

TEST SERIES FOR GATE

BOOKLET SERIES **C**

Paper Code: **CY**

Test Type: **TEST SERIES**

Duration: **3:00 Hours**

CHEMISTRY

Date: **18-01-2016**

Maximum Marks: **100**

Read the following instructions carefully:

1. Attempt all the 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 $\frac{1}{3}$ marks for a **1-mark** question and $\frac{2}{3}$ 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.

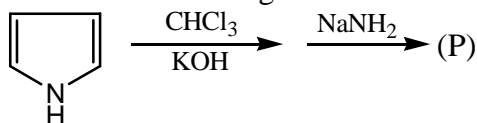
- Which is the correct form of incorrect sentence: The speed of this car is greater than the old one.
 - Correct: The speed of this car is greater than that a old one
 - Correct: The speed of this car is greater than that the old one
 - Correct: The speed of this car is greater than that old one
 - Correct: The speed of this car is greater than that of old one
- Which is the correct form of incorrect sentence: Neither his brother nor any member of the family helped him.
 - Correct: Neither his brother nor other member of the family helped him.
 - Correct: Neither his brother nor any other member of the family helped him.
 - Correct: Neither his brother nor any member of the family helped him.
 - Correct: Neither his brother or any other member of the family helped him.
- Two numbers X and Y are 20% and 28% less than a third number Z. Find by what percentage is the number Y less than the number X?
 - 8%
 - 12%
 - 10%
 - 9%
- What is antonyms of word advent?
 - Arrival
 - Runaway
 - Departure
 - discover
- What is synonym of word skirmish?
 - Minor fight
 - discussion
 - killing
 - high expectation

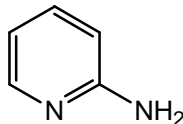
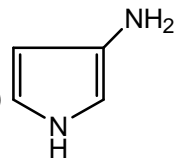
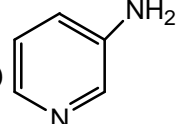
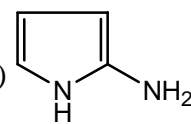
Q.6-Q. 10 carry TWO marks each.

- Find the remainder in expression of $73 \times 75 \times 78 \times 57 \times 197$ when it is divisible by 34.
 - 28
 - 29
 - 30
 - 31
- In a village, $\frac{5}{8}$ of the population are adults $\frac{1}{2}$ of the adults are male $\frac{4}{5}$ of adult females are illiterate. If 400 females are illiterate then the population of the village is:
 - 2000
 - 1500
 - 1800
 - 1600
- A two digit number becomes five sixth of itself when its digit are reversed the two digits differ by one then number is:
 - 24
 - 45
 - 56
 - 54
- Two trains 180 and 220 metres long are running in opposite directions at 40 and 50 km/h respectively. They cross each other in
 - 16 s
 - 17 s
 - 18 s
 - 22 s
- Skeleton: Body::Grammar:?
 - Language
 - Sentence
 - Meaning
 - Education

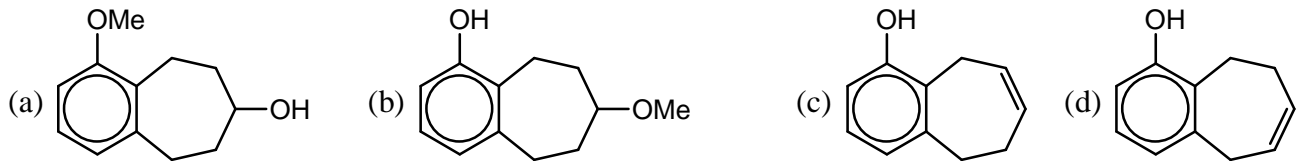
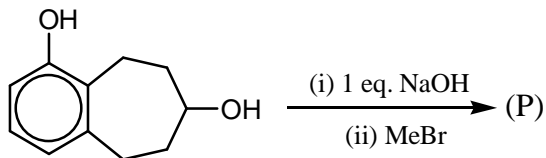
Q.11-Q.35 carry one mark each.

- The major product (P) formed in the following reaction is :



- 
- 
- 
- 

12. The product (P) in the following reaction is



13. Among the following, the correct statement is

- (a) CH is isolobal to $\text{Co}(\text{CO})_3$ (b) CH_2 is isolobal to $\text{Ni}(\text{CO})_2$
 (c) CH is isolobal to $\text{Fe}(\text{CO})_4$ (d) CH_2 is isolobal to $\text{Mn}(\text{CO})_4$.

14. Identify the compound whose ^1H NMR-spectral data is given as

^1H NMR (δ , CDCl_3); 0.92 (3H, t, $J = 7.2$ Hz); 1.25 (3H, t, $J = 7.2$ Hz); 2.10 (2H, m); 4.1 (2H, q, $J = 7.2$ Hz); 5.90 (1H, dt, $J = 16, 2\text{Hz}$), 7.10 (1H, dt, $J = 16, 7.2$ Hz).



15. For a first order reaction $A \rightarrow P$, the temperature (T) dependent rate constant (K) was found to follow

$$\text{the equation, } \log K = \frac{2000}{T} + 6.0$$

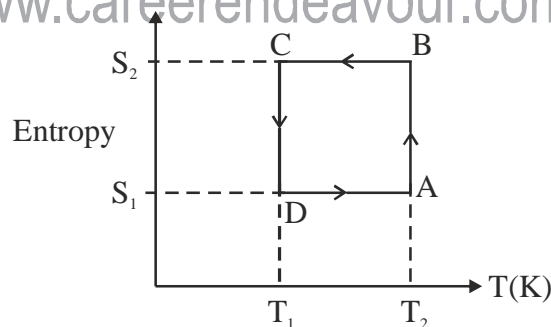
The pre-exponential factor A and the activation energy E_a , respectively, are

- (a) $1.0 \times 10^6 \text{ S}^{-1}$ and 9.2 KJ mol^{-1} (b) 6.0 S^{-1} and 16.6 KJ mol^{-1}
 (c) $1.0 \times 10^6 \text{ S}^{-1}$ and 16.6 KJ mol^{-1} (d) $1.0 \times 10^6 \text{ S}^{-1}$ and 38.3 KJ mol^{-1}

16. The correct order of acidic strength

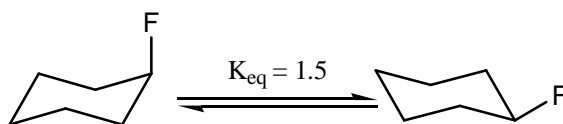
- (a) $\text{CO}_2 < \text{SO}_2 < \text{SO}_3$ (b) $\text{CO}_2 > \text{SO}_3 > \text{SO}_2$ (c) $\text{SO}_3 > \text{CO}_2 > \text{SO}_2$ (d) none is correct.

17. Which is/are true for given cycle.



- (a) $w_{A \rightarrow B} + w_{C \rightarrow D} = 0$ (b) $w_{B \rightarrow C} + w_{D \rightarrow A} = 0$
 (c) $w_{A \rightarrow B} + w_{B \rightarrow C} = 0$ (d) $w_{C \rightarrow D} + w_{D \rightarrow A} = 0$

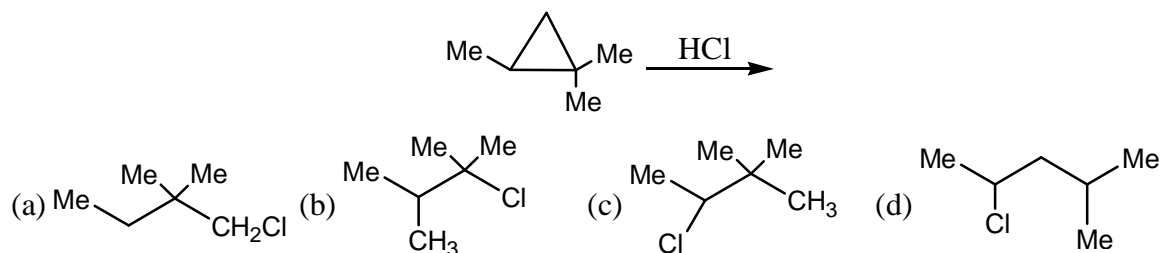
18. The equilibrium constant for the ring-inversion of fluoro-cyclohexane is 1.5 at 25°C.



The fraction of the axial conformer at this temperature is

- (a) 60% (b) 40% (c) 75% (d) 15%
19. For metal olefin complexes (1) $[\text{PCl}_3(\text{C}_2\text{H}_4)]^-$ and (2) $[\text{PtCl}_3(\text{C}_2\text{Me}_4)]^-$. The correct statement is
 (a) C–C bond length is same in both (1) and (2)
 (b) C–C bond length in (1) is smaller compared to that (2)
 (c) C–C bond length in (1) is larger compared to that of (2)
 (d) A metallocycle is formed in each complex.
20. The number of microstate for d^5 -electronic configuration is
21. If 5 moles of O_2 and 3 moles of H_2 are mixed in a container at constant temperature and pressure then
 (1) $\Delta_{\text{mix}}S \geq 0$ (2) $\Delta_{\text{mix}}H \geq 0$ (3) $\Delta_{\text{mix}}G \leq 0$ (4) $\Delta_{\text{mix}}V = 0$
 (a) 1 and 2 (b) 2, 3 and 4 (c) 3 and 4 (d) 1 only
22. Two times of the ionisation energy of H-atom is called one atomic unit energy (1 au), then ionisation energy of Li^{++} is(au).
23. The $t_{1/2}$ of cobalt-60 is 5.26 years. Percentage activity after 4 years will be
 (a) 70% (b) 40% (c) 59% (d) 50%
24. Particle in 1-D box model which is/are statement wrong
 (1) In ground state ($n = 1$) particle is in rest
 (2) In first excited state particle is in rest at mid point of the width of box.
 (3) In first excited state particle is in rest at three point
 (4) In first excited state particle is not in rest
 (a) 1, 2, 3 (b) 1 and 3 (c) 2 and 4 (d) 3 only
25. Which one of the following represents eigenvalue equation
 (a) $\frac{\hat{d}}{dx}(\sin kx) = k \cos kx$ (b) $\frac{\hat{d}^2}{dx^2}(\sin kx) = -k^2 \sin kx$
 (c) $\frac{\hat{d}}{dx}(4x^3) = 12x^2$ (d) $\frac{\hat{d}}{dx} \cos kx = -\sin kx$
26. The shape of IF_8^- is
 (a) dodecahedron (b) square antiprismatic (c) cubic (d) all
27. The number of M–M bond in the given complex (A) and (B) are respectively
 $[\eta^5\text{CpCr}(\text{CO})_3]_2$ & $[\eta^5\text{CpMo}(\text{CO})_2]_2^{2-}$
 (A) (B)
 (a) 1 & 0 (b) 2 & 0 (c) 1 & 3 (d) 1 & 2

28. The major product in the reaction is:

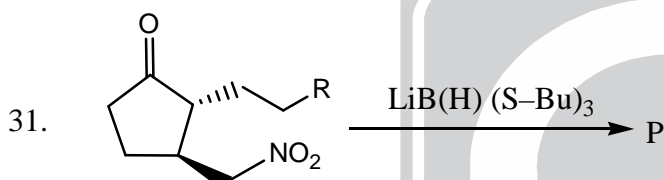


29. Which is not correct for the e'_{2g} Mulikan symbol.

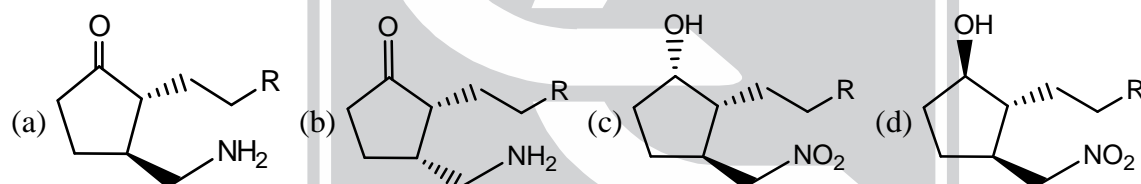
- (a) Unsymmetric with respect to σ_h (b) Symmetric with respect to σ_h
 (c) Symmetric with respect to center of inversion
 (d) Doubly degenerate.

30. Which statement is not correct?

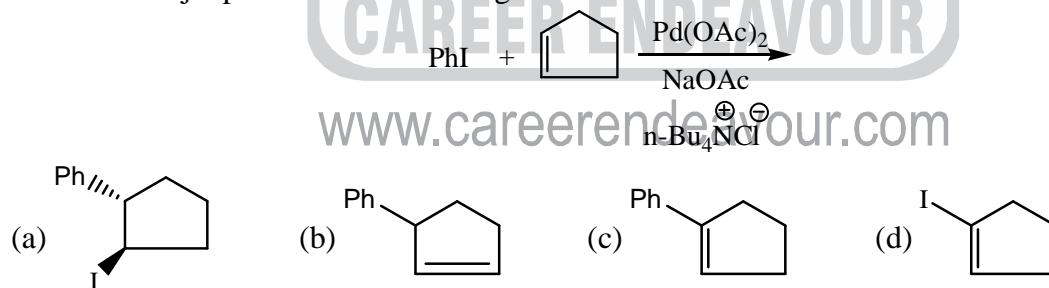
- (a) Tetrachloroethylene is a symmetric top molecule
 (b) Rotational energy levels of non rigid rotator are closer than that of rigid rotator.
 (c) Rotational energy levels of HBr (80) are closer than that of rigid rotator HBr (82).
 (d) Intensity of rotational transition J1 to J2 will be less than that of J3 to J4



The major product 'P' in the above reaction is:



32. Predict the major product in the following reaction



33. When crystals of NaCl are heated in an atmosphere of sodium vapour, then yellow colour is imparted by the crystals of NaCl due to

- (a) Creation of Schottky defect
 (b) Creation of Frenkel defect.
 (c) Creation of F-centres which causes energy absorption in visible region.
 (d) Creation of metal deficiency defect.

34. A diffraction pattern of the element polonium gave lines at the following values of θ (in degree) when X-rays were used: 6.05° , 8.55° , 10.5° , 12.15° , 13.6° , 14.95° , 17.35° , 18.45° , 19.45° , 20.45° , 21.4° .

The cubic lattice type is:

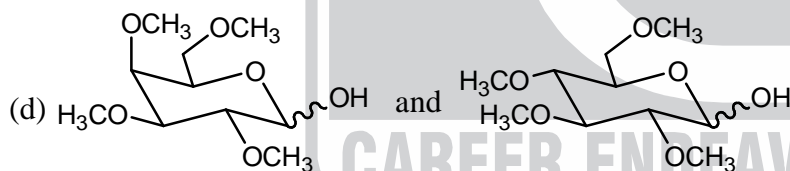
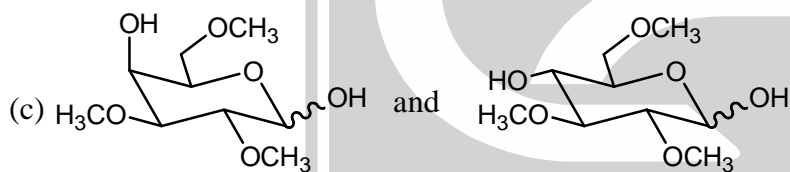
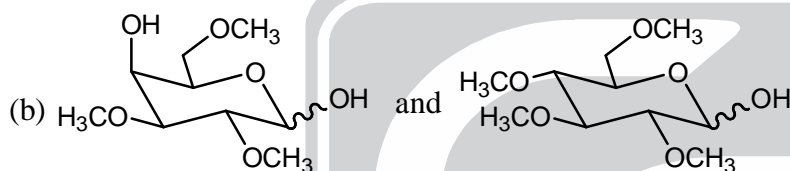
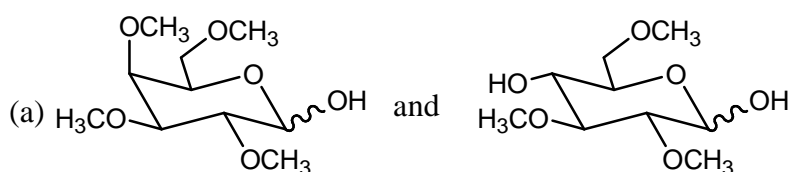
- (a) Primitive (b) Body centred (c) Face-centered (d) Cannot be predicted.



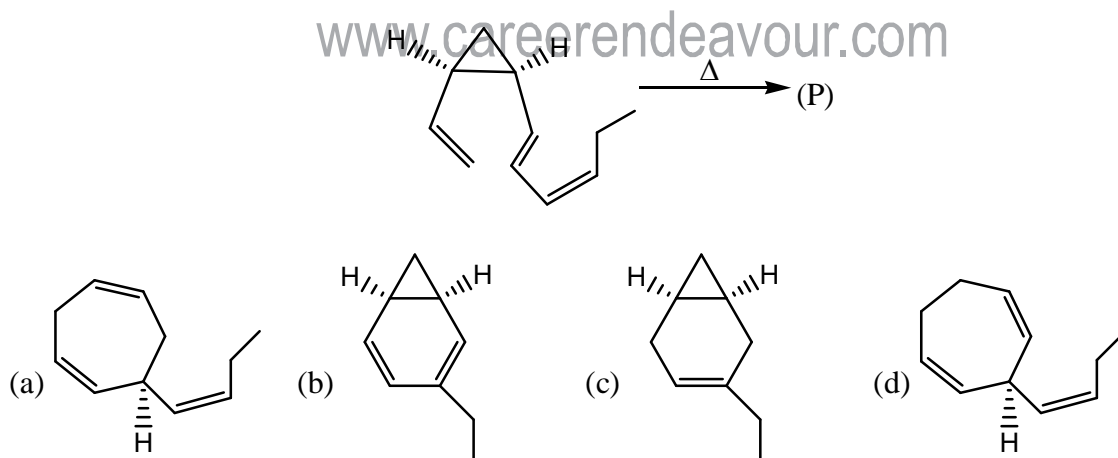
35. If 0.0033 M of a substance quenches the fluorescence efficiency by 25%, the value of the stern-volmer constant in M^{-1} unit is _____

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

36. Which among the following statements are correct.
 (1) pyridine is more basic than pyrrole
 (2) pyridine forms N-oxide with per acids while pyrrole does not form
 (3) pyridine gives electrophilic subs faster than pyrrole.
 (4) electrophilic substitution on pyridine occurs at 2nd position while on pyrrole occurs at 3rd position.
 (a) 1 and 2 (b) 1 and 3 (c) 2 and 3 (d) 1 and 4
37. The most reactive position on pyridine for nucleophilic substitution is _____ position.
38. Treatment of lactose with excess Me-I in presence of moist Ag_2O , followed by acid hydrolysis will form



39. The major product (P) formed in the reaction given below is



40. Which one is correct about compressibility factor for z of a gas:
 (a) $z > 1$ means gas have larger molar volume than perfect gas.
 (b) $z < 1$ means gas have larger molar volume than perfect gas

(c) $z > 1$ means, gas molecules experienced more attractive force than repulsive force.

(d) molecular forces does not affected the z value of a gas.

41. There are three functions $\psi_1 = \frac{1}{\sqrt{2\pi}}$, $\psi_2 = \frac{1}{\sqrt{2\pi}} \cos nx$ and $\psi_3 = \frac{1}{\sqrt{\pi}} \cos nx$ in the range $0 < x < 2a$

(a) ψ_1 and ψ_2 are orthonormal

(b) ψ_1 and ψ_3 are orthonormal.

(c) ψ_1 and ψ_2 are normalized functions

(d) only ψ_2 is normalized functions.

42. Which is/are statements are TRUE

(1) the operator $\hat{p}_x \cdot \hat{p}_x$ is a hermitian operator

(2) the eigen functions of a Hermitian operator corresponding to different eigenvalues are orthogonal.

(3) the eigenvalues of a hermitian operator are real.

(4) $\sin 2x$ is an eigen function of operator $\frac{d}{dx}$ but not that of operator $\frac{\hat{d}}{dx}$.

(a) 1, 2 and 3

(b) 1 and 4

(c) 2 and 3

(d) 2 only

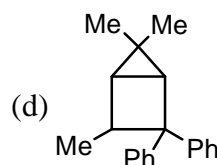
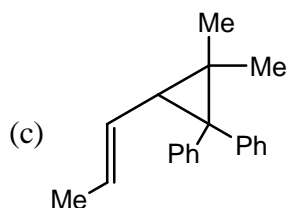
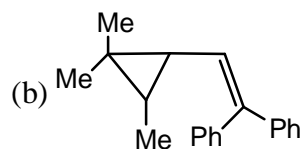
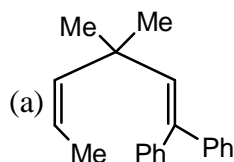
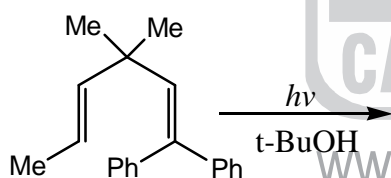
43. For a proton, if the applied magnetic field has a strength of approximately 4.70 tesla, the frequency of NMR spectrometer (in MHz) is (Given, γ for H = 267.53).

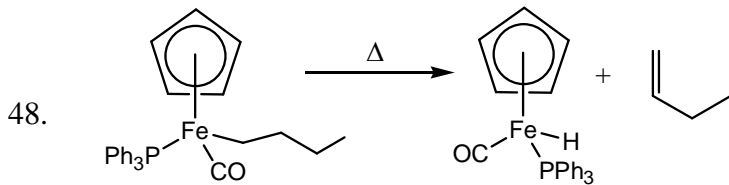
44. The intensity of a light beam decreases by 50% when it passes through a sample of 1.0 cm path length. The percentage of transmission of the light passing through the same sample, but of 3.0 cm path length would be

45. The crystal field stabilization energy for complex $[Co(H_2O)_3 F_3]$ is $-870 \text{ kJ/mole}^{-1}$. The Δ_0 for complex is

46. The final temperature of a sample of CO_2 of mass 16.0gm that is expanded reversibly and adiabatically from 500 cm^3 at 298.15K to 2.00 dm^3 isK. (Given, $C_{p,m}$ of $CO_2 = 37.11 \text{ JK}^{-1} \text{ mol}^{-1}$).

47. Identify the major product in the following reaction

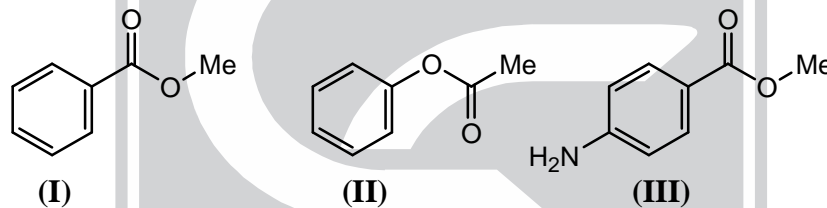




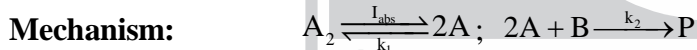
The mechanistic step for the above given reaction is:

- (a) Ligand dissociation, β -H transfer, ligand substitution
 (b) β -H transfer, ligand substitution, ligand dissociation.
 (c) Ligand dissociation, ligand substitution, β -H transfer
 (d) It is difficult to say what happen.
49. Identify the correct statements from following
- (1) 3d-block metal complex gives sharper spectra than lanthanoids and actinoids
 (2) the ground state term of V^{3+} is 3F_2 .
 (3) $Co^{2+} > Mg^{2+} > Sr^{2+} > Ba^{2+}$ (stability order with $EDTA^{4-}$)
 (4) $MnO_4^- > CrO_4^{2-} > VO_4^{3-}$ (correct order of LMCT)
- (a) 1 and 4 (b) 2 and 3 (c) 3 and 4 (d) 4 only

50. The order of carbonyl stretching frequency in the IR-spectra of following compound is



- (a) I > II > III (b) I = II > III (c) II > I > III (d) I > III > II
51. For the given photochemical reaction mechanism for the reaction $A_2 + B \rightarrow P$,

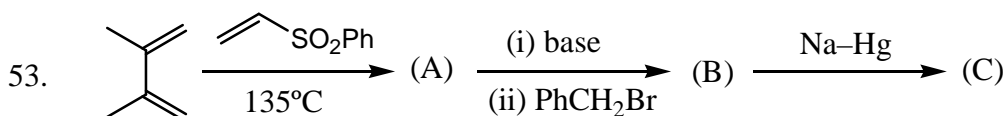


The rate law expression for the reaction is:

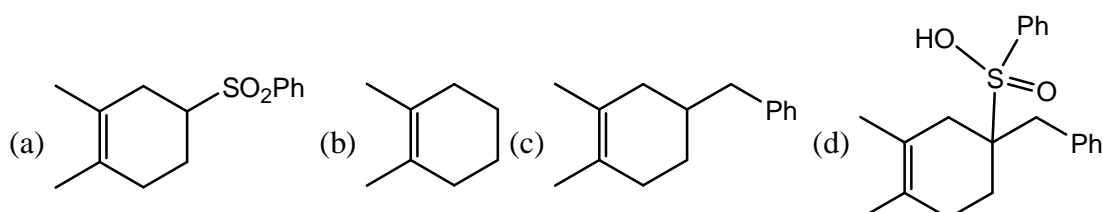
- (a) $\frac{k_2 I_{abs} [B]}{k_1 + k_2 [B]}$ (b) $\frac{k_2 I_{abs}^{1/2} [B]}{(k_1 + k_2 [B])^{1/2}}$ (c) $\frac{k_2 I_{abs} [B]^2}{k_1 + k_2 [B]}$ (d) $\frac{k_2 I_{abs} [A_2][B]}{k_1 + k_2 [B]}$

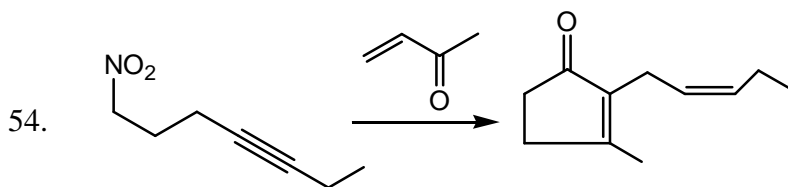
52. 5.26 g of sulphur containing ore of copper releases 2.12 g of SO_2 . Assuming that the ore only contains copper and sulphur. The empirical formula of the ore is:

- (a) CuS_2 (b) Cu_2S (c) CuS (d) Cu_2S_3



Product C is:



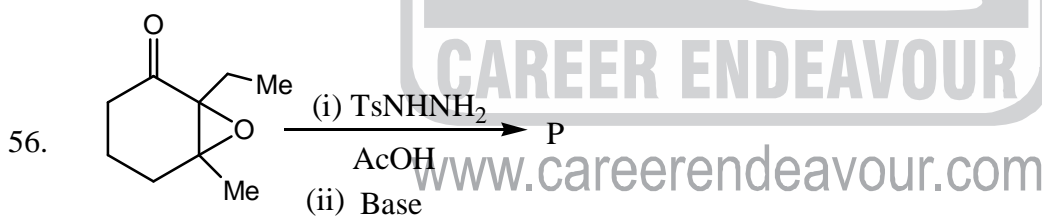
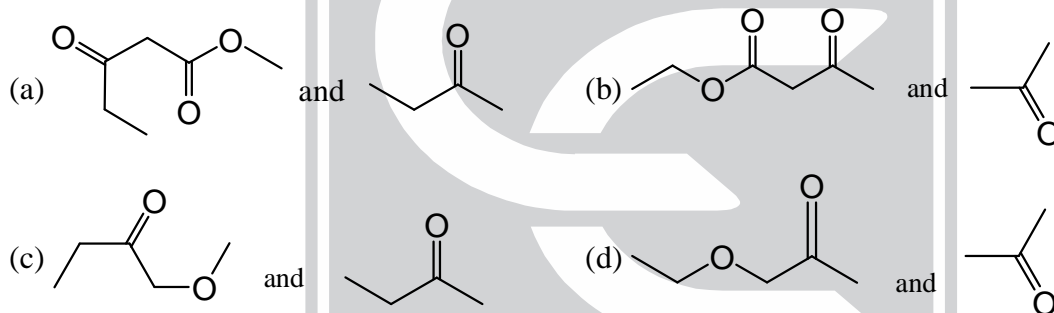


For the above reaction suitable reagent is

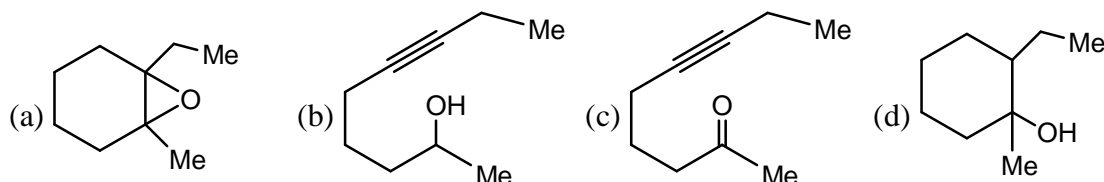
- (a) (i) LDA, (ii) $\text{TiCl}_3, \text{H}_2\text{O}$, (iii) NaOH, (iv) $\text{CaCO}_3/\text{Pd}/\text{H}_2$.
 (b) (i) LDA, (ii) $\text{Pd}/\text{C}/\text{H}_2$, (iii) LDA, (iv) NaOH, (v) $\text{CaCO}_3/\text{Pd}/\text{H}_2$.
 (c) $\text{TiCl}_3, \text{H}_2\text{O}$, (ii) $\text{Pd}/\text{C}/\text{H}_2$, (iii) LDA, (iv) NaOH, (v) $\text{CaCO}_3/\text{Pd}/\text{H}_2$.
 (d) None of the above.
55. The reaction of two-mole ethyl acetate with one mole sodium hydride in cyclohexane produces an organic salt. Acidification of the organic salt compound A. On hydrolysis the compound A produces a ketone. The NMR data of compound A are given here.

Give the name of compound A and Ketone

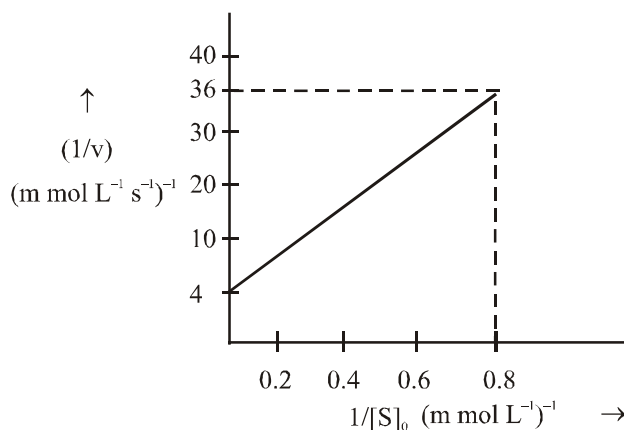
C. Shift(ppm)	Multiplicity	Integration
1	triplet	23.2
2.1	singlet	22.8
3.8	singlet	15.2
4.1	quatret	15.5



The major product 'P' is:



57. For an enzyme catalysed reaction a line weaver-Burk plot obtained as



The value of Michaelis constant

58. The infrared spectrum of a H—CF³⁵ molecule has oscillation wave number ($\bar{\omega}_e$) 2170 cm⁻¹ and highest intensity hot band transition (i.e. from 1st excited state to 2nd excited state) is at wave number 2100 cm⁻¹. The anharmonicity constant (cm⁻¹) of the molecule is
59. Rate constant of a second order reaction at 300 and 400K are respectively 8×10^6 and 8×10^7 dm³ mol⁻¹ s⁻¹. The approximate value of activation energy (in kJ mol⁻¹) in the above reaction is
60. The root mean square speed of 8g of He is 300 ms⁻¹. Total kinetic energy of He gas is:
 (a) 120 J (b) 240 J (c) 360 J (d) 480 J
61. A molecule shows molecular ion signals at m/z 720 and 721 in intensity ratio 3:2 in mass spectrum. The number of carbon present in the given molecule is
62. For a complex [CrF₆]³⁻ the absorption frequency are found at 34400, 22700 and 14900. Find the value of β .
 (Given B for this complex is 1100 cm⁻¹)
 (a) 0.85 (b) 0.75 (c) 1 (d) 1.5
63. The shape of I₃⁺, XeF₂ and BrOF₄⁻ are respectively.
 (a) Linear, linear and square pyramidal (b) Linear, linear and trigonalbipyramidal.
 (c) Linear, Linear and distorted octahedral (d) Bent, linear and square pyramidal.
64. For a 3s-orbital, $\psi(3s) = \frac{1}{9\sqrt{3}} \left(\frac{1}{a_0} \right)^{3/2} (6 - 6x + 6x^2) e^{-x/2}$, where $x = \frac{2rz}{3a_0}$
 www.careerendevour.com
 what is the maximum radial distance of node from the nucleus?
 (a) $\frac{(3 + \sqrt{3})a_0}{z}$ (b) $\frac{a_0}{z}$ (c) $\frac{3(3 + \sqrt{3})a_0}{2z}$ (d) $\frac{2a_0}{z}$
65. The solubility product of AgCl(s) is 2×10^{-10} at 298K. If the standard reduction potential of the half-cell, E⁰_{Ag⁺|Ag} is 0.80 V, the standard reduction potential, E⁰_{Cl⁻(0.004M)|AgCl(s)|Ag} (in volts) is

Space for rough work

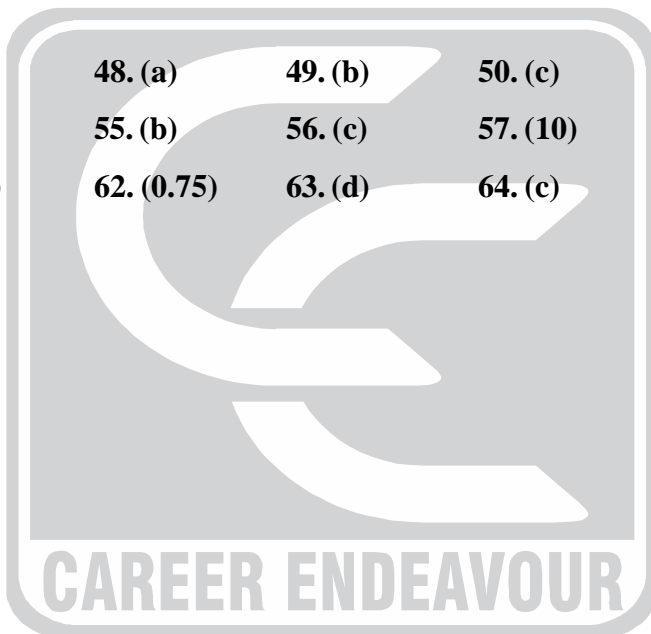


CHEMISTRY-CY

Date: 18-01-2016

GATE TEST SERIES-III**ANSWER SHEET**

- | | | | | | | |
|-----------|----------|------------|-----------|-----------|--------------|----------------|
| 1. (d) | 2. (b) | 3. (c) | 4. (c) | 5. (a) | 6. (a) | 7. (d) |
| 8. (d) | 9. (a) | 10. (a) | | | | |
| 11. (c) | 12. (a) | 13. (a) | 14. (d) | 15. (d) | 16. (a) | 17. (b) |
| 18. (b) | 19. (c) | 20. (252) | 21. (b) | 22. (4.5) | 23. (c) | 24. (a) |
| 25. (b) | 26. (b) | 27. (d) | 28. (b) | 29. (a) | 30. (c) | 31. (c) |
| 32. (b) | 33. (c) | 34. (a) | 35. (101) | 36. (a) | 37. (2) | 38. (a) |
| 39. (a) | 40. (a) | 41. (b) | 42. (a) | 43. (200) | 44. (12.5) | 45. (182047.5) |
| 46. (200) | 47. (c) | 48. (a) | 49. (b) | 50. (c) | 51. (a) | 52. (b) |
| 53. (c) | 54. (a) | 55. (b) | 56. (c) | 57. (10) | 58. (0.008) | 59. (23) |
| 60. (c) | 61. (60) | 62. (0.75) | 63. (d) | 64. (c) | 65. (0.3692) | |



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