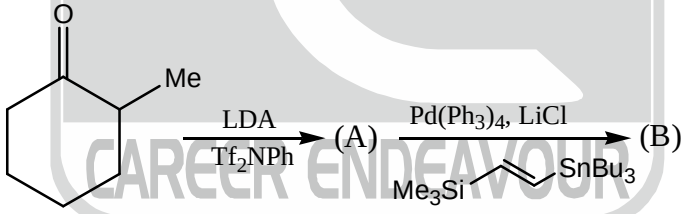
(c)



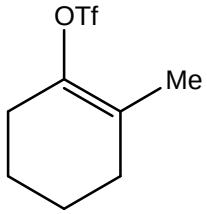
(d)



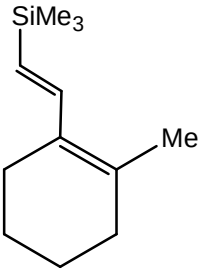
59. The major products (A) and (B) formed in the following reaction sequence are



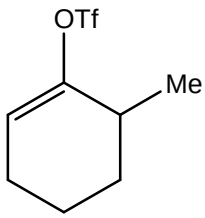
(a) A =



B =



(b) A =



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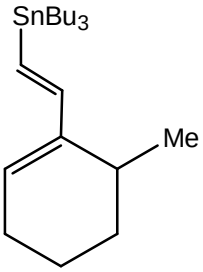
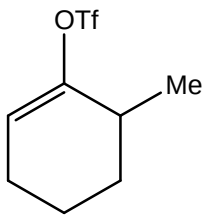
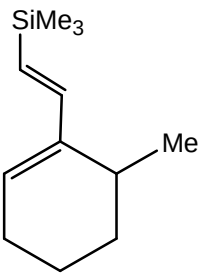


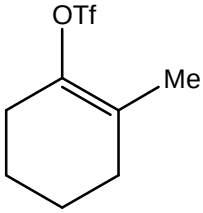
(c) A =



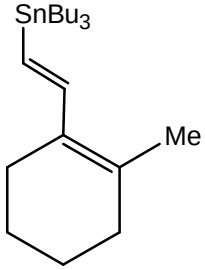
B =



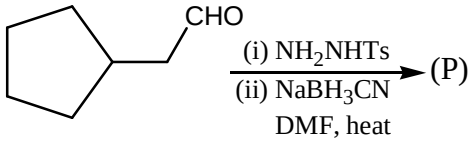
(b) A =



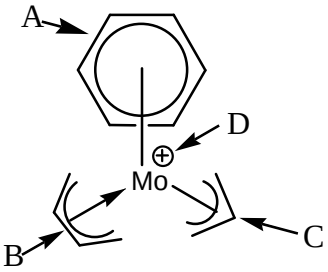
B =



60. In the following reaction, the number of DBE (double bond equivalent) in the product (P) is/are _____(answer should be an integer).

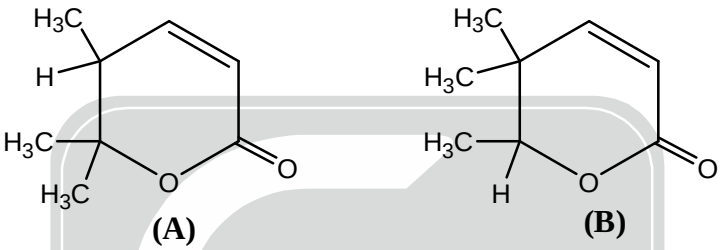


61. The most preferential site for nucleophilic attack in compound (X) is



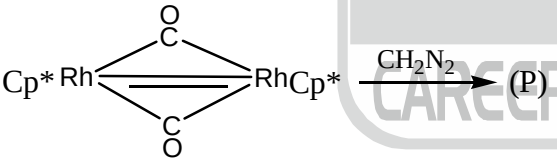
(a) A (b) B (c) C (d) D

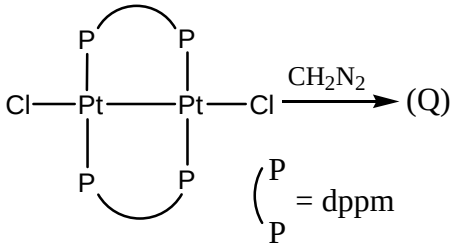
62. The appropriate set of key spectroscopic parameters to distinguish the organic compound A and B will be



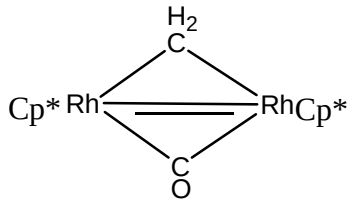
(a) Chemical shift of HNMR and mass spectrum
(b) Multiplicity of NMR signals UV-spectrum
(c) Number of signal in HNMR and IR-spectrum
(d) Chemical shift and multiplicity in HNMR

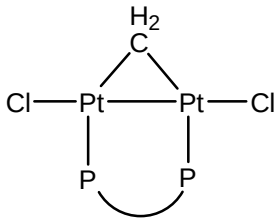
63. In the 400 MHz spectrum of organic compound exhibits a doublet. The two lines of the doublet are at 2.35 and 2.38 ppm. If we record the NMR spectrum of same molecule at 200MHz, the first lines of the same doublet should appear at _____(up to three decimal place)

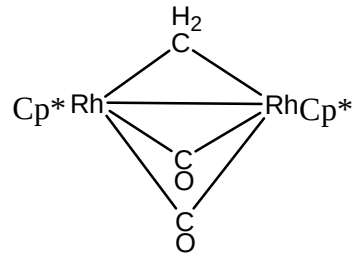
64. 

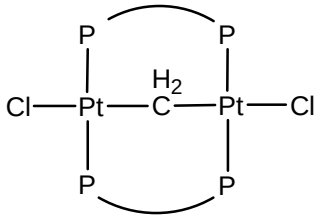


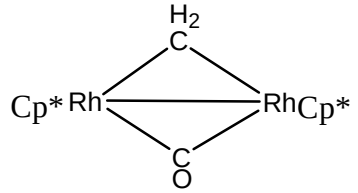
The major product (P) and (Q) in the above reaction is (Note: Compound (Q) = 16 electron and P = 18 electron).

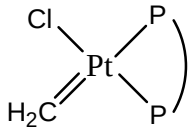
(a) **(P)** 

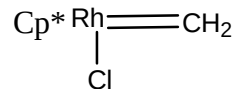
(Q) 

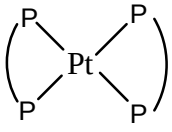
(b) **(P)** 

(Q) 

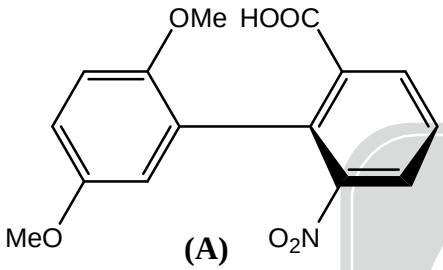
(c) **(P)** 

(Q) 

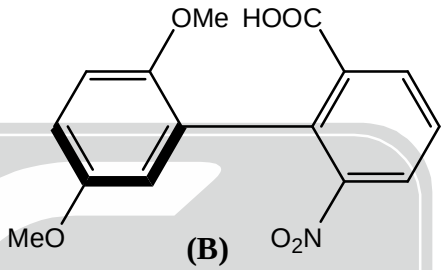
(d) **(P)** 

(Q) 

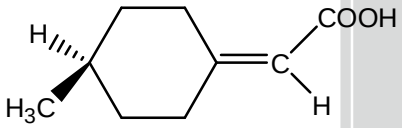
65.



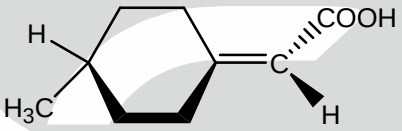
(A)



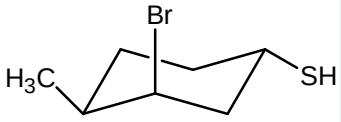
(B)



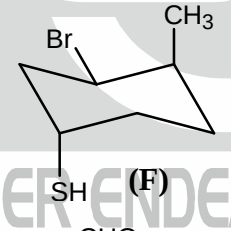
(C)



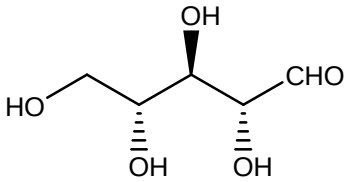
(D)



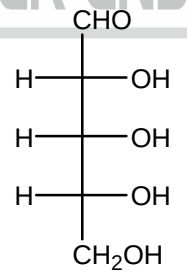
(E)



(F)



(G)



(H)

The *incorrect* statement among the following is

(a) A and B are enantiomers
(b) C and D are enantiomers
(c) E and F are diastereoisomers
(d) G and H are diastereoisomers

****

Space for rough work

CHEMISTRY - CY

GATE TEST SERIES-D

Date: 23-01-2019

PHYSICAL CHEMISTRY

ANSWER KEY

1. (36)	**2.** (b)	**3.** (d)	**4.** (b)	**5.** (c)
6. (b)	**7.** (b)	**8.** (a)	**9.** (b)	**10.** (a)
11. (b)	**12.** (42901 to 42904)	**13.** (15 to 15)	**14.** (–120.4 to -124.4)	
15. (-6.31 to -6.35)	**16.** (d)	**17.** (a)	**18.** (d)	
19. (b)	**20.** (b)	**21.**(b)	**22.** (11.39 to 11.42)	
23. (a)	**24.** (0.01 to 0.01)	**25.** (50 to 50)	**26.** (d)	
27. (a)	**28.** (d)	**29.** (d)	**30.** (d)	
31. (d)	**32.** (a)	**33.** (4 to 4)	**34.** (d)	
35. (4)	**36.** (10.50 to 10.60)	**37.** (b)	**38.** (1.23 to 1.27)	
39. (90 to 90)	**40.** (5.04 to 5.06)	**41.** (0.1 to 0.1)	**42.** (-42080)	
43. (a)	**44.** (c)	**45.** (c)	**46.** (d)	
47. (b)	**48.** (c)	**49.** (c)	**50.** (0.03 to 0.06)	
51. (29351 to 29355)	**52.** (b)	**53.** (6.45 to 6.65)	**54.** (26.20 to 26.30)	
55. (10000 to 10000)	**56.** (a)	**57.** (c)	**58.** (d)	
59. (c)	**60.** (1)	**61.** (b)	**62.** (d)	
63. (2.330 to 2.340)	**64.** (b)	**65.** (d)		